Note:

Pages verified before binding - 29 Sept. 1979.

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24 October 1979

SLOK

PAUL GUZZI
SECRETARY OF
THE COMMONWEALTH

The Commonwealth of Massachusetts

Office of the Secretary

State House • Boston 02133

GW

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FROM: The State Bookstore

DATE: November 4, 1977

The enclosed information is intended to make your Building Code easier to use. In this mailing you will find:

1. A subscription service order blank for the new subscription year (October 1, 1977 to September 30, 1978). This year we will print all amendments single sided to make your code updating easier.

2. An Amendment Checklist which explains how to make sure your code is up to date. It also has price information so you can order any missing amendments.

3. An Amendment Reference Guide which will help you find out which Code sections are affected by particular amendments. An explanation of how to use the Amendment Reference Guide is attached.

We hope this information will be helpful to you. If you have questions about your Subscription service or need to order amendments, please call the State Bookstore 727-2834 or write us at Room 116, State House, Boston, MA 02133

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AMENDMENT REFERENCE GUIDE

Instructions for Use

The Amendment Reference Guide will tell you whether a particular Code section has been amended and cites the particular amendment in which the changes are found. Amendments are cited by filing date and Secretary of State regulation numbers, both of which appear on the cover sheet of each amendment.

To find out whether a particular Code section has been amended, check the decimal numbers identifying that section against the decimal numbers in the Amendment Reference Guide.

1. If no decimal numbers for that section appear in the Amendment Reference Guide, you know that the Code was not amended between January 1, 1975 and November 4, 1977.

2. If there is a corresponding decimal number, you can find the amended section by checking the filing date and Secretary of State Regulation number against the filing date and regulation numbers on the cover sheets of your amendments.

3. For example, you may be using Article 21 to determine requirements for 1 and 2 family dwellings. You need to know whether Section 2100.10, (The requirements for means of egress in one and two family dwellings), have been amended. A check of page 5 of the Amendment Reference Guide shows that Section 2100.10 was amended by Secretary of State Regulation numbers 16-6E, 16-6Q, 16-6R and 16-6V filed on April 11, 1975, June 14, 1976, June 30, 1976 and June 3, 1977. You would then read each of the amendments listed in the Reference Guide to determine current egress requirements.

BUILDING CODE AMENDMENT CHECKLIST AS OF NOVEMBER 4, 1977

Please take a few minutes to examine this memo and the attachments, which explain how to make sure that your State Building Code is up-to-date. These materials were developed by the State Building Code Commission in cooperation with the State Bookstore to assure good service.

1. First, check the title page to see which edition you own. If it is a first edition, your Code should contain the following five special amendments. If your code book is not identified as a first edition, this would not apply, since the 5 amendments cited below were incorporated as a part of all subsequent printings.

Building Code Provisions for One and Two - Family Dwellings (Article 21) (Form 16-6A)	$2.35
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2. Second, check your Code section-by-section, using the Reference Guide to be sure that you have all relevant amendments for each section. The Amendment Reference Guide is a listing of all code amendments on a section-by-section basis. It indicates the number of times a particular section has been amended and the dates of amendment.

3. If there is a missing amendment, refer to the order blank for the price of the missing amendment (listed by filing date and form number.)

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The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

THE STATE BUILDING CODE COMMISSION, Made by Authority of Chapter 802 of the Acts of 1972

Filed by as amended and entitled the

COMMONWEALTH OF MASSACHUSETTS STATE BUILDING CODE

including amendments filed up to and including January 9, 1975

Date Published

Chapter 233, sec. 75

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Attested as a true copy
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Paul Guzzi

SECRETARY OF THE COMMONWEALTH

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24 October 1979

THE COMMONWEALTH OF MASSACHUSETTS

STATE BUILDING CODE

Michael S. Dukakis, Governor
Commonwealth of Massachusetts

William G. Flynn, Secretary
Executive Office of Communities and Development

Second Edition

The preparation of this document was financed in part through a grant from the U. S. Department of Housing and Urban Development under the provisions of Section 701 of the Housing Act of 1954, as amended.

FOREWORD

The promulgation of this Code is a major step forward in the formulation of a building regulatory system, which will have an impact on both the public and private sectors.

This system will consist of the promulgation and maintenance of this statewide, mandatory uniform building code applicable to all buildings and structures; the establishment of a state mechanism for the approval of all new construction materials, devices and techniques; the establishment of a mechanism for state inspection and certification of manufactured buildings, building components and mobile homes; the training and certification of all building code officials; and the coordination of all state agencies having a direct or indirect bearing on this Code through the Technical Code Council whose function is to prevent problems of overlapping jurisdictions and fragmentation of administration.

More significantly, however, this system places the state on record as a proponent of technological change in an industry whose impact is both profound and pervasive on every citizen of the Commonwealth. Through the implementation of this system, the State will fulfill a most important obligation -- that of promoting an improved quality of life in the most cost-efficient manner possible.

ACKNOWLEDGEMENTS

The promulgation of the State Building Code and the establishment of the building regulatory system could not have been accomplished without the passage of St. 1972, C. 802, which had received full bi-partisan support from Governor Francis W. Sargent, Senate President Kevin B. Harrington, Speaker of the House David M. Bartley, members of the General Court, as well as that of Richard E. McLaughlin, Secretary of the Executive Office of Public Safety.

SPECIAL ACKNOWLEDGEMENTS

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SAMPLE FORM

It is anticipated that the use of the Code will reveal the need for revisions. Recommendations for specific changes should be submitted on the form available from the State Building Code Commission (reference Appendix L).

CODE REVISION PROPOSAL FORM

DATE:_____

Building Code Section No._____ Code Change No._____

Proponent (Name) _____

(Address) _____

_____Change subsection as follows.

_____Add new subsection as follows.

_____Delete subsection and substitute as follows.

_____Delete subsection - no substitution.

PROPOSED CODE AMENDMENT:

SUPPORTING STATEMENT(S):

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ARTICLE 1

ADMINISTRATION AND ENFORCEMENT

SECTION 100.0 SCOPE

100.1 TITLE: These regulations shall be known as the Commonwealth of Massachusetts State Building Code hereinafter referred to as the Basic Code. In accordance with C. 802, of the Acts of 1972 as amended, these regulations shall control; a) the construction, reconstruction, alteration, repair, demolition, removal, inspection, issuance and revocation of permits or licenses, installation of equipment, classification and definition of any building or structure and use or occupancy of all buildings and structures and parts thereof or classes of buildings and structures and parts thereof; b) the rehabilitation and maintenance of existing buildings; c) the standards or requirements for materials to be used in connection therewith, including but not limited to provisions for safety, ingress and egress, energy conservation and sanitary conditions; d) the establishment of reasonable fees for the issuance of licenses and permits in connection therewith; except as such matters are otherwise provided for in the Massachusetts General Laws Annotated, or in the rules and regulations authorized for promulgation under the provisions of the Basic Code.

100.2 APPLICATION OF REFERENCES: Unless otherwise specifically provided in the Basic Code, all references to article or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such article, section or provision of the Basic Code.

100.3 CODE REMEDIAL: The Basic Code shall be construed to secure its expressed intent which is to insure public safety, health and welfare insofar as they are affected by building construction, through structural strength, adequate egress facilities, sanitary conditions, equipment, light and ventilation and fire safety; and in general, to secure safety to life and property and community from all hazards incident to the design, erection, repair, removal, demolition or use and occupancy of buildings, structures, or premises. The intent of the Basic Code is also to effect the establishment of uniform standards and requirements for construction and construction materials, compatible with accepted standards of engineering and fire prevention practices and public safety; the adoption of modern technical methods, devices and improvements which may reduce the cost of construction without affecting the health, safety, and security of the occupants or users of buildings; the elimination of restrictive, obsolete, conflicting and unnecessary building regulations and requirements which may increase the cost of construction and maintenance over the life of the building, or

retard unnecessarily the use of new materials, or which may provide unwarranted preferential treatment of types of classes of materials, products or methods of construction without affecting the health, safety, and security of the occupants or users of buildings.

100.4 SPECIALIZED CODES: Specialized codes, rules or regulations pertaining to building construction, reconstruction, alteration, repair, or demolition promulgated, and as amended from time to time, by the various authorized state agencies shall be incorporated in the Basic Code. The said specialized codes, rules or regulations include, but are not limited to, those listed in appendix K.

100.5 TECHNICAL CODE COUNCIL: The Technical Code Council is comprised of representatives from each of the state agencies having jurisdiction over the specialized codes including those cited in section 100.4, and listed in appendix K, and serves as an advisory board to the State Building Code Commission, herein referred to as the Commission, on matters related to uniformity of rules and regulations governing building construction and the establishment of uniform procedures relative to their administration and enforcement. Members of the Technical Code Council are listed in appendix L.

SECTION 101.0 MATTERS COVERED

The provisions of the Basic Code shall apply to all buildings and structures and their appurtenant constructions, including vaults, area and street projections and accessory additions; and shall apply with equal force to municipal, county, state, authorities established by the legislature and private buildings and structures; except where such buildings and structures are otherwise specifically provided for by statute.

101.1 EXEMPTIONS: No building or structure shall be constructed, extended, repaired, removed, demolished, or altered in violation of these provisions, except for ordinary repairs as defined in section 102.

101.2 MATTERS NOT COVERED.

101.21 PROPOSED BUILDINGS: Any requirement essential for structural strength, adequate egress facilities, sanitary conditions, equipment, light and ventilation, and fire safety of a proposed building or structure at the plan review stage and which is not specifically covered by the Basic Code, shall be determined by the State Building Code Commission.

101.22 EXISTING BUILDINGS AND BUILDINGS UNDER CONSTRUCTION: The building official shall determine any requirement which is not specifically covered by the Basic Code and which is essential for

structural strength, adequate egress facilities, sanitary conditions, equipment, light and ventilation, and fire safety of existing buildings and structures or buildings and structures under construction. The Commission and the Department of Public Safety shall be notified in writing within seven (7) working days of any action taken under this section.

101.3 ZONING RESTRICTIONS: When the provisions herein specified for structural strength, adequate egress facilities, sanitary conditions, equipment, light and ventilation, and fire safety conflict with the local zoning by-laws or ordinances, the Basic Code shall control the erection or alteration of buildings.

SECTION 102.0 ORDINARY REPAIRS

Ordinary repairs to buildings and structures may be made without application or notice to the building official; but such repairs shall not include the cutting away of any wall, partition or portion thereof, the removal or cutting of any structural beam or bearing support, or the removal or change of any required means of egress, or rearrangement of parts of a structure affecting the exitway requirements; nor shall ordinary repairs include addition to, alteration of, replacement or relocation of any standpipe, water supply, sewer, drainage, drain leader, gas, soil, waste, vent or similar piping, electric wiring or mechanical or other work affecting public health or general safety.

SECTION 103.0 INSTALLATION OF SERVICE EQUIPMENT

When the installation, extension, alteration or repair of an elevator, moving stairway, mechanical equipment, refrigeration, air conditioning or ventilating apparatus, plumbing, gas piping, electric wiring, heating system or any other equipment is specifically controlled by the provisions of the Basic 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 or other municipal or state agency having jurisdiction.

SECTION 104.0 MAINTENANCE

All buildings and structures and all parts thereof shall be maintained in a safe and sanitary condition. All service equipment, means of egress, devices and safeguards which are required by the Basic Code in a building or structure shall be maintained in good working order. Any requirement necessary for the safety of the occupants thereof, not specifically covered by the Basic Code shall be determined by the building official.

104.1 OWNER RESPONSIBILITY: The owner, as defined in article 2, or his designated agent shall be responsible for the safe and sanitary maintenance of the building or structure and its exitway facilities at all times, unless otherwise specifically provided in the Basic Code.

SECTION 105.0 CHANGE IN EXISTING USE

105.1 CONTINUATION OF EXISTING USE: The legal use and occupancy of any structure existing on January 1, 1975, or for which it had been heretofore approved, may be continued without change, except as may be specifically covered in the Basic Code or as may be deemed necessary by the building official for the general safety and welfare of the occupants and the public.

105.2 CHANGE IN USE AND OCCUPANCY: It shall be unlawful to make any change in the use or occupancy of any structure or parts thereof without the building official having issued a certificate of use and occupancy indicating that such structure complies with the provisions of the Basic Code for the proposed new use or occupancy and that such change does not result in any greater hazard to public safety or welfare.

105.3 PART CHANGE IN USE: If a portion of the building is changed in occupancy or to a new use group and that portion is separated from the remainder of the building with the required vertical and horizontal fire division complying with the fire grading in table 9-1, then the construction involved in the change shall be made to conform to the requirements of the Basic Code for the new use and occupancy and the existing portion shall be made to comply with the exitway requirements of the Basic Code.

105.4 REESTABLISHMENT OF A PRIOR USE: After an approved change of use has been made to a building or parts thereof, the reestablishment of a prior use that is not legal to a new building or parts thereof of the same type of construction, is prohibited unless all the applicable provisions of the Basic Code have been met.

SECTION 106.0 ALTERATIONS & REPAIRS

Except as provided in this section, existing buildings or structures when altered or repaired as herein specified shall be made to conform to the full requirements of the Basic Code for new buildings:

106.1 ALTERATIONS EXCEEDING FIFTY PERCENT: If alterations or repairs are made within any period of twelve (12) months, costing in excess of fifty (50) percent of the physical value of the building; or

106.2 DAMAGES EXCEEDING FIFTY PERCENT: If the building is damaged by fire or any other cause to an extent in excess of fifty (50) percent of the physical value of the building before the damage was incurred.

106.3 ALTERATION UNDER FIFTY PERCENT: If the cost of alterations or repairs described herein is between twenty-five (25) and fifty (50) percent of the physical value of the building, the building official shall determine to what degree the portions so altered or repaired shall be made to conform to the requirements for new buildings:

106.4 ALTERATION UNDER TWENTY-FIVE PERCENT: If the cost of alterations or repairs described herein is twenty-five (25) percent or less of the physical value of the building, the building official shall permit the restoration of the building to its condition previous to damage or deterioration with the same kind of materials as those of which the building was constructed; provided that such construction does not endanger the general safety and public welfare and complies with the provisions of article 9 in respect to existing roofs.

106.5 PHYSICAL VALUE: In applying the provisions of this section, the physical value of the building, at the option of the owner, shall be based on the assessed value of the building as recorded in the assessor's office of the municipality or on the basis of the current replacement cost of the building less physical deterioration, provided that satisfactory evidence of the current replacement cost less physical deterioration is submitted to the building official for his approval.

SECTION 107.0 BUILDING DEPARTMENT

107.1 BUILDING COMMISSIONER OR INSPECTOR OF BUILDINGS: The building department shall have an administrative chief responsible for the administration and enforcement of the Basic Code who shall be known as the building commissioner or inspector of buildings.

107.11 LOCAL INSPECTOR: The local inspector shall assist the building commissioner or inspector of buildings in the performance of his duties and shall also be responsible for the enforcement of the Basic Code.

107.12 ALTERNATE INSPECTOR: An alternate inspector of buildings may be appointed to act in the disability of the inspector of buildings in case of illness, absence, or conflict of interest. The alternate inspector shall meet the qualifications of section 107.4.

107.2 APPOINTMENT: The chief administrative officer of each city or town shall employ and designate an inspector of buildings or building commissioner, as well as such other local inspectors as are reasonably necessary. The inspector of buildings or building commissioner shall report directly and be solely responsible to the appointing authority.

107.3 OTHER PERSONNEL: The building commissioner or inspector of buildings may appoint such other personnel as shall be necessary for the administration of the Basic Code and as authorized by the appointing authority.

107.4 QUALIFICATIONS OF THE BUILDING COMMISSIONER OR INSPECTOR OF BUILDINGS: Each building commissioner or inspector of buildings shall have had at least five (5) years of experience in the supervicion of building construction or design or in the alternative a four-year undergraduate degree in a field related to building construction or design. In addition, such persons shall have had general knowledge of the accepted requirements for building construction, fire prevention, light, ventilation and safe exits; and a general knowledge of other equipment and material essential for safety, comfort, and convenience of the occupants of the building or structure; plus whatever requirements of experience and knowledge that are deemed necessary by the municipality.

107.5 QUALIFICATIONS OF THE LOCAL INSPECTOR: Each local inspector shall have had at least five (5) years of experience in the supervision of building construction or design or in the alternative a two-year associate degree in a field related to building construction or design. In addition, such persons shall have a general knowledge of the quality and strength of building materials; a general knowledge of the accepted requirements for building construction; fire prevention, light, ventilation and safe exits; and materials essential for safety, comfort, and convenience of the occupants of a building or structure; plus whatever requirements of experience and knowledge that are deemed necessary by the municipality.

107.6 CERTIFICATION: The Department of Community Affairs shall offer a certification program for building officials and shall issue a certificate to those who satisfactorily complete said program.

107.6 TRAINING: The Department of Community Affairs shall offer a continuing educational program designed to assist all building officials and state inspectors in executing their responsibilities as defined herein. Regular attendance at these programs shall be required of all building officials and state inspectors and no building official or state inspector who attends such course of instruction shall lose any reights relative to compensation or vacation time.

107.8 RESTRICTION ON EMPLOYLOYEES: No full-time building commissioner, inspector of buildings, or full-time local inspector as defined herein shall be engaged in, or directly or indirectly connected with, the furnishing of labor, materials or appliances for the construction, alteration or maintenance of a building or structure, or the preparation of plans or of

specifications therefor, unless he is the owner of the building or structure; nor shall any officer or employee associated with the building department engage in any work which conflicts with his official duties or with the interests of the department.

107.9 RELIEF FROM PERSONAL LIABILITY: Insofar as the law allows, while acting for the municipality, the building official, charged with the enforcement of the Basic Code shall not be deemed personally liable in the discharge of his official duties.

SECTION 108.0 DUTIES AND POWERS OF THE BUILDING OFFICIAL AND THE STATE INSPECTOR

108.1 THE BUILDING OFFICIAL: The building commissioner or inspector of buildings and the local inspector shall enforce all the provisions of the Basic Code and any other applicable state statutes, rules and regulations, or ordinances and by-laws, and act on any question relative to the mode or manner of construction, and the materials to be used in the construction, reconstruction, alteration, repair, demolition, removal, installation of equipment, and the location use, occupancy, and maintenance of all buildings and structures, including any building or structure owned by any authority, except as may otherwise be specifically provided for by statutory requirements or as herein provided.

108.11 APPLICATIONS AND PERMITS: The building official shall receive applications and issue permits for the construction, reconstruction, alteration, repair, demolition, removal, and installation of equipment, and inspect the premises for which such permits have been issued and enforce compliance with the Basic Code provisions.

108.12 BUILDING NOTICES AND ORDERS: The building official shall issue all necessary notices or orders to remove illegal or unsafe conditions, to require the necessary safeguards during construction, to require adequate exitway facilities in new and existing buildings and structures, and to insure compliance with all the code requirements for the safety, health and general welfare of the public.

108.13 NEW MATERIALS AND METHODS OF CONSTRUCTION: The building official shall accept duly authenticated reports from the Commission on all new materials and methods of construction proposed for use which are not specifically provided for in the Basic Code. Wherever there is insufficient evidence that any material or method of construction conforms to the requirements of the Basic Code or there is insufficient evidence to substantiate claims for alternative materials or construction, the building official may require tests meeting the functional requirements of the Basic Code, and such tests shall be conducted by a laboratory and/or personnel approved by the Commission. The costs of all such tests or other investigations required under these provisions shall be paid by the applicant.

108.131 TEST RESULTS: Copies of the results of all such tests shall be forwarded to the Commission within ten (10) days and shall be kept on file in the permanent records of the building department.

108.132 RETESTING: The Commission may require tests to be repeated, if at any time there is reason to believe that material or construction no longer conforms to the requirements on which its approval was based.

108.14 INSPECTIONS: The building official shall make all the required inspections, or he may accept reports of inspections from a qualified registered professional engineer or architect or others certified by the Commission, and all reports of such inspections shall be in writing; or the building official may engage such expert as he may deem necessary to report upon unusual technical issues that may arise.

108.15 INSPECTION AND CERTIFICATION - SPECIFIED USE GROUPS: The building official shall periodically inspect and certify buildings and structures or parts thereof in use groups F, H, L-1, and L-2, according to Table 1-1. No certificate of inspection as herein specified shall be issued until an inspection is made certifying that the building or structure, or parts thereof, complies with all the applicable requirements of the Basic Code, and until the fee is paid as specified on Table 1-1. A copy of said certificate shall be kept posted as specified in section 121.2.

108.16 ADMINISTRATIVE PROCEDURES: The building commissioner or inspector of buildings shall have the authority to formulate administrative procedures necessary to uniformly administer and enforce the Basic Code, provided that such procedures do not conflict with the rules and regulations promulgated by the Commission in the Basic Code or pursuant thereto.

108.17 DEPARTMENT RECORDS: The building official shall keep in a public place and open to public inspection during normal working hours official records of applications received, permits and certificates issued, fees collected, reports of inspections, variances grated, and notices and orders issued. File copies of all papers in connection with building operations shall be retained in the official records so long as the building or structure to which they relate remains in existence.

108.18 REPORTS: The building official shall submit the following reports:

a) to the Department of Community Affairs on a form provided by said department a report of the building permit activity for the month;

b) to the chief administrative officer of the municipality a written statement of all permits and certificates issued, fees collected, inspections made, and notices and orders issued for the year;

TABLE 1-1 -- REQUIRED MINIMUM INSPECTIONS AND CERTIFICATION FOR SPECIFIED USE GROUPS
(See ARTICLE 2 for complete descriptions of use groups.)

USE GROUP			INSPECTIONS	CERTIFICATIONS	FEES*
F-1-A	Assembly Theatres (accommodating over 400)	With stage and scenery	Monthly	Annually	150
F-1-B		Without Stage Movie Theatre	Semi-Annually	Annually	50
F-2	Assembly -- Night clubs and similar uses (accommodating over 400)		Semi-Annually	Annually	50
F-3	Assembly -- Lecture halls, recreation centers, terminals, etc. (accommodating over 400)		Semi-Annually	Annually	50
F-1-A	Assembly Theatres (accommodating 400 or less)	With stage and scenery	Prior to the issuance of each new certificate	Annually	25
F-1-B		Without stage Movie Theatre		Annually	25
F-2	Assembly -- Night clubs and similar uses (accommodating 400 or less)			Annually	25
F-3	Assembly -- Lecture halls, recreation centers, terminals, etc. (accommodating 400 or less)			Annually	25
F-4	Assembly -- Churches, low density recreation			Up to five years	25
F-5	Assembly -- Grandstands, bleachers, etc.			Every two years	50
F-6	Assembly -- Schools: 10 or more students			Every two years	50
F-7	Assembly -- All places of assembly accommodating between 20 and 49 persons			Annually	25
H-1	Institutional -- Restrained			Every two years	50
H-2	Institutional -- Incapacitated			Every two years	50
L-1	Residential -- Hotels			Annually	50
L-2	Residential -- Multi-Family			Up to five years	50

*FEES: (Applicable to the issuance of <u>new</u> certificates of inspection)

c) to the Commission and Department of Public Safety reports on decisions regarding the matters not covered as specified in section 101.22; and

d) to the assessors of the municipality reports on permits issued as specified in section 114.11.

108.2 THE STATE INSPECTOR: In every city and town the Basic Code shall be enforced by the state inspector as to any structures or buildings or parts thereof that are owned by the Commonwealth or any departments, commissions, agencies, or authorities of the Commonwealth. The state inspector shall have as to such buildings and structures all the powers of a building commissioner or inspector of buildings.

108.21 OTHER RESPONSIBILITIES: The state inspector may review any order or decision of the building official. He shall supervise the enforcement of the Basic Code, make periodic reviews of all building inspection practices of the local building department, make recommendations for improvements of such practices, and report in writing his findings to the building official.

108.22 REVIEW BY THE COMMISSIONER: The Commissioner of the Commonwealth of Massachusetts, Department of Public Safety shall establish districts which shall be supervised by a state inspector of the Division of Inspection. The Commissioner may review, on his own initiative or on the application of any state inspector, any action or refusal or failure of action by any building official the result of which does not comply with the uniform implementation of the Basic Code; and may reverse, modify or annul, in whole or in part, such action except with respect to the specialized codes, provided that no order or action of the Commissioner shall reverse, modify, annul, or contravene any order, action, determination, interpretation or any decision by the Commission or the State Building Code Appeals Board.

108.23 REPORTS: The state inspector shall file with the Commission reports of his periodic reviews and recommendations for improvements of building inspection practices. The format and due dates for these reports shall be determined by the Commission.

SECTION 109.0 RULES AND REGULATIONS

109.1 RULE MAKING AUTHORITY: Under authority granted by Chapter 802, Acts of 1972, as amended, the Commission is empowered in the interest of public safety, health and general welfare, to adopt and promulgate rules and regulations to interpret and implement the provisions of the Basic Code to secure the intent thereof and to establish applicable requirements due to local climatic or other conditions.

109.11 LICENSING OF CONSTRUCTION SUPERVISORS: Effective January 1, 1976, any individual directly supervising persons engaged in construction, reconstruction, alterations, repairs, removal or demolition involving the structural elements of buildings and structures shall be licensed according to the rules and regulations promulgated by the Commission entitled "RULES AND REGULATIONS FOR LICENSING CONSTRUCTION SUPERVISORS." No city or town shall be prohibited from requiring such licensing of construction supervisors from January 1, 1975 through December 31, 1975.

109.12 LICENSING OF LABORATORIES AND TEST PERSONNEL: The Commission shall issue rules and regulations for the licensing of individuals, laboratories, and firms responsible for the testing of materials, devices and methods of construction, as provided in section 127.1.

109.13 MANUFACTURED BUILDINGS: The Commission shall issue rules and regulations pursuant to article 19 governing manufactured buildings and building components.

109.14 MOBILE HOMES: The commission shall issue rules and regulations pursuant to article 19 governing mobile homes.

109.2 ACCEPTED ENGINEERING PRACTICE: In the absence of approved rules, the regulations, specifications and standards listed in the appropriate article or in the appendices shall be deemed to represent accepted engineering practice with respect to the material, equipment, system or method of construction therein specified.

109.3 AMENDMENTS AND PROMULGATION OF RULES: Any person may propose amendments to the Basic Code. Public hearings shall be held in the city of Boston in May and October of each year, and at such other times and places as the Commission may determine, to consider petitions for such amendments. Amendments adopted by the Commission shall be binding and have the full force and effect of law in all cities and towns.

SECTION 110.0 VARIANCES

When there are practical difficulties involved in carrying out structural or mechanical provisions of the Basic Code, the board of appeals may allow a variance or a modification from such provisions as applied for by the owner as provided in section 126.0, provided that the decision of the board shall not conflict with the general objectives of the Basic Code and its enabling legislation and provided that no decision shall be considered by any person or agency as a precedent for future decisions.

SECTION 111.0 INSPECTION

111.1 PRELIMINARY INSPECTIONS: Before issuing a permit, the building official may examine or cause to be examined all buildings, structures and sites for which an application has been filed for a permit to construct, enlarge, alter, repair, remove, demolish or change the use thereof.

111.2 NEW BUILDINGS AND STRUCTURES

111.21 INSPECTION: The building official shall make all required inspections as specified in the provisions of the Basic Code and he shall conduct such inspections from time to time during and upon completion of the work for which he has issued a permit; and he shall maintain a record of all such examinations and inspections and of all violations of the Basic Code. In conjunction with specific construction projects the building official may designate specific inspection points in the course of construction that require the contractor or builder to give the building official twenty-four (24) hours notice prior to the time when those inspections need to be performed. The building official shall make the inspection within forty-eight (48) hours after such notification.

111.3 MANUFACTURED BUILDINGS

111.31 PLANT INSPECTION: Inspection of all manufactured buildings, building components, and mobile homes at the plant shall be performed by a third party which shall be certified and approved by the Commission and monitored by the Department of Public Safety as specified in article 19 and the rules and regulations pursuant thereto.

111.32 SITE INSPECTION: Inspection of all manufactured buildings, building components, and mobile homes at the installation site shall be made by the building official as specified in article 19 and the rules and regulations pursuant thereto.

111.4 EXISTING BUILDINGS.

111.41 PERIODIC INSPECTIONS: The building commissioner or inspector of buildings shall develop plans for the systematic periodic inspection of all existing buildings and structures and shall cause such buildings and structures to be periodically or otherwise inspected as specified in section 108.15 and section 121.4, for compliance with the Basic Code.

111.42 CHANGES OF OCCUPANTS: Before any building or part thereof, except multi-family and one and two-family dwellings (use groups L-2 and L-3), is re-occupied, the building official shall be notified by the owner. The building may be inspected and when in compliance with the Basic Code the building official shall re-certify the building or structure.

111.43 CHANGES OF OCCUPANTS-DWELLING UNITS: When any dwelling unit is vacated, the building official shall be so notified by the owner before the unit is re-occupied within any twelve-month period. Upon the determination of the building official, said dwelling unit may be inspected to determine if said unit conforms to the Basic Code. A dwelling unit shall be inspected with three (3) working days from the date of notification or it shall be deemed to be approved for occupancy. Nothing in this section is intended to require an owner to so notify the building official where another vacancy occurs within a twelve-month period of a prior notification.

111.5 FINAL INSPECTION: The owner or his authorized representative shall notify the building official upon completion of the building or structure or part thereof. Prior to the issuance of the certificate of use and occupancy required in section 120.0, a final inspection shall be made and all violations of the approved plans and permit shall be noted and the holder of the permit shall be notified of any discrepancies.

111.6 INSPECTION SERVICES: The building official may accept the written report of inspections from a qualified registered professional engineer or architect or others certified by the Commission; and such inspection report shall specify but not be limited to any violation of the requirements of the Basic Code in respect to egress requirements, floor load, fire grading, occupancy load and use of the buildings.

SECTION 112.0 RIGHT OF ENTRY

In the discharge of his duties, the building official shall have the authority to enter at any reasonable hour any building, structure or premises in the municipality to enforce the provisions of the Basic Code.

If any owner, occupant, or other person refuses impedes, inhibits, interferes with, restricts, or obstructs entry and free access to every part of the structure, operation or premise where inspection authorized by the Basic Code is sought, the building official, or state inspector may:

a) seek in a court of competent jurisdiction a search warrant so as to apprise the owner, occupant or other person concerning the nature of the inspection and justification for it and may seek the assistance of police authorities in presenting said warrant and/or

b) revoke or suspend any license, permit or other permission regulated under the Basic Code where inspection of the structures, operation or premises is sought to determine compliance with the Basic Code.

112.1 OFFICIAL BADGE: The Commission may adopt a badge of office for building officials which shall be displayed for the purpose of identification.

112.2 MUNICIPAL COOPERATION: The assistance and cooperation of police, fire, and health departments and all other municipal officials shall be available to the building official as required in the performance of his duties.

SECTION 113.0 APPLICATION FOR PERMIT

113.1 WHEN PERMIT IS REQUIRED: It shall be unlawful to construct, enlarge, alter, remove or demolish a building, or change the occupancy of a building from one use group to another; or to install or alter any equipment for which provision is made or the installation of which is regulated by the Basic Code, without first filing an application with the building official in writing and obtaining the required permit therefor; except that ordinary repairs as defined in section 102 which do not involve any violation of the Basic Code shall be exempt from this provision.

113.2 FORM OF APPLICATION: The application for a permit shall be submitted in such form as the building official may prescribe and shall be accompanied by the required fee as prescribed in section 118.0.

113.3 BY WHOM APPLICATION IS MADE: Application for a permit shall be made by the owner, as defined in article 2, of the building or structure. The full names and addresses of the owner, applicant, and of the responsible officers, if the owner is a corporate body, shall be stated in the application.

113.4 DESCRIPTION OF WORK: The application shall contain a general description of the proposed work, its location, the use and occupancy of all parts of the building or structure and of all portions of the site or lot not covered by the building; and shall state whether or not fire extinguishing equipment, plumbing, water piping, gasfitting, heating or electrical work is involved, the estimated cost of such work including the general work, and such additional information as may be required by the building commissioner or inspector of buildings. The building commissioner or inspector of buildings may require the facts contained in each application to be certified by the applicant under oath.

113.5 PLANS AND SPECIFICATIONS: The application for the permit shall be accompanied by not less than three (3) copies of specifications and of plans drawn to scale, with sufficient clarity and detail dimensions to show the nature and character of the work to be performed. When quality of materials is essential for conformity to the Basic Code, specific information shall be given to establish such quality; and in no case shall the code be cited or the term "legal" or its equivalent be used as a substitute for specific information. The building official may waive the requirement for filing plans when the work involved is of a minor nature.

All plans filed with the building official shall include but not be limited to:

a) the accurate locations and dimension of all means of egress from fire and an occupancy schedule of persons for all occupiable spaces.

b) the method and amount of ventilation and sanitation.

c) the methods of fire stopping as required in this code.

d) schedules and details indicating compliance of interior trim and finish with provisions of article 9.

113.51 STRUCTURES SUBJECT TO CONTROL: In those structures subject to control as required in section 128.0, affidavits must be submitted with the permit application, that the individuals and testing laboratories responsible for carrying out the duties of section 128.0 have been licensed and registered by the Commission through the provisions of sections 800.4, 800.41 and 800.42.

113.6 PLOT PLAN: There shall also be filed a plot plan showing to scale the size and location of all the new construction and all existing structures on the site, distances from lot lines and the established street grades; and it shall be drawn in accordance with an accurate boundary line survey. In the case of demolition, the plot plan shall show all construction to be demolished and the location and size of all existing buildings and construction that are to remain on the site or plot. The plot plan shall not be changed except as specified in section 115.4.

113.7 ENGINEERING DETAILS: The building official may require adequate details of structural, mechanical and electrical work, including computations, stress diagrams and other essential technical data to be filed. All such plans and computations shall bear the Massachusetts seal of registration of the qualified registered professional engineer or architect.

113.8 AMENDMENTS TO APPLICATION: Subject to the limitations of section 113.9, no amendments or revisions to a plan or other records accompanying the same may be made until the proposed changes have been filed with and approved by the building official; and such approved amendments shall be deemed part of the original application and shall be filed therewith.

113.9 TIME LIMITATION OF APPLICATION: An application for a permit for any proposed work shall be deemed to have been abandoned six (6) months after date of filing, unless such application has been diligently prosecuted or a permit shall have been issued; except that for reasonable cause the building official may grant one or more extensions of time for additional periods not exceeding ninety (90) days each.

SECTION 114.0 PERMITS

114.1 ACTION ON APPLICATION: The building commissioner or inspector of buildings shall examine or cause to be examined all applications for permits and amendments thereto within thirty (30) days after filing. Before a permit is granted for the excavation or for the erection of any building or structure, a written statement shall be furnished by the owner from a town or city engineer as to the established grades. If the application or the plans do not conform to the requirements of the Basic Code or of all pertinent laws, he shall reject such application citing the specific sections of the Basic Code or pertinent law. If he is satisfied that the proposed work conforms to the requirements of the Basic Code and all pertinent law applicable thereto, he shall issue a permit.

114.11 REPORT TO ASSESSORS: The building official shall give to the assessors of the municipality written notice of the granting by him of permits for the construction of any buildings or for the removal or demolition or for any substantial alteration or addition thereto. Such notice shall be given within seven (7) days after the granting of each permit, and shall state the name of the person to whom the permit was granted and the location of the building to be constructed, altered, demolished or removed.

114.2 EXPIRATION OF PERMIT: Any permit issued shall become invalid unless the work authorized by it shall have been commenced within six (6) months after its issuance in which case it shall be deemed abandoned, or if the work authorized by such permit is suspended for a period of one (1) year after the time the work is commenced; provided that, for cause, one or more extensions of time, for periods not exceeding ninety (90) days each, may be allowed in writing by the building commissioner or inspector of buildings. For purposes of this section, any permit issued shall not be considered invalid, if such suspension or abandonment is due to a court order prohibiting such work as authorized by such permit. Provided however, in the opinion of the building commissioner, inspector of buildings or state inspector, the person so prohibited by such court order, adequately defends such action before the court.

114.3 PREVIOUS APPROVALS: Nothing in the Basic Code or the rules and regulations pursuant thereto shall affect any building permit lawfully issued, or any building or structure lawfully begun in conformance with such permit, before the effective date of the Basic Code in a city or town, provided, that work under such a permit is commenced within six months after its issue, and that such work, whether under such permit or otherwise lawfully begun, proceeds in good faith continuously to completion so far as is reasonably practicable under the circumstances.

114.4 SIGNATURE TO PERMIT: The building commissioner or inspector of buildings shall affix his signature to every permit.

114.5 APPROVED PLANS: If approved by him the building commissioner or inspector of buildings or supervisor of plans of the Division of Inspection of the Department of Public Safety shall stamp and endorse in writing the plans submitted in accordance with section 113.5; two sets of such stamped and endorsed plans shall be retained and he shall not allow the removal of any such plans and specifications from the department except in his sole discretion for the purposes of examination by another municipal or state department; the other set of plans shall be kept at the building site, open to inspection of the building commissioner, inspector of buildings, Commissioner of the Department of Public Safety or their authorized representative, at all reasonable times.

114.6 REVOCATION OF PERMITS: The building official may revoke a permit or approval issued under the provisions of the Basic Code in case any false statement or misrepresentation of fact in the application of the plans on which the permit or approval was based.

114.7 APPROVAL IN PART: When application for a permit to erect or add to a building or other structure has been filed, as required in section 113.5, and pending issuance of such permit, the building official may at his discretion issue a special permit for the foundations or any other part of a building or structure. The holder of such a special permit may proceed at his own risk without assurance that a permit for the entire structure will be granted.

114.8 POSTING OF PERMIT: A copy of the building permit provided by the building department shall be kept in view and protected from the weather on the site of operations open to public inspection during the entire time of prosecution of the work and until the certificate of occupancy shall have been issued. The building permit shall serve as an inspection record card to allow the building official conveniently to make entries thereon regarding inspection of the work.

114.9 NOTICE OF START: At least twenty-four (24) hours' notice of start of work under a building permit shall be given to the building official.

SECTION 115.0 CONDITIONS OF PERMIT

115.1 COMPLIANCE WITH CODE: The permit shall be a license to proceed with the work and shall not be construed as authority to violate, cancel or set aside any of the provisions of the Basic Code, except as specifically stipulated by modification or legally granted variation in accordance with section 126.0.

115.2 COMPLIANCE WITH PERMIT: All work shall conform to the stamped or endorsed application and plans for which the permit has been issued and any approved amendments thereto.

115.3 COMPLIANCE WITH PLOT PLAN: All new work shall be located strictly in accordance with the approved plot plan.

115.4 CHANGE IN PLOT PLAN: No lot or plot shall be changed, increased or diminished in area from that shown on the official plot plan, as specified in section 113.6, unless a revised plan showing such changes accompanied by the necessary affidavit of owner or applicant shall have been filed and approved; except that such revised plot plan will not be required if the change is caused by reason of an official street opening, street widening or other public improvement.

SECTION 116.0 DEMOLITION OF BUILDINGS

116.1 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.

SECTION 117.0 REMOVAL OF BUILDINGS

117.1 LOT REGULATION: When a building or structure has been demolished or removed and no building operation has been projected or approved, the vacant lot shall be filled with non-organic fill, graded and maintained in conformity with adjacent grades. 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; provisions shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property; and the necessary retaining walls and fences shall be erected in accordance with the provisions of article 13.

SECTION 118.0 FEES

No permit shall be issued to begin work for new construction, alteration, removal, demolition or other building operation until the fees prescribed by municipal ordinance or by-law shall have been paid to the city or town collector or other municipal agency authorized to collect such fees.

118.1 SPECIAL FEES: The payment of the fee for the construction, alteration, removal or demolition and for all work done in connection with or concurrently with the work contemplated by a building permit shall not relieve the applicant or holder of the permit from the payment of other fees that may be prescribed by law or ordinance for water taps, sewer connections, electrical and plumbing permits, erection of signs and display structures, marquees or other appurtenant structures, or fees for inspections, certificates of use and occupancy or other privileges or requirements, both within and without the jurisdiction of the building department.

SECTION 119.0 FEE COMPUTATION

The permit fees shall be computed according to the fee schedule and procedures adopted in the municipality.

SECTION 120.0 CERTIFICATE OF USE AND OCCUPANCY

120.1 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. The

certificate shall not be issued until all the work has been completed in accordance with the provisions of the approved permits and of the applicable codes for which a permit is required, except as provided in section 120.4.

120.2 BUILDINGS HEREAFTER ALTERED: No building hereafter enlarged, extended or altered to change the use group classification, the fire-grading, the maximum live load capacity, or the occupancy load capacity, 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 permits and of the applicable codes for which a permit is required. 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 issued by the building official.

120.3 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 the Basic 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.

120.4 TEMPORARY OCCUPANCY: Upon the request of the 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, and provided that the agencies having jurisdiction for permits issued under other applicable codes are notified of the decision to issue a temporary certificate.

120.5 CONTENTS OF CERTIFICATE: The certificate shall certify compliance with the provisions of the Basic Code and the purpose for which the building or structure may be used in its several parts; and shall be issued by the building official within ten (10) days after final inspection, provided that the provisions of the approved permits and of the applicable codes for which permits are required have been met. For use groups A, B, C, D and E the certificate of use and occupancy shall specify; the use group, in accordance with the provisions of article 2, the fire grading as defined in article 2 and table 9-1, 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.

SECTION 121.0 POSTING BUILDINGS

121.1 POSTED USE AND OCCUPANCY: A suitably designed placard approved by the building official shall be posted by the owner on all floors of every building and structure and part thereof designed for high hazard, storage, mercantile, industrial or business use (use groups A, B, C, D, and E) as defined in article 2. Said placard shall be securely fastened to the building or structure in a readily visible place, stating: the use group, the fire grading, the live load and the occupancy load.

121.2 POSTED OCCUPANCY LOAD: A suitably designed placard approved by the building official shall be posted by the owner of every building and structure and part thereof designed for use as a place of public assembly or as an institutional building for harboring people for penal, correctional, educational, medical or other care of treatment, or as residential buildings used for hotels, lodging houses, boarding houses, dormitory buildings, multiple-family dwellings (use groups F, H, L-1 and L-2). Said placard shall designate the maximum occupancy load.

121.3 REPLACEMENT OF POSTED SIGNS: All posting signs shall be furnished by the owner and shall be of permanent design; they shall not be removed, or defaced and, if lost, removed or defaced, shall be immediately replaced.

121.4 PERIODIC INSPECTION FOR POSTING: The building official shall periodically inspect all existing buildings and structures except one and two-family dwellings for compliance with the Basic Code in respect to posting; or he may accept the report of such inspections from a qualified registered engineer or architect or others certified by the Commission; and such inspections and reports shall specify any violation of the requirements of the Basic Code in respect to the posting of floor load, fire grading, occupancy load and use group of the building.

SECTION 122.0 VIOLATIONS

122.1 NOTICE OF VIOLATION: The building official shall serve a written notice of violation or order on the owner, as defined in article 2, or the person responsible when in violation of any of the provisions of the Basic Code. Such notice or order shall direct the discontinuance of the illegal action or condition and the abatement of the violation.

122.12 NOTICE OR ORDERS - SERVICE AND CONTENT: Every notice or order authorized by the Basic Code shall be in writing, and shall be served on the person responsible:

a) personally, by any person authorized by the building official: or

b) by any person authorized to serve civil process by leaving a copy of the order or notice at his last and usual place of abode; or

c) by sending him a copy of the order by registered mail, return receipt requested, if he is within the Commonwealth; or

d) if his last and usual place of abode is unkown or outside the Commonwealth, by posting a copy of the order or notice in a conspicuous place on or about the premises in violation and by publishing it for at least three (3) out of five (5) consecutive days in one or more newspapers of general circulation wherein the building or premises affected is situated.

122.2 PROSECUTION OF VIOLATION: If the notice of violation is not complied with within thirty (30) days after service, unless otherwise provided in the Basic Code, the building official may institute the appropriate proceeding at law or in equity in a court of competent jurisdiction to restrain, correct or abate such violation or to require the removal or termination of the unlawful use of the building or structure in violation of the provisions of the Basic Code or of the order or direction made pursuant thereto; or

122.3 VIOLATION PENALTIES: A person who shall violate a provision of the Basic Code shall be punishable by a fine of not more than one thousand dollars ($1,000) or by imprisonment for not more than one year, or both, for each violation. Each day during which any portion of a violation continues shall constitute a separate offense.

122.4 ABATEMENT OF VIOLATION: The imposition of the penalties herein prescribed shall not preclude the building official from instituting appropriate action to prevent unlawful construction or to restrain, correct or abate a violation, or to prevent illegal occupancy of a building, structure or premises or to stop an illegal act, conduct, business or use of a building or structure in or about any premises.

SECTION 123.0 STOP-WORK ORDER

123.1 NOTICE TO OWNER: Upon notice from the building official that any work on a building or structure is being prosecuted contrary to the provisions of the Basic Code or in an unsafe or dangerous manner, such work shall be immediately stopped. The stop-work order shall be in writing and shall be served on the owner, as defined in article 2, or on the person responsible as provided in section 122.12; and shall state the conditions under which work

may be resumed; provided, however, that in instances where immediate action is deemed necessary for public safety or in the public interest, the building official may require that work be stopped upon verbal order.

123.11 POSTING: A stop-work notice shall be posted in a conspicuous place on the job site and can only be removed by the building official.

123.2 UNLAWFUL CONTINUANCE: Any person who shall continue any work in or about the job site after having been served with a stop-work order, except such work as he is directed to perform to remove a violation or unsafe conditions, shall be liable to prosectution as provided in section 122.0.

SECTION 124.0 UNSAFE BUILDINGS - SURVEY BOARD

124.1 DUTIES OF BUILDING OFFICIAL - UNSAFE BUILDINGS: The building official, immediately upon being informed by report or otherwise that a building or other structure or anything attached thereto or connected therewith is dangerous to life or limb or that any building in that city or town is unused, uninhabited or abandoned, and open to the weather, shall inspect the same; and he shall forthwith in writing notify the owner as provided in section 122.12, as defined in article 2, to remove it or make it safe if it appears to him to be dangerous, or to make it secure if it is unused, uninhabited or abandoned and open to the weather. If it appears that such structure would be especially unsafe in case of fire, it shall be deemed dangerous within the meaning hereof, and the building official may affix in a conspicuous place upon its exterior walls a notice of its dangerous condition, which shall not be removed or defaced without authority from him.

124.2 REMOVAL OR MAKING STRUCTURE SAFE - PUTTING UP FENCE: Any person so notified shall be allowed until twelve o'clock noon of the day following the service of the notice in which to begin to remove such structure or make it safe, or to make it secure, and he shall employ sufficient labor speedily to make it safe or remove it or to make it secure; but if the public safety so requires and if the mayor or selectmen so order, the building official may immediately enter upon the premises with the necessary workmen and assistants and cause such unsafe structure to be made safe or demolished without delay and a proper fence put up for the protection of passersby, or to be made secure.

124.3 FAILURE TO REMOVE OR MAKE STRUCTURE SAFE, SURVEY BOARD, SURVEY, REPORT: If an owner, as defined in article 2, of such unsafe structure refuses or neglects to comply with the require-

ments of such notice within the specified time limit, and such structure is not made safe or taken down as ordered, therein, a careful survey of the premises shall be made by a board consisting; in a city, of a city engineer, the head of the fire department, as such term is defined in Section 1 of Chapter 148 of the Massachusetts General Laws Annotated, as amended, and one disinterested person to be appointed by the building official; and, in a town, of a surveyor, the head of the fire department and one disinterested person to be appointed by a building official. In the absence of any of the above officers or individuals, the mayor or selectmen shall designate one or more officers or other suitable persons in place of the officers so named as members of said board. A written report of such survey shall be made, and a copy thereof served on such owner.

SECTION 125.0 EMERGENCY MEASURES

125.1 REMOVAL OF DANGEROUS OR ABANDONED STRUCTURES: If such survey report as outlined in section 124.0, declares such structure to be dangerous or to be unused, uninhabited or abandoned, and open to the weather, and if the owner, as defined in article 2, continues such refusal or neglect the building official shall cause it to be made safe or taken down or to be made secure, and, if the public safety so requires, said building official may at once enter the structure, the land on which it stands or the abutting land or buildings, with such assistance as he may require, and secure the same, and may remove and evict, under the pertinent provisions of Chapter 239 of the Massachusetts General Laws Annotated as amended or otherwise, any tenant or occupant thereof, and may erect such protection for the public by proper fence or otherwise as may be necessary, and for this purpose may close a public highway. In the case of such demolition, the said building official shall cause such lot to be levelled to conform with adjacent grades by a non-organic fill. The costs and charges incurred shall constitute a lien upon the land upon which the structure is located and shall be enforced in an action of contract, and such owner shall for every day's continuance of such refusal or neglect after being so notified, be punished by a fine in accordance with section 122.3. The provisions of the second paragraph of Section 3A of Chapter 139 of the Massachusetts General Laws Annotated as amended, relative to liens for such debt and the collection of claims for such debt, shall apply to any debt referred to in this section, except that the said building official shall act hereunder in place of the mayor or board of selectmen. During the time such order is in effect, it shall be unlawful to use or occupy such structure or any portion thereof for any purpose.

125.2 REMEDY OF PERSON ORDERED TO REMOVE A DANGEROUS STRUCTURE OR MAKE IT SAFE: An owner, as defined in article 2, aggrieved by such order may have the remedy prescribed by Section 2 of Chapter 139 of the Massachusetts General Laws Annotated as amended; provided, that no provision of said Section 2 shall be construed so as to hinder, delay or prevent the building official acting and proceeding under section 125.1; and provided, further, that this section shall not

prevent the city or town from recovering the forfeiture provided in said section 125.1 from the date of the service of the original notice, unless the order is annulled by the jury.

SECTION 126.0 BOARD OF APPEALS

126.1 STATE BUILDING CODE APPEALS BOARD: Whoever is aggrieved by an interpretation, order, requirement, direction or failure to act under the Basic Code by any agency or official of the city, town or region, or agency or official of the State charged with the administration or enforcement of the Basic Code or any of its rules or regulations, excepting any specialized codes, may appeal directly to the State Building Code Appeals Board as provided in section 126.

Whoever is aggrieved by an interpretation, order, requirement, direction or failure to act under the Basic Code by any agency or official of a city, town or region charged with the administration or enforcement of the Basic Code or any of its rules and regulations, excepting any specialized codes, may appeal directly to the State Building Code Appeals Board or may appeal first to a local or regional appeals board and then to the State Building Code Appeals Board as provided in section 126.

In the event an appeal is taken directly to the State Building Code Appeals Board from an interpretation, order, requirement or direction, said appeal shall be filed as specified in section 126.31, with the State Building Code Appeals Board no later than forty-five (45) days after the service of notice thereof of the interpretation, order, requirement or direction.

In the event the appeal is taken directly to the State Building Code Appeals Board for the failure to act, the appeal shall be taken no later than forty-five (45) days after a request to act has been made by the aggrieved person in writing and served to the appropriate building official or chief administrative officer of the state or local agency which fails to act.

If the aggrieved person elects to appeal before the local or regional board, he shall not be allowed to enter such appeal with the State Building Code Appeals Board until such time as the said local or regional board renders a decision, unless the reason for appeal to the State Building Code Appeals Board is the failure of the local or regional board to act.

126.2 MEMBERSHIP

126.21 THREE MEMBER PANEL: The State Building Code Appeals Board (hereinafter referred to in section 126 as the Board) shall consist of the membership of the State Building Code Commission. The chairman of the Commission shall be chairman of the Board. The chairman of the

Board may designate any three (3) members of the Board to act as a three (3) member panel to hold any public hearing under section 126, and to hear testimony and take evidence. The chairman of the Board shall select one (1) of the three (3) members to act as chairman of the said three (3) member panel. If a three (3) member panel is so designated, the three (3) member panel shall act as the appeals board and render a decision as provided in section 126.

126.22 CLERK: The Executive Secretary of the Commission shall designate one (1) of the staff of the Commission to act as Clerk to the Board. The Clerk shall keep a detailed record of all decisions and appeals and a docket book on file with the name of each appeal properly indexed and the disposition of the appeal. Said docket book shall be open to public inspection at all times during normal business hours.

126.23 QUORUM: A majority of the Board shall constitute a quorum if the appeal is heard by the entire Board. If the appeal is heard by a three (3) member panel, two (2) members shall constitute a quorum.

126.3 APPEALS PROCEDURE FOR STATE BUILDING CODE APPEALS BOARD

126.31 ENTRY: Appeals shall be entered on forms provided by the Commission and shall be accompanied by an entry fee of fifty dollars ($50) or such other amounts as may be determined by the Commission from time to time.

The appeal shall be signed by the appellant or his attorney or agent and shall note the name and address of the person or agency in whose behalf the appeal is taken and the name of the person and address wherein service of notice for the appellant is to be made. The appeal shall also state in detail the interpretation, order, requirement, direction or failure to act which are the grounds of the appeal as well as the particular section or sections of the Basic Code which are involved in the appeal and the reasons the appellant advances supporting the appeal.

A copy of the appeal shall be served in accordance with section 122.12 by the appellant on the person or state, regional or local agency from whose action or inaction the appeal is taken, on or before entry of the appeal. A return of service under oath shall be filed with the Board forthwith by the appellant.

126.32 STAY OF PROCEEDINGS: Entry of an appeal shall stay all proceedings in furtherance of the action or failure to act appealed from, unless the state, regional or local agency or any person charged with the administration or enforcement of the Basic Code or any of its rules or regulations presents evidence and the Board or a three (3) member panel or a single member of the Board appointed by the chairman for said purpose, finds that upon the evidence presented a stay would involve imminent peril to life or property. In such an event, stay of all proceedings shall be waived or the Board or three (3) member panel or single member may order such other action necessary to preserve public safety.

Before waiving the stay of proceedings, the Board or three (3) member panel or single member of the Board appointed by the chairman for said purpose, shall hold a hearing and give the appellant and state, regional or local agency or any person claiming that a stay would involve imminent peril to life or property, notice in writing of the hearing not less than twenty-four (24) hours before said hearing.

126.33 DOCUMENTS: Upon entry, the Clerk shall request in writing from the state, city, regional or town officer in charge of the matter on appeal, a copy of the record and all other papers and documents relative to the appeal to be transmitted forthwith to the Board. Said state, city, regional or town officer shall upon receipt of the request of the board transmit forthwith all the papers and documents and a copy of the record relating to the matter on appeal.

126.34 HEARINGS: The chairman of the Board shall fix a convenient time and place for a public hearing. Said hearings shall be held not later than thirty (30) days after the entry of such appeal, unless such time is extended by agreement with the appellant. Any such party may appear in person or by agent or attorney at such hearing. The chairman or clerk shall give notice of the time and place of said hearing to all parties to the hearing and to anyone else requesting notice in writing at least ten (10) days prior thereto. Failure to hold a public hearing within thirty (30) days shall not affect the validity of the appeal or any decision rendered. The board or three (3) member panel in its hearings conducted under this section shall not be bound by strict rules of evidence prevailing in courts of law or equity.

126.4 DECISIONS

126.41 VOTES REQUIRED: If the appeal is conducted by a three (3) member panel, then the concurrence of two (2) of the three (3) members holding the public hearing shall be required. If the appeal is conducted by the entire board, then a majority vote of those hearing the case shall be required.

126.42 STANDARD: The board or a three (3) member panel may vary the application of any provision of this Code to any particular case when in the opinion of the board or a three (3) member panel, the enforcement of the Code would do manifest injustice, provided that the board or three-member panel finds that the decision to grant a variance shall not conflict with the general objectives set forth in Section 18 of Chapter 23B of the General Laws of the Commonwealth or with the general objectives of the Basic Code.

126.43 TIME FOR DECISION: The board shall within thirty (30) days after such hearing, unless such time is extended by agreement of the parties, issue a decision or order reversing, affirming or modifying in whole or in part the order, interpretation, requirement, direction or failure to act which is the subject matter of the appeal.

Failure to render a decision within thirty (30) days shall not affect the validity of any such decision or appeal.

Notice of and a copy of the decision shall be sent by the Clerk to all parties to the appeal and anyone requesting in writing a copy of the decision.

126.44 CONTENTS OF DECISION: All decisions shall be in writing and state findings of fact, conclusions and reasons for decisions. Every decision shall indicate thereon the vote of each member and shall be signed by each member voting. No decision shall be considered by any person or agency as a precedent for future decisions.

126.45 ADDITIONAL POWERS: The board or a three (3) member panel may impose in any decision, limitations both as to time and use, and a continuation of any use permitted may be conditioned upon compliance with future amendments to the Basic Code.

126.5 ENFORCEMENT: Upon receipt of the decision of the Board or a three (3) member panel, the parties to the appeal shall take action forthwith to comply with the decision unless a later time is specified in the decision.

126.6 APPEALS FROM STATE BUILDING CODE APPEALS BOARD: Any person aggrieved by a decision of the State Building Code Appeals Board may appeal to a court of law or equity in conformance with Chapter 30A, Section 14 of the General Laws.

126.7 LOCAL OR REGIONAL BOARD OF APPEALS: Whoever is aggrieved by an interpretation, order, requirement, direction or failure to act under the Basic Code by any agency or official of a city, region or town charged with the administration or enforcement of the Basic Code or any of its rules and regulations may appeal first to the appeals board in that city, region or town and then to the State Building Code Appeals Board as provided in section 126.

In the event an appeal is taken from an interpretation, order, requirement or direction, said appeal shall be filed with the local or regional appeal board no later than forty-five (45) days after the service of notice thereof of the interpretation, order, requirement or direction.

In the event the appeal is taken for the failure to act, the appeal shall be taken no later than forty-five (45) days after a request to act has been made by the aggrieved person in writing and served to the appropriate building official or chief administrative officer of the city, regional or town agency which fails to act.

126.8 LOCAL AND REGIONAL BOARD OF APPEALS

126.81 MEMBERSHIP: Any building code board of appeals duly established by ordinance or by-law or otherwise in a city, region or town and in

existence on January 1, 1975, shall qualify as a local board of appeals under section 126 notwithstanding anything to the contrary contained herein. However, the procedure and rights for appeals for such board of appeals shall be governed by this Code.

If a city, region or town has not duly established by ordinance or by-law or otherwise a local or regional building code appeals board by January 1, 1975, said city, region or town may establish a local or regional board of appeals, hereinafter referred to as the local board of appeals, consisting of five (5) members appointed by the chief administrative officer of the city, region or town: one (1) member appointed for five (5) years, one (1) for four (4) years, one for three (3) years, one for two (2) years and one to serve for one (1) year; and thereafter each new member to serve for five (5) years or until his successor has been appointed.

126.82 QUALIFICATIONS OF LOCAL BOARD MEMBERS: Each member of a local board of appeals established under section 126.81 shall have had at least five (5) years experience in the construction, alteration, repair and maintenance of building and building codes. At least one (1) member shall be a registered structural or civil professional engineer and one (1) member a licensed professional architect.

126.83 CHAIRMAN OF LOCAL OR REGIONAL BOARD: The board shall select one (1) of its members to serve as chairman, and the building official shall designate a person from the department to serve as secretary to the board, who shall keep a detailed record of all proceedings on file in the said building department.

126.84 ABSENCE OF MEMBERS: During the absence of a member of a local board of appeals for reason of disability or disqualification, the chief administrative officer of the city, region or town shall designate a substitute who shall meet the qualifications as outlined in section 126.82.

126.85 QUORUM: A quorum shall be three (3) members, but when five (5) qualified members are not present to consider a specific appeal, either the appellant or appellee may request a postponement of the hearing.

126.86 PROCEDURES: Entry of appeals shall be governed by section 126.31 excepting that the city, region or towns may set their own entry fee.

Upon notice of entry of appeal the local building commissioner or inspector of buildings shall transmit a copy of the record and all the papers and documents to the local board of appeals.

Entry of an appeal shall stay all proceedings in furtherance of the action or failure to act appealed from, unless the building commissioner or inspector of buildings certifies in writing to the local

board of appeals that a stay would involve imminent peril to life or property. Notice in writing of such certification by the building commissioner or inspector of buildings shall be given the appellant at least twenty-four (24) hours prior to the hearing. In such an event a hearing on such stay shall be given first priority and be the first matter heard by the local board of appeal at its next scheduled meeting. The hearing on the appeal shall be held as soon as possible thereafter in accordance with section 126.87.

The local board of appeal may establish its own rules for procedure not established herein or not inconsistent with this Code or the enabling legislation creating a statewide building code.

126.87 HEARINGS: All hearings shall be public and notice of said hearings shall be advertised in a newspaper of general circulation in the city, region or town in which the appeal is taken, at least ten (10) days before said hearing. Notice of the hearing, setting forth the date and time of said hearing shall be mailed by the local board of appeals to all parties and all those who requested notice in writing at least fourteen (14) days before said hearing. Said hearings shall be held not later than thirty (30) days after the entry of such appeal, unless such time is extended by agreement with the appellant. This section as it pertains to notice shall not apply to hearings on a stay as provided in section 126.86.

126.88 DECISIONS OF LOCAL BOARDS: A concurring vote of a majority of all the members shall be required for any decision. The local appeals board may vary the application of this Code to any particular case when in its opinion the enforcement of this Code would do manifest injustice, provided that the decision of the board shall not conflict with the general objectives of the state building code or any of its enabling legislation. The local board of appeal may impose in any decision, limitations both as to time and use, and a continuation of any use permitted may be conditioned upon compliance with future amendments to the Basic Code.

126.89 TIME FOR DECISION: The board shall within thirty (30) days after such hearing, unless such time is extended by agreement of the parties, issue a decision or order reversing, affirming or modifying in whole or in part the order, interpretation, requirement, direction or failure to act which is the subject matter of the appeal.

Failure to render a decision within thirty (30) days shall not affect the validity of any such decision or appeal.

Notice of and a copy of the decision shall be sent by the clerk to all parties to the appeal and to anyone requesting in writing a copy of the decision.

126.90 CONTENTS OF DECISION: All decisions shall be in writing and state findings of fact, conclusions and reasons for the decisions.

Every decision shall indicate thereon the vote of each member and shall be signed by each member voting. Any decision shall not be considered by any person or agency as a precedent for future decisions.

126.91 ENFORCEMENT OF DECISION: If said decision is approved by the State Building Code Appeals Board, all parties to the appeal shall take immediate action in accordance with the decision of the local board unless the person aggrieved by such decision appeals to the State Building Code Appeals Board as provided in section 126.

126.92 COPY OF DECISION: A copy of any decision by a local board of appeals shall be transmitted to the State Building Code Appeals Board within ten (10) days after the rendering of such decision. If the State Building Code Appeals Board disapproves of the said decision of the local board, it may on its own motion, appeal from the local appeals board's decision according to section 126 and call for a hearing de novo.

If the State Building Code Appeals Board does not notify the local board in writing within forty-five (45) days from the date of the local board's decision, the said decision shall be deemed approved; provided that the decision shall not conflict with the general objectives of the state building code and any of its enabling legislation.

126.93 REVIEW: Any person, including the State Building Code Appeals Board, aggrieved by a decision of the local board of appeals, whether or not a previous party to the decision, or any municipal officer or official board of the municipality, may not later than forty-five (45) days after the mailing of the decision of the local board, apply to the State Building Code Appeals Board for a hearing de novo before the state board, in accordance with the regulations contained in section 126.

SECTION 127.0 CONSTRUCTION MATERIALS SAFETY BOARD

127.1 RULES AND REGULATIONS FOR LICENSING: The commission shall issue rules and regulations for the examination and licensing, and the revocation of licenses of individuals, laboratories and firms responsible for the inspection, control, testing and quality of materials, devices and methods of construction. Said rules and regulations shall require that all testing equipment and procedures shall comply with standards issued by the American Society for Testing and Materials, provided that such standards shall not conflict at any time with any rules and regulations established by and for the said commission.

127.11 CONSTITUTION OF THE CONSTRUCTION MATERIALS SAFETY BOARD: There shall be a board under the control of the commission called the Construction Materials Safety Board, hereafter in section 127 called the board, which shall consist of nine (9) members, one (1) of whom shall be a member of the commission who shall be ex officio and a voting member of the

board, and eight (8) members to be appointed by the chairman of the commission: one of whom shall be a registered professional engineer who is a structural engineer; one of whom shall be a registered architect; one of whom shall be a representative of a Commercial Testing Laboratory; one of whom shall be a representative of a Public Testing Laboratory; two of whom shall be representatives from the construction industry; one of whom shall be a member of a university faculty engaged in research and teaching in structural materials; and one of whom shall be a member of a university faculty engaged in research and teaching in the area of theoretical and applied mechanics.

127.12 CONSTRUCTION MATERIALS SAFETY BOARD: The board will review applications for registration for licensing of individuals and laboratories responsible for the inspection, control and testing of construction materials and report to the State Building Code Commission their recommendations. The board will collect information and review cases where disciplinary action against an existing license, whether an individual, laboratory or firm, has been proposed, and make recommendations to the State Building Code Commission. The commission will issue applications, receive payment of registration and licensing fees, and maintain records for the efficient dispatch of the duties of the board. The board shall submit to the commission reports from time to time as requested by the commission, but at least annually.

127.2 TESTING AND EVALUATION GROUP: The State Building Code Commission shall establish and maintain a Testing and Evaluation Group, who will have the responsibility of administering and directing, under the supervision of the commission, the testing and controls for evaluating individual applicants and laboratories wishing to become registered and licensed as required under section 128.9.

127.3 ACTIVITIES REQUIRING LICENSES

127.31 CONCRETE TESTING: On and after the first day of January 1975, no person shall engage in the activities of field testing, plant testing or field inspection of concrete unless such person is licensed to do so by the commission. Any person who violates the provisions of this section, any person who falsifies or counterfeits a license issued by the board, or any person who fraudulently issues or accepts such a license shall be punished as provided in section 122.0 of this Code. The commission shall require strict adherence to the standards of the American Society for Testing and Materials, Designation E-329, entitled "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."

128.0 CONTROLLED CONSTRUCTION

128.1 STRUCTURES SUBJECT TO CONTROL: Structures and/or parts thereof which fall within the categories below shall be subject to control as provided in this section:

CATEGORIES

a) one-story structures with a story height of twenty-five (25) feet or more

b) four (4) or more floors of framed construction

c) more than two (2) levels of shored concrete framework

d) piles, caissons, pressure-injected footings

e) underpinnings

f) temporary shoring or sheeting ten (10) feet or more in height

g) masonry bearing walls four (4) stories or more in height

h) structures using post-tensioned concrete

i) four (4) stories or more of precast concrete

j) retaining walls ten (10) feet or more in total height

k) bridges, quays and wharfs.

128.2 WAIVER OF STRUCTURAL PLANS: The examination of structural plans and specifications of structures and/or parts thereof which fall within the categories listed in section 128.1 may be waived by the building official when such plans and specifications are submitted by a qualified registered professional engineer. In such case they shall be accompanied by an affidavit stating that the registered professional engineer has supervised the preparation of the structural design contract documents, and that such documents conform to all provisions of this Code and legal rules adopted under its provisions.

128.3 WAIVER OF STRUCTURAL FIELD EXAMINATION: If required by the building official, the detailed department field inspection of those parts of plans and specifications submitted under the provisions of section 128.2 shall be performed by a qualified registered professional engineer. Such qualified registered professional engineer shall submit an affidavit stating that the structure shall be built under his observation or that of his qualified designated representative and in accordance with the approved contract documents and furthermore, that he will review and approve all working drawings for the construction. Such qualified registered professional engineer or representative shall certify that the construction is in substantial accordance with the drawings and specifications submitted under sections 128.2 and 128.3.

128.4 BUILDING OFFICIAL RESPONSIBILITY: Nothing contained in this section shall have the effect of waiving or limiting the building

official's authority to enforce the Code with respect to examination of plans and field inspections.

128.5 REPORTS: The engineer retained under the provisions of section 128.3 shall submit progress reports to the building official at least weekly. Such reports will terminate upon the completion of the work on the structural elements, submitted in the structural drawings subject to section 128.3 and the exterior enclosure of such structural elements.

128.6 QUALIFICATIONS: The registered professional engineer shall be approved by the building official as qualified by experience in the specific field of construction involved in the building project under consideration.

128.7 PERMIT PROCEDURE: Structures and parts thereof included in the listing of section 128.1 shall be subject to the permit procedures of section 113.51.

128.8 LICENSING OF CONSTRUCTION SUPERVISORS: Construction supervisors operating under the provisions of section 128.0 shall be subject to licensing according to the rules and regulations promulgated by the Commission as provided in section 109.11.

128.9 LICENSING OF LABORATORIES AND TEST PERSONNEL: Laboratories and test personnel operating under the provisions of section 128.0 shall be subject to licensing according to the rules and regulations promulgated by the Commission as provided in section 109.12.

SECTION 129.0 VALIDITY

The provisions of this Code are severable, and if any of its provisions shall be held unconstitutional or otherwise invalid by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

ARTICLE 2

DEFINITIONS AND CLASSIFICATIONS

SECTION 200.0 SCOPE

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

200.1 APPLICATION OF TERMS: The terms herein defined shall be used to interpret all the applicable provisions of the Basic Code. Definitions of technical terms relating to specific structural and means of egress requirements and to the installation of mechanical, electrical and service equipment are included in the respective articles.

200.2 APPLICATION OF OTHER LAWS: Nothing herein contained shall be deemed to nullify any provisions of the zoning by-law or ordinance of any municipality in the Commonwealth of Massachusetts insofar as those provisions deal exclusively with those powers of regulating zoning granted by the provisions of Chapter 40A and 41 of the Massachusetts General Laws Annotated, as amended.

SECTION 201.0 GENERAL DEFINITIONS

Unless otherwise expressly stated, the following terms shall, for the purpose of the Basic 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. Any terms relating to Elevators, Dumbwaiters and Escalators shall have their meaning as defined by Regulations ELV-1 and ELV-2 of the Department of Public Safety of the Commonwealth of Massachusetts. Any terms relating to plumbing and electrical wiring shall have their terms as defined by the Regulations of the Commonwealth of Massachusetts pertaining to plumbing and electrical wiring.

ABUT: to touch or be contingent.

ACCEPTED ENGINEERING PRACTICE: that which conforms to accepted principles, tests or standards of nationally recognized technical or scientific authorities.

ACCESSORY STRUCTURE: a building the use of which is incidental to that of the main building and which is located on the same lot.

ACCESSORY USE: a use incidental to the principal use of a building as defined or limited by the provisions of the local zoning laws.

ACCREDITED AUTHORITATIVE AGENCIES: (see appendix A).

ADDITION: an extension or increase in floor area or height of a building or structure.

AIR CONDITIONING: (see section 1801.0).

AIR DUCT: (see section 1801.0).

AIRPLANE HANGAR: (see section 401.0).

AISLE: a clear and unobstructed passageway through a room.

ALLEY: a secondary thoroughfare less than thirty (30) feet in width dedicated for the public use of vehicles and pedestrians affording access to abutting property.

ALTERATION: change in or addition to a building which reduces the means of exit or fire resistance or changes its structural support, use or occupancy.

ALTERNATE INSPECTOR: a person appointed to act in the absence of the inspector of buildings in case of illness, disability, or conflict of interest. (see section 107.12)

AMUSEMENT DEVICE: a device or structure, open to the public, by which individuals are conveyed or moved in an unusual manner for diversion.

APARTMENT: a dwelling unit as defined in this Code.

APPROVED: approved by the Commission, the building official or other authority having jurisdiction.

APPROVED COMBUSTIBLE PLASTIC: (see section 1401.0).

APPROVED MATERIAL, EQUIPMENT AND METHODS: approved by the Commission or by an agency approved by the Commission.

APPROVED PLASTIC: (see section 2001.0).

APPROVED RULES: those rules approved by the State Building Code Commission unless otherwise specified.

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.

ARCHITECTURAL TERRA COTTA: (see section 801.0).

AREA (BUILDING): the maximum horizontally projected areas of the building at or above grade, exclusive of court and vent shafts.

AREA (FLOOR): the useable area of each story of a building or portion thereof, within surrounding exterior walls. (see section 601.0).

AREAWAY: (form of construction). An uncovered subsurface space adjacent to a building.

ASHLAR FACING: (see section 801.0).

ASHLAR MASONRY: (see section 801.0).

ATTIC: the space between the ceiling beams of the top habitable story and the roof rafters.

-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: a device or system which has the capability of providing a predetermined function when predetermined conditions exist.

AUTOMATIC COLLAPSIBLE REVOLVING DOOR: (see section 601.0).

AUTOMATIC FIRE ALARM SYSTEM: (see section 1201.0).

AUTOMATIC FIRE DOOR: (see section 901.0).

AUTOMATIC SPRINKLER HEAD: (see section 1201.0).

AUTOMATIC SPRINKLER SYSTEM: (see section 1201.0).

AUTOMATIC WATER SUPPLY SOURCE: (see section 1201.0).

BASEMENT: a portion of the building partially underground, but having less than half its clear height below the grade plane (see cellar).

BASIC CODE: the State Building Code of the Commonwealth of Massachusetts, also referred to as this Code.

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.

BILLBOARD: (see section 1401.0).

BOILER: (see section 1101.0).

BRICK: (see section 801.0).

BUILDING: (see structure) A structure enclosed within exterior walls or firewalls, built, erected and framed of a combination of any materials, whether portable or fixed, having a roof, to form a structure for the shelter of persons, animals or property. For the purpose of this definition, "roof" shall include an awning or any similar covering, whether or not permanent in nature. The word "building" shall be construed where the context requires as though followed by the words "or part or parts thereof."

BUILDING (EXISTING): any structure erected or one for which a legal building permit has been issued prior to the adoption of the Basic Code.

BUILDING COMMISSIONER: The administrative chief of the building department in a municipality who is charged with the administration and enforcement of the Basic Code. See also inspector of buildings. (see section 107.1)

BUILDING COMPONENT: (see section 1901.0)

BUILDING DEPARTMENT: The person, body, agency, department or office of any municipality charged with the administration and enforcement of the Basic Code.

BUILDING OFFICIAL: The officer or other designated authority charged with the administration and enforcement of the Basic Code. Building official as used herein includes the building commissioner or the inspector of buildings and the local inspector.

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

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.

BUILDING SYSTEM: (see section 1901.0)

BUTTRESS: (see section 801.0)

CELLAR: The portion of the building partially underground, having half or more than half of its clear height below the grade plane.

CENTRAL STATION SYSTEM: (see section 1201.0)

CERAMIC SURFACE UNIT: (see section 801.0)

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.

CERTIFICATION: (see section 1901.0)

CHANGE OF USE: An alteration by change of use in a building heretofore existing to a new use group which imposes other special provisions of law governing building construction, equipment or means of egress.

CHIMNEY: (see section 1001.0)

CHIMNEY CONNECTOR: (see section 1001.0)

CLASSROOM: A room with desks or equivalent used for group instruction purposes for ten (10) or more students. For the purpose of the provisions contained in section 460.0, libraries, study halls, science laboratories, shops, domestic science rooms and typing rooms shall be considered classrooms for the number of students indicated in the occupancy schedule.

CLAY MASONRY UNIT: (see section 801.0)

CLOSED SIGN: (see section 1401.0)

COMBUSTIBLE: (see section 901.0)

COMBUSTIBLE (MATERIAL): (see section 901.0)

COLD-FORMED STEEL CONSTRUCTION: (see section 801.0)

COMBINATION OF MUNICIPALITIES: Any two or more cities and/or towns who have agreed to combine in order to share costs necessary for the administration and enforcement of the Basic Code in the said cities and/or towns.

COMBINATION SIGN: (see section 1401.0)

COMBUSTIBLE FIRE DAMPER: (see section 901.0)

COMMENCED: Any physical action begun on the job site for the purposes of construction, for which a building permit is required.

COMMISSION: (see State Building Code Commission)

COMMON HALLWAY: (see section 601.0)

COMPLIANCE ASSURANCE PROGRAM: (see section 1901.0)

CONCRETE: (see section 801.0)

CONCRETE BRICK: (see section 801.0)

CONCRETE MASONRY UNIT: (see section 801.0)

CONFLAGRATION HAZARD: (see section 901.0)

CONTROLLED CONSTRUCTION: (see sections 128.0 and 701.0)

CONTROLLED MATERIALS: (see sections 701.0 and 722.0)

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.

CONSTRUCTION OPERATION: The erection, alteration, repair, renovation, demolition or removal of any building or structure; and the excavation, filling, grading and regulation of lots in connection therewith.

CONSTRUCTION SUPERVISOR: Any individual directly supervising persons engaged in construction, reconstruction, alterations or repairs involving the structural elements of buildings and structures.

CORRIDOR: (see passageway, section 601.0)

COURT: (see section 501.0)

CURB LEVEL: The elevation of the street curb as established in accordance with law.

-BUILDING OR WALL HEIGHT: The elevation of the street grade opposite the center of the wall nearest to and facing the street lot line.

-EXCAVATIONS: The elevation of the street grade nearest to the point of excavation.

DAY CARE CENTER: Any facility operated on a regular basis whether known as a day nursery, nursery school, kindergarten, child play school, progressive school, child development center, or preschool, or known under any other name, which receives children not of common parentage under seven (7) years of age or under sixteen (16) years of age if such children have special needs for non-residential custody and care during part or all of the day separate from their parents. Day care center shall not include: any part of a public school system; any part of a private, organized educational system unless the services of such system are primarily limited to kindergarten, nursery or related preschool services; a Sunday school conducted by a religious

institution; a facility operated by a religious organization where children are cared for during short periods of time while persons responsible for such children are attending religious services; a family day care home, as defined by section nine (9) of chapter 28A of the MGLA as amended; an informal cooperative arrangement among neighbors or relatives; or the occasional care of children with or without compensation therefor.

DELUGE SYSTEM: (see section 1201.0)

DISPLAY SIGN: (see section 1401.0)

DISPLAY SURFACE: (see section 1401.0)

DOORWAY: The clear width of the opening protected by a door, subject to the width reduction provisions of this Code.

DRAFT HOOD: (see section 1001.0)

DRAFT REGULATOR: (see section 1001.0)

DUCT: (see section 1001.0)

DWELLINGS:

-ONE-FAMILY DWELLING: A building containing one (1) dwelling unit with not more than three (3) lodgers or boarders. L-3 Use Group.

-TWO-FAMILY DWELLING: A building containing two (2) dwelling units with not more than three (3) lodgers or boarders per dwelling unit. L-3 Use Group.

-MULTI-FAMILY APARTMENT HOUSE: Any building or portion thereof used as a multiple dwelling for the purpose of providing three (3) or more separate dwelling units with shared means of egress. L-2 Use Group.

-BOARDING HOUSE, TOURIST HOME: A building arranged or used for lodging, with or without meals, by more than three (3) lodgers or boarders. L-1 Use Group.

-LODGING HOUSE: Any building or portion thereof arranged or used for lodging by more than three (3) lodgers or boarders and where cooking or sanitary facilities may be provided. L-1 Use Group.

-DORMITORY: A space in a unit where group sleeping accommodations are provided, with or without meals, for persons not members of the same family group, in one room, or in a series of closely associated rooms under joint occupancy and single management, as in college dormitories, fraternity houses, military barracks and ski lodges. Use Group L-1.

-HOTEL: Any building containing six (6) or more guest rooms intended or designed to be used, or which are used, rented or hired out to be occupied or which are occupied for sleeping purposes by guests. Use Group L-1.

DWELLING UNIT: One or more rooms arranged for the use of one (1) or more individuals living together as a single housekeeping unit, with cooking, living, sanitary and sleeping facilities.

ESCALATOR: (see section 601.0)

EXISTING BUILDING: A building erected prior to the adoption of the Basic Code, or one for which a legal building permit has been issued.

EXITWAY: (see section 601.0)

EXITWAY ACCESS: (see section 601.0)

EXITWAY DISCHARGE: (see section 601.0)

EXITWAY DISCHARGE COURT: (see section 401.0)

EXTERIOR MASONRY WALL CONSTRUCTION: (see section 217.0)

FIRE AREA: The floor area enclosed and bounded by fire walls or exterior walls of a building to restrict the spread of fire.

FIRE DAMPER: (see section 1801.0)

FIRE DISTRICTS: The territories defined and limited by the provisions of the Basic Code for the restriction of types of construction.

FIRE DIVISION: (see section 901.0)

FIRE DOOR: (see section 901.0)

FIRE DOOR ASSEMBLY: (see section 901.0)

FIRE DRILL: (see section 1201.0)

FIRE GRADING: (see sections 202, 901, 902 and Table 9-1)

FIRE HAZARD: (see section 901.0)

FIRE LIMITS: (see section 301.0)

FIRE PARTITION: (see section 901.0)

FIRE PREVENTION: (see section 901.0)

FIRE PROTECTION: (see section 901.0)

FIRE SAFETY: (see section 901.0)

FIRE SEPARATION: (see section 901.0)

FIRE TOWER: Smokeproof tower (see section 601.0)

FIRE WALL: (see section 901.0)

FIRE WINDOW: (see section 901.0)

FIREPROOF CONSTRUCTION: (see section 215.0)

FIRERESISTANCE: (see section 901.0)

FIRERESISTANCE RATING: (see section 901.0)

FIRERESISTIVE PARTITION: (see section 901.0)

FIRERETARDANT CONSTRUCTION: (see section 901.0)

FIRERETARDANT LUMBER: (see section 901.0)

FLAME SPREAD: (see section 901.0)

FLAME SPREAD RATING: (see section 901.0)

FLAMERESISTANCE: (see section 901.0)

FLAMMABLE: (see section 401.0)

FLAMMABLE FILM: (see section 401.0)

FLEXIBLE TUBING: (see section 1001.0)

FLOOR AREA, GROSS: (see section 601.0)

FLOOR AREA, NET: (see section 601.0)

FLOOR FILL: (see section 801.0)

FLOOR FILLING: (see section 801.0)

FLOOR FINISH: (see section 801.0)

FLOOR FURNACE: (see section 1101.0)

FLUE: (see section 1001.0)

FORCED AND INDUCED DRAFT FUEL BURNING APPLIANCES: (see section 1001.0)

FORMED STEEL: (see section 701.0)

FOUNDATION WALL: (see section 701.0)

FOYER: (see section 401.0)

FRAME CONSTRUCTION: (see section 218.0)

FUEL OIL: (see section 401.0)

GARAGE: (see section 401.0)

GAS VENTS: (see section 1001.0)

GRADE: A reference plane representing the average of finished ground level adjoining the building at all exterior walls.

GRADE BEAM: A beam of masonry, reinforced concrete or structural steel incased in concrete at or below grade that receives the load from the superstructure and transmits it to the foundation.

GRADE HALLWAY: (see section 601.0)

GRANDSTAND: (see section 401.0)

GROUND SIGN: (see section 1401.0)

GROUP RESIDENCE: (see section 433.1)

HABITABLE ROOM: (see section 501.0)

HALLWAY, GRADE: (see section 601.0-Grade hallway)

HALLWAY, COMMON: (see section 601.0-Common hallway)

HAZARD: (Low, moderate, high. see section 901.0).

HEAD OF THE FIRE DEPARTMENT: The chief executive officer of the fire department in a city, town or fire district having such an officer, otherwise the fire commissioner, board of fire commissioners or fire engineers, or commissioner of public safety; and in towns not having a fire department, the chief engineer, if any, otherwise the chairman of the board of selectmen. The words "head of the fire department" shall be construed, where the content allows, as though followed by the words "or person delegated by him."

HEATING APPLIANCES: (see section 1101.0)

HEIGHT, BUILDING: The vertical distance from the grade to the highest point of the roof. When a building faces more than one street the height shall be measured from the average of the grade at the center line of each street front.

-COURT: The vertical distance from the lowest level of the court to the mean height of the top of the enclosing walls.

-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.

-WALL: The vertical distance from the foundation wall or other immediate support of such wall to the top of the wall.

HEREAFTER: After the time that the Basic Code becomes effective.

HERETOFORE: Before the time that the Basic Code became effective.

HIGH HAZARD USE: (see section 203.0)

HIGH PRESSURE BOILER: (see section 1101.0)

HOLLOW BRICK: (see section 801.0)

HOOD: (see section 1001.0)

HORIZONTAL EXIT: (see section 601.0)

HORIZONTAL FIRE LINE: (see section 1201.0)

INFLAMMABLE: (see Flammable. section 401.0)

INSPECTOR OF BUILDINGS: The administrative chief of the building department in a municipality who is charged with the administration and enforcement of the Basic Code. See also building commissioner. (see section 107.1)

INSTALLATION: (see section 1901.0)

INTERIOR LOT LINE: Any lot line other than one adjoining a street or public space.

KEROSENE: (see section 401.0)

LABEL: (see section 1901.0)

LIGHT GAUGE STEEL CONSTRUCTION: (see section 701.0)

LIGHT-DIFFUSING SYSTEM: (see section 2001.0)

LIMIT CONTROL: (see section 1801.0)

LINTEL: (see section 801.0)

LOAD: (see section 701.0)

LOBBY: (see section 401.0)

LOCAL ENFORCEMENT AGENCY: (see section 1901.0)

LOCAL INSPECTOR: A person in a municipality who assists the building commissioner or inspector of buildings in the performance of his duties and is charged with the enforcement of the Basic Code. (see section 107.11)

LOT: A portion or parcel of land considered as a unit.

-CORNER LOT: One with two (2) adjacent sides abutting upon streets or other public spaces.

-INTERIOR LOT: One which faces on one street or with opposite sides on two (2) streets.

LOT LINE: A line dividing one lot from another, or from a street or any public place.

LOW HAZARD USE: (see section 204.2)

LOW PRESSURE BOILER: (see section 1101.0)

MANUAL FIRE-ALARM SYSTEM: (see section 1201.0)

MANUFACTURED BUILDING: (see section 1901.0)

MARQUEE: (see section 1401.0)

MARQUEE SIGN: (see section 1401.0)

MASONRY: (see section 801.0)

MEANS OF EGRESS: A continuous and unobstructed path of travel from any point in a building or structure to a public space 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 shall include intervening room spaces, doors, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts and yards.

MECHANICAL VENTILATION: (see section 1801.0)

MECHANICAL WARM AIR FURNACE: (see section 1101.0)

MEZZANINE: An intermediate floor between the floor and ceiling of any story, and covering less than thirty-three and one-third (33 1/3) percent of the floor area immediately below.

MINIMUM HABITABLE ROOM HEIGHT: (see section 501.0)

MINIMUM HABITABLE ROOM SIZE: (see section 501.0)

MOBILE HOME: (see sections 401.0 and 1901.0)

MOBILE HOME SYSTEM: (see section 1901.0)

MODERATE HAZARD USE: (see section 204.1)

MORTAR: (see section 801.0)

MOTEL: A hotel as defined in this Code.

MOTOR FUEL SERVICE STATION: (Oil selling station, Gasoline service station, section 401.0)

MOTOR VEHICLE REPAIR SHOP: (see section 401.0)

MOVING STAIRWAY: (see section 601.0)

MUNICIPALITY: Any city or town in the Commonwealth of Massachusetts. The word "municipality" shall be construed, where the context requires, as though followed by the words "or combination of municipalities."

NOMINAL DIMENSION: (see section 801.0)

NON-AUTOMATIC SPRINKLER SYSTEM: (see section 1201.0)

NONCOMBUSTIBLE BUILDING MATERIAL: (incombustible)(see section 901.0)

NONCOMBUSTIBLE CONSTRUCTION: (see section 216.0)

NOTICE: (see section 122.12)

OCCUPANCY: The purpose for which a building, or part thereof, is used or intended to be used.

OCCUPANCY LOAD: The number of individuals normally occupying the building or part thereof, or for which the exitway facilities have been designed.

OCCUPANTS: Persons normally located within the building or structure or part thereof.

OCCUPIABLE ROOM: (see section 501.0)

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: (see section 1201.0)

OPEN SIGN: (see section 1401.0)

ORDINARY MATERIALS: (see section 701.0 and 722.0)

ORIEL WINDOW: A window projected beyond and suspended from the wall of the building or cantilevered therefrom.

OWNER: Every person who alone or jointly or severally with others (a) has legal title to any building or structure; or (b) has care, charge, or control of any building or structure in any capacity including but not limited to agent, executor, executrix, administrator, administratrix, trustee or guardian of the estate of the holder of legal title; or (c) lessee under a written letting agreement; or (d) mortgagee in possession; or (e) agent, trustee or other person appointed by the courts. Each such person is bound to comply with the provisions of the Basic 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)

PARKING STRUCTURE, OPEN: (see section 401.0)

PARTIAL SPRINKLER SYSTEM: (see section 1201.0)

PARTY WALL: (see section 901.0)

PASSAGEWAY: (see section 601.0-grade hallway)

PENTHOUSE: An enclosed structure above the roof of a building, other than a roof structure or bulkhead occupying not more than thirty-three and one-third (33 1/3) percent of the roof area.

PERMIT: An official document or certificate issued by the authority having jurisdiction authorizing performance of a specified activity.

PERSON: Every individual, partnership, corporation, firm, association, trustee or group, including a city, town, county, authority or other governmental unit, owning property or conducting any activity regulated by this Basic Code.

PLACE OF ASSEMBLY: A room or space accommodating fifty (50) or more individuals for religious, recreational, educational, political, social or amusement purposes or for the consumption of food and drink, including all connected rooms or spaces with a common means of egress and entrance.

PLACE OF OUTDOOR ASSEMBLY: Premises used or intended to be used for public gatherings of two hundred (200) or more individuals in other than buildings.

PLASTIC GLAZING: (see section 2001.0)

PLASTIC ROOF PANELS: (see section 2001.0)

PLASTIC WALL PANEL: (see section 2001.0)

PLENUM CHAMBER: (see section 1801.0)

POLE SIGNS: (see section 1401.0)

POSTED USE AND 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.

POSTER PANEL: (see section 1401.0)

PRESERVATIVE TREATED WOOD: (see section 801.0)

PRIMARY MEMBER: (see section 701.0)

PROFESSIONAL ENGINEER OR ARCHITECT: (see qualified registered professional engineer or architect)

PROJECTING SIGN: (see section 1401.0)

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 table 2-5, and includes protected-frame, protected-ordinary and protected-noncombustible construction.

PUBLIC PARKING DECKS: (see section 401.0)

PUBLIC SPACE: A legal open space on the premises, accessible to a public way or street, such as yards, courts or open spaces permanently devoted to public use which abuts the premises.

PYROXYLIN PLASTIC: (see section 401.0)

QUALIFIED REGISTERED PROFESSIONAL ENGINEER OR ARCHITECT: A registered professional engineer who is qualified by his experience and training to perform the work for which he is responsible.

RAISED PLATFORM: A raised portion of floor to be used for simple stage purposes that involves a minimum of fire hazard, so located that it extends not more than eighteen (18) feet behind the probable curtain line of the proscenium opening and of an area limited to seventeen and one-half (17.5) percent of the assembly room floor area of 1,550 square feet, whichever is less.

REFRIGERANT: (see section 1801.0)

REFRIGERATION: (see section 1801.0)

REINFORCED CONCRETE: (see section 801.0)

REINFORCED THERMOSETTING PLASTIC: (see section 2001.0)

REMOVAL OF BUILDINGS: The moving of a building or structure from one site to another.

REPAIR: The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

REQUIRED: Shall be construed to be mandatory by provisions of the Basic Code.

ROOF: The roof slab or deck with its supporting members, not including vertical supports.

ROOF COVERING: The covering applied to the roof for weather resistance, fireresistance or appearance.

ROOF SIGN: (see section 1401.0)

ROOF STRUCTURE: An enclosed structure on or above the roof of any part of a building.

RUBBLE MASONRY: (see section 801.0)

RUNWAY: (see section 1301.0)

RUPTURE MEMBER: (see section 1801.0)

SCAFFOLD: Any elevated platform which is used for supporting workmen, materials, or both.

SCHOOLHOUSE: Any building or premise in which a regular course of public or private instruction is given to not less than ten (10) students at one time except for rooms in buildings separate from or attached to churches used for the primary purpose of religious instruction.

SECONDARY MEMBER: (see section 701.0)

SELF-CLOSING: (see section 601.0)

SERVICE EQUIPMENT: (see building service equipment)

SHALL: The term when used in the Basic Code shall be construed as mandatory.

SHAFT: (see section 901.0)

SLIDESCAPE: (see section 601.0)

SLOW-BURNING PLASTIC: (see check test). (see section 2001.0)

SMOKE DETECTOR: (see section 1801.0)

SMOKEPIPE: (see section 1001.0)

SMOKEPROOF TOWER: (fire tower, see section 601.0)

SMOKESTACK: (see section 1001.0)

SOLID MASONRY UNIT: (see section 801.0)

SPACE HEATER: (see section 1101.0)

SPECIALIZED CODE: All building codes, rules or regulations pertaining to building construction, reconstruction, alteration, repair or demolition promulgated by and under the authority of the various agencies which have been authorized from time to time by the General Court of the Commonwealth of Massachusetts.

SPRINKLER SYSTEM: (see section 1201.0)

SPRINKLERED: (see section 1201.0)

STAGE: (see section 401.0)

STAIRWAY: (see section 601.0)

STANDARD FIRE TEST: (see section 901.0)

STANDPIPE: (see section 1201.0)

STATE BUILDING CODE: The State Building Code and amendments and rules and regulations thereto as promulgated by the State Building Code Commission under sections sixteen (16), seventeen (17) and eighteen (18) of Chapter twenty-three (23)B of the Massachusetts General Laws Annotated as amended.

STATE BUILDING CODE COMMISSION: The Massachusetts State Building Code Commission established by section sixteen (16) of chapter twenty-three (23)B of the Massachusetts General Laws Annotated as amended.

STATE INSPECTOR: An employee of the Division of Inspection, State Department of Public Safety who is charged with administering and enforcing the Basic Code relative to any structure or building or parts thereof that are owned by the Commonwealth or any departments, commissions, agencies or authorities of the Commonwealth. The state inspector is also charged with supervising the enforcement of the Basic Code relative to all buildings and structures other than those owned by the Commonwealth. (see section 108.2)

STEEL JOIST: (see section 701.0)

STORY: That portion of a building included between the upper surface of a floor and upper surface of the floor or roof next above. (see also mezzanine)

STORY, FIRST: A story in which the finished floor is nearest to, and the ceiling of which is six (6) feet or more above the average grade of the sidewalk or ground adjoining.

STREET: A primary thoroughfare or highway thirty (30) feet or more in width as dedicated or devoted to public use by legal mapping use, or other lawful means.

STREET LOT LINE: The lot line dividing a lot from a street or other public space.

STRUCTURAL CLAY TILE: (see section 801.0)

STRUCTURAL STEEL MEMBER: (see section 701.0 and 801.0)

STRUCTURE: A combination of materials assembled at a fixed location to give support or shelter, such as a building, framework, retaining wall, tent, reviewing stand, platform, bin, fence, sign, flagpole, recreational tramway, mast for radio antenna or the like. The word "structure" shall be construed, where the context requires, as though followed by the words "or part or parts thereof."

SUPERVISED SPRINKLER SYSTEM: (see section 1201.0)

TECHNICAL CODE COUNCIL: (see section 100.5)

TEMPORARY SIGN: (see section 1401.0)

THEATRE: A building or part thereof in which it is intended to make a business of the presentation of performances for the entertainment of spectators, which has a seating capacity of more than four hundred (400), with a stage which can be used for scenery and other appliances. (see section 208.1)

THERMOPLASTIC MATERIAL: (see section 2001.0)

THERMOSETTING MATERIAL: (see section 2001.0)

TILE: (see section 801.0)

TON OF REFRIGERATION: (see section 1801.0)

TRAVEL TRAILERS: (see section 401.0)

TWO-SOURCE SYSTEM: (see section 1201.0)

UNFIRED PRESSURE VESSEL: (see section 1101.0)

UNIT HEATER: (see section 1101.0)

USE GROUP: The classification of a building or structure based on the purpose for which it is used.

USE-USED: The purpose for which the building or structure is designed, used or intended to be used.

VENT: (see section 1001.0)

VENT CONNECTOR: (see section 1001.0)

VENT DUCT: (see section 1801.0)

VENT PIPE (GAS): (see section 1001.0)

VENT SYSTEM: (see section 1001.0)

VENTILATION: (see section 1801.0)

VERTICAL OPENING: An opening through a floor or roof.

VOLATILE FLAMMABLE: (see section 401.0)

WALL: (see also section 801.0 and section 901.0)

-APRON WALL: That portion of a skeleton wall below the sill of a window.

-BEARING WALL: A wall supporting any vertical load in addition to its own weight.

-CURTIN WALL: A non-bearing enclosure wall not supported at each story.

-DIVISION WALL: A wall used to divide the floor area of a building or structure into separate parts for fire protection, for different uses, for restricted occupancy, or for other purposes specified in the Basic Code.

-NON-BEARING WALL: A wall which supports no vertical load other than its own weight.

-PARAPET WALL: That part of any wall entirely above the roof line.

-RETAINING WALL: A wall designed to prevent the lateral displacement of soil or other material.

-SKELETON OR PANEL WALL: A non-bearing wall supported by each story on a skeleton frame.

-SPANDREL WALL: That portion of a skeleton wall above the head of a window or door.

WALL HEATER: (see section 1101.0)

WALL SIGN: (see section 1401.0)

WARM AIR FURNACE: (see section 1101.0)

WATER CURTAIN: (see section 1201.0)

WINDER: (see section 601.0)

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

YARD: (see section 501.0)

ZONING: The reservation of certain specified areas within a community or city 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 USE GROUP CLASSIFICATION

Every building, structure and space therein shall be classified with respect to use in one of the following use groups: group A, high hazard; group B, storage; group C, mercantile; group D, industrial; group E, business; group F, assembly; group H, institutional; group L, residential; and group M, miscellaneous buildings.

202.1 FIRE GRADING OF BUILDINGS: All buildings and structures shall be graded in accordance with the degree of fire hazard of their use. Such fire hazard may be expressed in terms of hours and fractions of an hour, fire loading or rate of energy contribution, so long as the building official can adequately relate such fire hazard to the requirements of this code. In case of doubt the building official may accept an evaluation of fire hazard from a qualified registered professional engineer or architect.

202.2 NEW USES: The building official shall establish by approved rules the degree of hazard involved and the fire grading of any use not specifically provided for in this Code, or may require the evaluations of such fire hazard by a qualified registered professional engineer or architect.

SECTION 203.0 USE GROUP A, HIGH HAZARD BUILDINGS

All buildings and structures or parts thereof shall be classified in the high hazard use group which are used for the storage, manufacture or processing of highly combustible or explosive products or materials which are likely to burn with extreme rapidity or which may produce poisonous fumes or explosions; for storage or manufacturing which involves highly corrosive, toxic or noxious alkalies, acids or other liquids or chemicals producing flame, fume, explosive, poisonous, irritant or corrosive gases; and for the storage or processing of any materials producing explosive mixtures of dust or which result in the division of matter into fine particles subject to spontaneous ignition.

203.1 LIST OF HIGH HAZARD USES: The processes, materials and manufactures listed in table 2-1 are indicative of and shall be included among high hazard uses.

TABLE 2-1 - USE GROUP A, HIGH HAZARD USES

Acetylene gas and gases under pressure of fifteen (15) pounds or more and in quantities of greater than twenty-five hundred (2500) cubic feet; including hydrogen, illuminating natural, ammonia, chlorine, phosgene, sulphur dioxide, methyl oxide and all gases subject to explosion, fume or toxic hazard.

Artificial flowers and synthetic leather manufacture.

Ammunition, explosives and fireworks manufacture.

Celluloid and celluloid products.

Cereal, feed, flour and grist mills.

Cotton batting and cotton waste processes.

Cotton dressmaking.

Dry cleaning establishments using or storing more than three (3) gallons of gasoline or other hazardous liquids with a flash point under seventy-five (75) degrees F., or more than sixty (60) gallons of volatile flammable liquids with flash point between seventy-five (75) and one hundred and forty (140) degrees F., in a closed-up tester.

Feather renovating.

Fruit ripening processes.

Grain elevators.

Hydrogenation processes.

Industries employing solids or substances which ignite or produce flammable gases on contact with water.

Kerosene, fuel, lubricating, or any oil storage with a flash point under two hundred (200) degrees F.

Match manufacture or storage.

Metal enameling or japanning.

Nitro-cellulose film exchanges and laboratories.

Paint and varnish manufacture.

Paint spraying or dipping, except as specified in sections 213.2 and 302.3.

Petroleum manufacture.

Processing of paper or cardboard in loose form.

Pyroxylin products manufacture and storage.

Rag sorting and storage.

Refrigerating systems using high hazard refrigerants as defined in article 18.

Shoddy mills.

Shoe polish manufacture.

Smoke houses (industrial).

Straw goods manufacture or broom corn storage.

Sugar and starch pulverizing mills.

Tar, pitch or resin processing.

Tanneries with enameling or japanning.

Waste paper sorting, shredding, storage or bailing.

SECTION 204.0 USE GROUP B, STORAGE BUILDINGS

All buildings and structures or parts thereof shall be classified in the storage use group which are used primarily for the storage of goods, wares or merchandise, except those that involve highly combustible or explosive products or materials; including among others, warehouses, storehouses and freight depots.

204.1 LIST OF MODERATE HAZARD USES: Buildings used for storage of moderate hazard contents which are likely to burn with moderate rapidity but which do not produce either poisonous gases, fumes or explosives, including among others the materials listed in table 2-2, shall be classified in the group B-1 storage use group.

TABLE 2-2 - USE GROUP B-1, STORAGE USES - MODERATE HAZARD

Bags, cloth, burlap and paper
Bamboo and rattan
Baskets
Belting, canvas and leather
Books and paper in rolls or packs
Boots and shoes
Button, including cloth-covered, pearl or bone
Linoleum
Livestock shelters
Lumber yards
Motor vehicle repair shops
Petroleum warehouses for storage of lubricating oils with a flash point of three hundred (300) degrees F. or higher (See section 905.3).

Cardboard and cardboard boxes
Clothing, woolen wearing apparel
Cordage
Furniture
Furs
Glue, mucilage, paste and size
Horn and combs, other than celluloid
Leather enameling or japanning
Photo-engraving
Public garages and stables
Silk
Soap
Sugar
Tobacco, cigars, cigarettes and snuff
Upholstering and mattress manufacturing
Wax candles

204.2 LIST OF LOW HAZARD USES: Buildings used for the storage of noncombustible materials, and of low hazard wares that do not ordiarily burn rapidly, shall be classified in the B-2 storage use group unless herein otherwise classified, including among others the materials listed in table 2-3.

TABLE 2-3 - USE GROUP B-2, STORAGE USES - LOW HAZARD

Asbestos
Chalk and crayons
Food products
Glass
Ivory
Metals
Porcelain and pottery
Talc and soapstones

SECTION 205.0 USE GROUP C, MERCANTILE BUILDINGS

All buildings and structures or parts thereof shall be classified in the mercantile use group which are used for display and sales purposes involving stocks of goods, wares or merchandise incidental to such purposes and accessible to the public; including among others retail stores, shops and salesrooms and markets. Highly combustible materials shall be limited to small quantities that do not constitute a high hazard. Where the hazard of the contents is greater than the normal fire hazard for such use, the building official may require an evaluation by a qualified registered professional engineer or architect and based on such evaluation the building commissioner or inspector of buildings may require compliance with the requirements of high hazard use groups as established by the provisions of article 4 and tables 2-5 and 2-6.

SECTION 206.0 USE GROUP D, INDUSTRIAL BUILDINGS

All buildings and structures or parts thereof in which occupants are engaged in performing work or labor in fabricating, assembling or processing of products or materials shall be classified in the industrial use group; including among other factories, assembling plants, industrial laboratories and all other industrial and manufacturing uses, except those involving highly combustible, flammable or explosive products and materials of the high hazard use group (use group A).

206.1 LIST OF INDUSTRIAL USES: The processes and manufacturers listed in table 2-4 shall be indicative of and include the uses permitted in use group D buildings.

TABLE 2-4 - USE GROUP D, INDUSTRIAL USES

Bakeries
Boiler works
Breweries
Canneries, including food products
Condensed and powdered milk manufacture
Dry cleaning using other than volatile flammable liquids in cleaning or dyeing operations or other than classified in table 1
Electric light plants and power houses
Electrolytic reducing works
Glass plants
Ice plants
Leather and tanneries, excluding enameling or japanning
Millwork and woodworking
Sugar refineries
Tenant factories, excluding ladies' dresses and other high hazard uses.
Textile mills, including canvas, cotton cloth, bagging, burlap, carpets and rags
Upholstery and manufacturing shops
Water-pumping plants

206.2 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 table 2-6.

206.21 CONSTRUCTION: Buildings and structures for such low hazard industrial uses shall comply with the requirements of section 309.0 except as to height and when constructed of noncombustible (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.

206.22 ENCLOSURE WALLS: The enclosure walls of buildings of such low hazard industrial uses shall be constructed of approved noncombustible 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 fireresistance rating of not less than two (2) hours.

206.23 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 USE GROUP E, BUSINESS BUILDINGS

All buildings and structures or parts thereof shall be classified in the business use group which are used for the transaction of business, for the rendering of professional services or for other services that involve stocks of goods, wages or merchandise in limited quantities for use incidental to office uses or sample purposes; including among others offices, banks, civic administration activities, professional

services, testing and research laboratories, radio stations, telephone exchanges and other similar establishments.

SECTION 208.0 USE GROUP F, ASSEMBLY BUILDINGS

All buildings and structures or parts thereof shall be classified in the assembly use group which are used or designed for places of assembly as defined in the Basic Code.

208.1 USE GROUP F-1 - THEATRES.

208.11 USE GROUP F-1-A STRUCTURES shall include all theatres and other buildings used primarily for theatrical or operatic performances and exhibitions, arranged with a raised stage, proscenium curtain, fixed or portable scenery or scenery loft, motion picture booth, mechanical appliances or other theatrical accessories and equipment and provided with fixed seats.

208.12 USE GROUP F-1-B STRUCTURES shall include all theatres without a stage and equipped with fixed seats used for motion picture performances.

208.2 USE GROUP F-2 STRUCTURES shall include all buildings and places of public assembly, without theatrical stage accessories, designed for use as dance halls, night clubs and for similar purposes including all rooms, lobbies and other spaces connected thereto with a common means of egress and entrance.

208.3 USE GROUP F-3 STRUCTURES shall include all buildings with or without an auditorium in which persons assemble for amusement, entertainment or recreation, and incidental motion picture, dramatic, theatrical or educational presentations, lectures, or other similar purposes, without theatrical stage other than a raised platform; and principally used without permanent seating facilities, including art galleries, exhibition halls, museums, lecture halls, libraries, restaurants other than night clubs, and recreation centers; and buildings designed for other similar assembly purposes including passenger terminals.

208.4 USE GROUP F-4 STRUCTURES shall include all buildings used as churches and for similar religious purposes. Also included are buildings used for low density recreation such as swimming pools, tennis and skating and where there is accommodations of less than 100 spectators.

208.5 USE GROUP F-5 STRUCTURES shall include grandstands, bleachers, coliseums, stadiums, drive-in theatres, tents and similar structures for outdoor assembly use and shall comply with the provisions of the Basic Code for special uses and occupancies. (see article 4).

208.6 USE GROUP F-6 STRUCTURES shall include those buildings, structures, premises and parts thereof in which a regular course of public or private instruction is given to not less than ten (10) individuals at one time. Schools or rooms used for religious instruction which are under the jurisdiction or administration of a church or other defined religious body are regulated under Use Group F-4.

F-1B Schoolhouse Use: Schoolhouse structures or parts thereof used for F-1B assembly shall include all halls without a stage, except for a raised platform, equipped with fixed seats, and which may be used

for motion picture performances.

F-3 Schoolhouse Use: Schoolhouse structures shall include all buildings with or without an auditorium in which persons assemble for amusement, entertainment or recreation, and incidential motion pictures, dramatic or educational presentations, lectures or similar purposes, without a stage other than a raised platform and principally used without permanent seating facilities, including cafeterias and recreation centers; and buildings designed for other similar assembly purposes.

H Schoolhouse Use: All schoolhouse buildings and structures or parts thereof shall be classified in the institutional use group in which people suffering from physical limitations are harbored for medical, other care or treatment, or in which people are detained for penal or correctional purposes, or in which the liberty of the inmates is restricted.

H-1 Schoolhouse Use shall include all schoolhouse buildings designed for the detention of people under restraint, including among others jails, prisons, reformatories, institutions licensed under the State Department of Mental Health and similar uses.

H-2 Schoolhouse Use shall include all schoolhouse buildings used for housing people suffering from physical limitations, including among others hospitals, sanitariums, infirmaries, orphanages, and institutions licensed under the State Department of Mental Health, and/or State Department of Public Welfare, and State Department of Education.

208.7 USE GROUP F-7 STRUCTURES shall include those buildings, structures, premises and parts thereof which are used to provide a place to assemble individuals for any use covered by Use Group F, but which accommodate more than twenty (20) but less than fifty (50) people. Use Group F-7 structures shall be classified the same as Use Group E.

SECTION 209.0 USE GROUP H, INSTITUTIONAL BUILDINGS

All buildings and structures or parts thereof shall be classified in the institutional use group in which people suffering from physical limitations because of health or age are harbored for medical or other care or treatment, or in which people are detained for penal or correctional purposes, or in which the liberty of the inmates is restricted.

209.1 USE GROUP H-1 shall include all buildings designed for the detention of people under restraint including among others jails, prisons, reformatori insane asylums and similar uses.

209.2 USE GROUP H-2 shall include all buildings used for housing people suffering from physical limitations because of health or age, including among others day nurseries, hospitals, sanitariums, clinics, infirmaries, orphanages, homes for aged and infirm; and buildings designed for prosecutin public or civic services and activities of emergency character, including among others fire houses, police stations and similar uses.

SECTION 210.0 USE GROUP L, RESIDENTIAL BUILDINGS

All buildings and structures or parts thereof shall be classified in

the residential use group, in which families or households live or in which sleeping accommodations are provided for individuals with or without dining facilities, excluding those that are classified as institutional buildings.

210.1 USE GROUP L-1: Use 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. Such occupancies shall include hotels, lodging houses, boarding houses and similar occupancies.

210.2 USE GROUP L-2: Use Group L-2 shall include buildings with three or more dwelling units and other uses intended for living and sleeping accomodations of families or individuals on a long-term basis, and which shall include all multiple family dwellings, apartment houses, and dormitories.

210.3 USE GROUP L-3: Use Group L-3 shall include buildings occupied as one and two-family dwellings. Such buildings shall also include semi-detached houses which are vertically separated by fire divisions of the required use group fire grading, and have separate means of egress directly to the outside which are independent of any other dwelling unit.

Mobile homes are defined and controlled under the provisions of article 19.

SECTION 211.0 USE GROUP M, MISCELLANEOUS USES

Structures and buildings of a temporary character and miscellaneous structures not classified in any specific use group shall be constructed, equipped and maintained to meet the requirements of the Basic Code commensurate with the fire and life hazard incidental to their use. Miscellaneous uses shall include all accessory buildings and structures used as private garages, sheds, fences and similar purposes.

SECTION 212.0 DOUBTFUL USE CLASSIFICATION

When a building or structure is proposed for a use not specifically provided for in the Basic Code or the classification of which is doubtful, such building or structure shall be included in the use group which it most nearly resembles in respect to the existing or proposed life and fire hazard and it shall be so classified by the building official.

SECTION 213.0 MIXED USE AND OCCUPANCY

213.1 TWO OR MORE USES: When a building is occupied for two (2) or more uses not included in the same use group, one of the following shall apply:

a) The provisions of the code applying to each use shall apply to such parts of the building as come within that use group; and if there are conflicting provisions, the requirements securing the greater public safety shall apply to the entire building, or

b) The mixed uses shall be completely separated both horizontally and vertically by fire separation walls and floor-ceiling assemblies having a fireresistance rating corresponding to the highest fire grading prescribed in table 9-1 for the separate uses. Each part of the building shall be separately classified

as to use. The most restrictive height and area limitations in this Code for the mixed uses shall apply to the entire building, or except as otherwise provided for in this Code, or

c) The mixed uses shall be completely separated by fire walls having a fireresistance rating corresponding to the highest fire grading prescribed in table 9-1 for the separate uses. Each group shall then comply with the provisions of this Code applicable to that group.

213.2 INCIDENTAL USES: Where the higher hazard use is supplemental to the main use of the building and the area devoted to such use is constructed and segregated by fireresistive construction as required in article 4, the building shall be classified according to the main use.

213.3 FIRE DIVISIONS: When mixed uses are completely separated horizontally and vertically from adjoining occupancies by fire divisions of the highest fire grading prescribed in table 9-1 for the separated uses, each part of the building shall be separately classified as to use.

SECTION 214.0 CONSTRUCTION CLASSIFICATION

All buildings, structures, rooms or spaces hereafter altered or erected shall for the purposes of this Code be classified in one (1) or 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 type of construction unless it conforms to the minimum requirements for that type; and it shall be unlawful to post, or use, or designate, or advertise a building as of a given type of construction unless it complies with the minimum code requirements 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 the Basic 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 or more types of construction occur within the same structure which is occupied for only one use group classification, then any of the types of construction must be able to satisfy the requirements for the use group. If there is more than one use occupancy of the structure, then the construction must be able to satisfy the provisions of section 213.1.

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 exitways are constructed and protected with approved noncombustible materials to afford the fireresistance specified in table 2-5; except as otherwise specifically regulated by the provisions of article 9. Fireproof buildings shall be further classified as types 1-A and 1-B.

Fire-retardant treated wood may be used as specified in table 2-5 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 exitways are constructed of approved noncombustible materials meeting the fireresistive requirements specified in table 2-5, and as further regulated in article 9. Noncombustible buildings shall be further classified as types 2-A, 2-B, and 2-C.

Fire-retardant treated wood may be used as specified in table 2-5 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 of the walls supported thereon; and all structural elements have the required fireresistance rating specified in table 2-5.

217.1 TYPE 3A: Buildings and structures of heavy timber construction are those in which fire resistance 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 852.0 for construction details.)

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.

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.

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.

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 one-half (½) inch plywood, or one-half (½) inch particle board; 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, or one-half (½) inch plywood, or one-half (½) inch particle board.

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, 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.

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.

NON-BEARING WALLS: Nonbearing portions of exterior walls shall be of approved noncombustible materials except as otherwise noted and; where a horizontal separation of less than twenty (20) feet is provided, nonbearing exterior walls shall have a fireresistance 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 fireresistance rating of not less than one (1) hour. Where a horizontal separation of thirty (30) feet or more is provided, no fireresistance 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 fireresistance rating where specified in table 2-5.

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 874.0, and in which the structural elements have the required fireresistance ratings specified in table 2-5. Frame buildings shall be further classified as types 4-A and 4-B.

TABLE 2-5. FIRE RESISTANCE RATINGS OF STRUCTURAL ELEMENTS IN HOURS

TYPE OF CONSTRUCTION

Notes on Page 2-33			TYPE 1		TYPE 2 NONCOMBUSTIBLE Note b			TYPE 3 EXTERIOR MASONRY WALLS			TYPE 4 FRAME	
	STRUCTURAL ELEMENT		FIREPROOF		PROTECTED		Unprotected	Heavy Timbers (Mill)	Ordinary Protected	Ordinary Unprotected	Protected	Unprotected
	EXTERIOR WALLS	Note a	1A	1B	2A	2B	2C	3A	3B	3C	4A	4B
1	On street lot lines or with fire separation of 30' or more from interior lot lines or any building	Bearing	4	3	2	3/4	0	2	2	2	3/4	0
		Non-Bearing	0	0	0	0	0	0	0	0	3/4	0
	On interior lot lines or less than 6' therefrom, or from any building	Bearing	4	3	2	1 1/2	Note c 3/4	2	2	2	3/4	3/4
		Non-Bearing	2	2	1 1/2	3/4	Note c 3/4	2	2	2	3/4	3/4
	6' or more but Less than 11'	Bearing	4	3	2	3/4	0	2	2	2	3/4	0
		Non-Bearing	2	2	1 1/2	3/4	0	2	2	2	3/4	0
	11' or more but Less than 30'	Bearing	4	3	2	3/4	0	2	2	2	3/4	0
		Non-bearing	1 1/2	1 1/2	3/4	3/4	0	See Sec217	1 1/2	1 1/2	3/4	0
2	Interior bearing walls and partitions		4	3	2	3/4	0	2	3/4	0	3/4	0
			← Noncombustible →									
3	Fire walls		4	3	2	2	2	2	2	2	2	Note d
			← In No Case less than Fire Grading of Use Group (See Table 16) →									
4	Fire Divisions		← Fire Resistance Rating corresponding to Fire Grading of Use Group (See Table 16) →									
5	Fire Enclosure of Exitways, Elevator Hoistways, Exitway Hallways and Stairways Note e		2	2	2	2	2	2	2	2	3/4	3/4
			← Noncombustible →									
6	Shafts other than Stairways		2	2	2	2	2	2	2	2	3/4	3/4
			← Noncombustible →									
7	Exitway Access Hallways & Vertical Separation of Tenant Spaces		3/4	3/4	3/4	3/4	0	3/4	3/4	0	3/4	0
			← Noncombustible →			Note h →						
	Other Non-bearing Partitions (See Art. 9)		← Noncombustible →			Note h →		0	0	0	0	0
8	Columns, Girders, Trusses (other than roof trusses) and Framing	Supporting one Floor or Roof	3	2	1 1/2	3/4	0	See Sec217	3/4	0	3/4	0
		Supporting more than One Floor	4	3	2	3/4	0	See Sec217	3/4	0	3/4	0
9	Structural Members Supporting Wall		← Required Fire Resistance of Wall Supported but not less than Fire Resistance Rating for Type of Construction →									
10	Floor Construction including Beams Note g		3	2	1 1/2	3/4	0	See Sec217	3/4	0	3/4	0
11	Roof Construction including Beams Note g		2	1 1/2	3/4	3/4	0	See Sec217	3/4	0	3/4	0
	15' or Less in Height				← Note h →							
12	Roof Trusses and Framing including Arches & Roof Deck Note f	More than 15' but less than 20' in height to lowest member	3/4	3/4	3/4	0	0	See Sec217	0	0	3/4	0
			← Note h →									
		20' or more in height to lowest member	0	0	0	0	0	See Sec217	0	0	0	0
			← Note h →									

NOTES APPLICABLE TO TABLE 2-5

GENERAL

For special high hazard uses involving a higher degree of fire severity and higher concentration of combustible contents, the fireresistance requirements for structural elements shall be increased accordingly. (See section 400).

SPECIFIC

Note a 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 901).

Note b Protected exteriors shall be required within the fire limits in type 2 construction as follows: high hazard uses, two (2) hour fireresistance with fire separation up to eleven (11) feet.

Note c One-story buildings of type 2-C construction which do not exceed three thousand (3000) square feet in area in all use groups except high hazard assembly and institutional shall be exempt from the protected exterior wall requirements of table 2-5. (See section 302.4.)

Note d Party walls in type 4 buildings shall be as follows: one and two-family dwellings, three-quarter (3/4) hour fire resistance. (See section 907.3) Other uses, except F-6, two (2) hours, but not less than the fire grading of the use group (See table 9-1).

z Note e Stair enclosures in all buildings, other than one and two-family dwellings, which do not exceed three (3) stories or forty (40) feet in height with an occupancy load of less than forty (40) below and less than seventy-five (75) above the grade floor shall be of not less than three-quarter (3/4) hour fireresistance. In buildings of types 3 or 4 construction, such three-quarter (3/4) hour enclosures may be of combustible construction as provided in section 618.92.

Fire enclosures of exitways, exitway hallways, and stairways in schoolhouse buildings which do not exceed three (3) stories in height shall be of not less than three-quarter (3/4) hour fireresistance.

Note f In all buildings, except F-6 use group, in which the roof framing may be unprotected, roof slabs and decking may be noncombustible without fire resistance 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.)

Note g 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) hour.

Note h Fire-Retardant Treated Wood, complying with section 903.72, may be used as provided in section 903.8.

TABLE 2-6. HEIGHT LIMITATIONS (UPPER FIGURE: STORIES AND FEET ABOVE GRADE)
AND AREA LIMITATIONS (LOWER FIGURE: AREA IN SQUARE FEET PER FLOOR PER STORY)
OF BUILDINGS FACING ON ONE STREET OR PUBLIC SPACE NOT LESS THAN 30 FEET WIDE

N P –NOT PERMITTED
UNLIMITED

TYPE OF CONSTRUCTION

Notes on Page 2-35 USE GROUP			TYPE 1 Fireproof Note b		TYPE 2 Noncombustible			TYPE 3 Exterior Masonry Walls			TYPE 4 Frame	
					Protected		Un-protected	(HT) Mill	Ordinary Joisted Protected	Un-protected	Protected	Un-protected
			1A	1B	2A	2B	2C	3A	3B	3C	4A	4B
A	HIGH HAZARD	Notes f and j.	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	1 ST 20' 4,800	1 ST 20' 5,100	N.P.
B-1	STORAGE-Moderate	Notes a, c, d, g and h.			5 ST 65' 19,950	4 ST 50' 13,125	2 ST 30' 8,400	4 ST 50' 12,600	3 ST 40' 11,550	2 ST 30' 8,400	2 ST 30' 8,925	1 ST 20' 4,200
B-2	STORAGE-Low	Notes a, c and d.			7 ST 85' 34,200	5 ST 65' 22,500	3 ST 40' 14,400	5 ST 65' 21,600	4 ST 50' 19,800	3 ST 40' 14,400	3 ST 40' 15,300	2 ST 30' 7,200
C	MERCANTILE	Notes a, c and d.			6 ST 75' 22,800	4 ST 50' 15,000	2 ST 30' 9,600	4 ST 50' 14,400	3 ST 40' 13,200	2 ST 30' 9,600	2 ST 30' 10,200	1 ST 20' 4,800
D	INDUSTRIAL	Notes a, c and d.			6 ST 75' 22,800	4 ST 50' 15,00	2 ST 30' 9,600	4 ST 50' 14,400	3 ST 40' 13,200	2 ST 30' 9,600	2 ST 30' 10,200	1 ST 20' 4,800
E	BUSINESS	Notes a, c and d.			7 ST 85' 34,200	5 ST 65' 22,500	3 ST 40' 14,400	5 ST 65' 21,600	4 ST 50' 19,800	3 ST 40' 14,400	3 ST 40' 15,300	2 ST 30' 7,200
F-1-A	ASSEMBLY THEATRES	With stage and scenery		6 ST 75' 14,400	4 ST 50' 11,400	2 ST 30' 7,500	1 ST 20' 4,800	2 ST 30' 7,200	2 ST 30' 6,600	1 ST 20' 4,800	1 ST 20' 5,100	N.P.
F-1-B	ASSEMBLY THEATRES	Without stage (Movie theatres)			5 ST 65' 19,950	3 ST 40' 13,125	2 ST 30' 8,400	3 ST 40' 12,600	3 ST 40' 11,550	2 ST 30' 8,400	1 ST 20' 8,925	1 ST 20' 4,200
F-2	ASSEMBLY - Night clubs and similar uses			4 ST 50' 7,200	3 ST 40' 5,700	2 ST 30' 3,750	1 ST 20' 2,400	2 ST 30' 3,600	2 ST 30' 3,300	1 ST 20' 2,400	1 ST 20' 2,550	1 ST 20' 1,200
F-3	ASSEMBLY – Lecture halls, recreation centers, terminals, restraurants Note c.				5 ST 65' 19,950	3 ST 40' 13,125	2 ST 30' 8,400	3 ST 40' 12,600	3 ST 40' 11,550	2 ST 30' 8,400	1 ST 20' 8,925	1 ST 20' 4,200
F-4	ASSEMBLY - Churches, schools Notes k and l.				5 ST 65' 34,200	3 ST 40' 22,500	2 ST 30' 14,400	3 ST 40' 21,600 Note e	3 ST 40' 19,800	2 ST 30' 14,400	1 ST 20' 15,300 Note e	1 ST 20' 7,200 Note e
F-6	ASSEMBLY - Schools (Schoolhouses) Notes m and n				5 ST 65' 34,200	3 ST 40' 22,500	2 ST 30' 14,400	3 ST 40' 21,600	3 ST 40' 19,800	N.P.	1 ST 20' 15,300	N.P.
H-1	INSTITUTIONAL - Restrained			6 ST 75' 18,800	4 ST 50' 14,250	2 ST 30' 9,375	1 ST 20' 6,000	2 ST 30' 9,000	2 ST 30' 8,250	1 ST 20' 6,000	1 ST 20' 6,375	N. P.
H-2	INSTITUTIONAL - Incapacitated			8 ST 90' 21,600	4 ST 50' 17,100	2 ST 30' 11,250	1 ST 20' 7,200	2 ST 30' 10,800	2 ST 30' 9,900	1 ST 20' 7,200	1 ST 20' 7,650	N. P.
L-1	RESIDENTIAL - Hotels				9 ST 100' 22,800	4 ST 50' 15,000	3 ST 40' 9,600	4 ST 50' 14,400	4 ST 50' 13,200	3 ST 40' 9,600	3 ST 40' 10,200	2 ST 35' 4,800
L-2	RESIDENTIAL - Multi-family				9 ST 100' 22,800	4 ST 50' 15,000	3 ST 40' 9,600	4 ST 50' 14,400	4 ST 50' 13,200	3 ST 40' 9,600	3 ST 40' 10,200	2 ST 35' 4,800
L-3	RESIDENTIAL - 1 & 2 family				4 ST 50' 22,800	4 ST 50' 15,000	3 ST 40' 9,600	4 ST 50' 14,400	4 ST 50' 13,200	3 ST 40' 9,600	3 ST 40' 10,200	2 ST 35' 4,800
M	MISCELLANEOUS & TEMPORARY											

NOTES TO TABLE 2-6

GENERAL

For all buildings, except F-6 of type 3B construction, which have more than twenty-five (25) percent of the building perimeter fronting on a street or other unoccupied space which is at least thirty (30) feet wide and has unrestricted accessibility for fire equipment and apparatus, the tabular area may be increased by two (2) percent for each one (1) percent of such perimeter excess above the twenty-five (25) percent.

Example: Perimeter = 400 feet
Accessible Perimeter = 300 feet
1. 25% of 400 feet = 100 feet
2. Excess of accessible perimeter
accessible perimeter = 300 feet
25% deduction = 100 feet
Excess of accessible perimeter = 200 feet
3. Percentage of excess = $\frac{200 \times 100\%}{400}$ = 50%
4. Increase allowable = 2 x 50% = 100%

A one-hundred (100) percent increase in the tabular area is allowed, thus doubling the allowable area.

SPECIFIC

Note a In use groups B-1, B-2, C, D, E and F-4, the tabular areas may be increased two hundred (200) percent for one (1) story buildings and one hundred (100) percent for buildings over one (1) story in height when such buildings are equipped with automatic sprinkler systems not specifically required by law. (See section 308).

Note b Type 1 buildings permitted unlimited tabular heights and areas are not subject to special requirements that allow increased heights and areas for other types of construction.

Note c In use groups B, C, D, E and F-3, isolated buildings of other than frame construction may be of unlimited areas outside of the fire limits when not more than one (1) story or eighty-five (85) feet in height when complying with specific provisions of the Basic Code. (See section 309).

Note d In use groups B-1, B-2, C, D and E types 1, 2 and 3 construction may be increased one (1) story but not more than twenty (20) additional feet in height when equipped with automatic sprinkler systems not specifically required by law. (See section 310.2).

Note e 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.

Note f For exceptions to height and area limitations of high hazard use buildings, see article 4 governing the specific use. For

other special fireresistive requirements governing specific uses, see section 905.

Note g For height and area exceptions covering public parking decks, see section 905.2.

Note h For height and area exceptions covering petroleum bulk-storage buildings, see section 905.3.

Note i For exceptions to height of multi-family dwellings of types 2-B and 3-B construction, see section 905.6

Note j For one (1) story combustible fibre warehouses, see section 408.3.

Note k The tabular area of one (1) story school buildings of use group F-4 may be increased two hundred (200) percent provided every classroom has at least one door opening directly to the exterior of the building. Not less than one-half (½) of the required exitways from any assembly room included in such buildings shall also open directly to the exterior of the building.

Note l For exception to area limitations for one (1) story buildings of type 2, 3-A and 3-B construction, see section 309.11.

Note m The tabular area for 4A construction shall be limited to 6,300 square feet for F-1B, F-3, and F-4 schoolhouse use and to 3,600 square feet for F-1A schoolhouse use.

Note n The first story in the two (2) story portions of buildings of this type of construction shall be constructed of the next most fire-resistive type of construction, i.e., type 2B and 2C. For the purposes of this table, concrete filled steel tube columns shall be considered to have the equivalent of a three-quarter (3/4) hour fireresistance rating.

ARTICLE 3

GENERAL BUILDING LIMITATIONS

SECTION 300.0 SCOPE

The provisions of this article shall control the division of the municipalities of the Commonwealth of Massachusetts 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, use group, density of development, exterior exposure and accessibility of buildings and structures to fire-fighting facilities and equipment.

SECTION 301.0 FIRE DISTRICT SUBDIVISIONS

For the purpose of control of use and construction of buildings, the building official may establish limiting districts designated Fire District No. 1, Fire District No. 2 and Outside Fire Limits under the legal procedure of the municipalities of the Commonwealth of Massachusetts for creating and establishing fire districts.

NOTE A: NUMBER OF FIRE DISTRICTS. - The number of fire districts to be established will depend upon the prevailing character of construction and typical development of the specific locality. In large cities, two (2) fire districts are generally desirable while in cities of moderate size and in small political subdivisions, one fire district may be adequate to provide for the fire hazard inherent in concentrated commercial and manufacturing occupancies. The fire district should include all those areas of the municipality in which buildings of business, mercantile, industrial, storage and other use groups of similar fire and conflagration hazard are concentrated. If provision is made for only one fire district, the restrictions herein prescribed for Fire District No. 1 will be applicable to such district.

301.1 FIRE DISTRICT NO. 1: Fire District No. 1 shall comprise the areas housing highly congested business, commercial, manufacturing and industrial uses or in which such uses are developing.

301.2 FIRE DISTRICT NO. 2: Fire District No. 2 shall comprise the areas housing residential uses (use groups L-1 and L-2), together with retail stores, business and amusement centers, or in which such uses are developing.

301.3 OUTSIDE FIRE LIMITS: All other areas not included in Fire District Nos. 1 and 2 shall be designated as Outside Fire Limits.

SECTION 302.0 GENERAL FIRE DISTRICT PROVISIONS

302.1 CHANGES IN DISTRICTS: Any changes in the boundaries of fire districts or changes of designation of any area from one fire district to another fire district shall be established by the local municipality.

302.2 OVERLAPPING DISTRICTS: A building or structure located in more than one fire district shall be deemed to be in that one of the three districts which contains the major part of the building area; and in the event of equal distribution in two or more districts, the limitations of the most restricted district shall apply.

302.3 HIGH HAZARD USES: Except as specifically approved by the municipal authorities, all buildings of high hazard use (use group A) shall be prohibited from location in Fire District No. 1. 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 segregated by fire divisions of the required fireresistance specified in table 9-1.

302.31 PROTECTED EXTERIORS: All buildings of type 2 construction for high hazard uses (use group A) within the fire districts shall be constructed with walls of two (2) hours fireresistance when located within eleven (11) feet of interior lot lines or any buildings on the same lot.

302.4 NONCOMBUSTIBLE CONSTRUCTION EXEMPTIONS: One (1) story buildings of type 2-C construction which do not exceed three thousand (3000) square feet in area in all use groups except high hazard, assembly and institutional shall be exempt from all protected exterior wall requirements.

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 lot to another with 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 (2½) stories nor more than thirty-five (35) feet.

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 FIRE DISTRICT NO. 1

All buildings and structures, and all additions to existing buildings and structures, hereafter erected within the boundaries of Fire

District No. 1 shall be of fireproof (type 1), protected noncombustible (types 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 table 2-5; and shall be constructed within the height and area limitations of table 2-6; except as herein provided.

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

303.1 FENCES: Fences not over six (6) feet in height may be erected of frame (type 4) construction.

303.2 STORM ENCLOSURES: 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.

303.3 ACCESSORY BUILDINGS

303.31 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 dwelling 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 other building.

303.32 GREENHOUSES: Greenhouses and similar structures may be erected of frame (type 4) construction when accessory to a one- or two-family dwelling on the same lot and when located not less than six (6) feet from interior lot lines or any building.

303.4 SHEDS: Sheds open on the long side not more than fifteen (15) feet in height nor more than five hundred (500) square feet in area may be erected of frame (type 4) construction when located not less than six (6) feet from the lot lines.

303.5 BUILDERS' SHANTIES AND REVIEWING STANDS: Temporary builders' shanties erected in connection with approved building operations, platforms, reviewing stands, and other similar miscellaneous structures may be erected of frame (type 4) construction for a limited period of time as approved by the building official.

303.6 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.

303.7 BINS, TANKS, TOWERS AND ROOF STRUCTURES

303.71 TIMBER CONSTRUCTION: Coal and material bins, water towers, tank structures and trestles may be erected of mill type heavy timber construction with dimensions not less than required for type 3-A construction, not over thirty-five (35) feet in height, when located

thirty (30) feet from the interior lot lines or any building, except when located on lot lines along a railroad right of way or waterfront.

303.72 STRUCTURES ON BUILDINGS: Aerial supports not more than twelve (12) feet in height, water tanks and flag poles may be erected of wood on buildings, not more than three (3) stories nor more than forty (40) feet in height, and drip bars in cooling towers may be constructed of wood.

303.8 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 use group E of table 2-6 provided thay are located less than eleven (11) feet from the lot line or any building.

303.9 BUS AND PASSENGER TERMINALS: Roofs over parking lots, bus and passenger terminals may be erected one 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.

303.10 STORE FRONTS: Wood veneers of one (1) inch nominal thickness or exterior grade plywood 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) inch and firestopped in accordance with sections 874 and 912.2.

SECTION 304.0 RESTRICTIONS OF FIRE DISTRICT NO. 2

All buildings and structures hereafter erected within the boundaries of Fire District No. 2 shall be fireproof (type 1), noncombustible (type 2) or exterior masonry wall (type 3) construction as regulated by table 2-5 and shall be constructed within the height and area limitations of table 2-6; except that all the variations permitted in Fire District No. 1 shall apply to permissible construction in Fire District No. 2 with the following additional exceptions:

304.1 DWELLINGS: One and two-family dwellings (use group L-3) may be erected of protected frame (type 4-A) construction when not less than three (3) feet from interior lot lines and of unprotected frame (type 4-B) construction when not less than six (6) feet from interior lot lines within the height and area limitations of table 2-6. Roof coverings shall be of Class A, B or C roofings complying with the provisions of article 9.

304.2 VERANDAS: Verandas, balconies, entrance porticos 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.

304.3 BOAT HOUSES: Boat houses not more than two (2) stories nor more than thirty (30) feet in height nor more than one thousand (1000) square feet in area may be erected of frame (type 4-B) construction.

304.4 EXTERIOR TRIM: Wood cornices and half timbering may be erected on residence (use group L) and business (use group C, D and E) buildings; and existing openings in exterior walls of masonry enclosed buildings (type 3-A, 3-B and 3-C) which are not required for ventilation or access purposes, may be filled in with wood studs, metal lath and stucco or other approved construction of equal fireresistance.

SECTION 305.0 RESTRICTIONS OUTSIDE FIRE LIMITS

Outside the fire limits, 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 table 2-6.

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 front and window and door openings in one- and two-family dwellings, but in no case shall such wall be located less than three (3) feet from interior lot lines.

305.2 ROOF COVERINGS: Roof coverings shall conform to the fireresistive requirements for Class A, B, C or non-rated roofings complying with the provisions of sections 903 and 928.

SECTION 306.0 EXISTING BUILDINGS

306.1 ALTERATIONS

306.11 LIMITATIONS: Nothing in these provisions shall be deemed to prohibit alterations within the limitations of section 106.0 provided no unlawful change of use is involved.

306.12 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.

306.13 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 use group within the fire district in which it is located and as regulated by table 2-6.

306.3 EXISTING EXCESSIVE AREA: Any building heretofore lawfully approved which exceeds the maximum allowable area specified in table 2-6 may be extended if the addition is separated from the existing building by an approved fire wall or fire division meeting the requirements of article 9 and table 2-5 and the additional area does not exceed the limits of table 2-6 for the specific use group and type of construction.

307.0 GENERAL AREA AND HEIGHT LIMITATIONS

All buildings, structures and parts thereof erected or altered shall be subject to the requirements of table 2-5 and table 2-6 for the appropriate type of construction and use groups classification involved subject to any specific modifications and exceptions allowed in this code.

307.1 AREA LIMIT: The area limitations specified in table 2-6 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 in feet and number of stories specified in table 2-6 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.

307.3 MULTI-STORY BUILDINGS: Buildings more than one story in height shall be subject to the area requirements of the table 2-6 and modified by the following table of factors:

TABLE 3-1
PERCENT REDUCTION
IN THE AREA LIMITS OF TABLE 2-6

No. of Stories	1A & 1B	2A	2B	2C	3A & 3B	3C	4A & 4B
1	None	None	None	None	None	None	None
2	None	None	None	None	None	None	None
3	None	5%	20%	20%	20%	20%	20%
4	None	10%	20%	20%	20%	20%	
5	None	15%	30%		30%		
6	None	20%	40%		40%		
7	None	25%	50%				
8	None	30%	60%				
9	None	35%	70%				
10	None						

SECTION 308.0 AREA EXCEPTIONS

The provisions of this section shall modify the area limits of table 2-6 as herein specified. Section 308.1 shall not apply to F-6 use group buildings of type 3B construction.

308.1 STREET FRONTAGE INCREASE: When a building or structure has more than twenty-five (25) percent 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) percent for each one (1) percent of such excess frontage.

308.2 SPRINKLER INCREASE: When a building is equipped with an approved one (1) source automatic sprinkler system, unless such sprinkler system is required by the provisions of article 4 for structures of special use and occupancy, the tabular values may be increased by two hundred (200) percent for one (1) story buildings and one hundred (100) percent for buildings more than one (1) story in height.

308.3 MAXIMUM TOTAL AREA: The maximum total area under the combined provisions of sections 308.1 and 308.2 shall not exceed three and one-half ($3\frac{1}{2}$) times the tabular area in table 2-6.

SECTION 309.0 UNLIMITED AREAS

309.1 ONE-STORY BUILDINGS: In other than frame construction, the area of all buildings of assembly (use group F-3), business, industrial mercantile and storage use 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 1212.0 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 noncombustible material not packed or crated in combustible material or as exempt by section 206.2 for special industrial uses.

309.11 SCHOOL BUILDINGS: School buildings, use group F-6, shall be subject to the provisions of Reference Standard F-6, Building Regulations for Schoolhouses, of the State Building Code Commission.

309.2 FIRE SEPARATION: The minimum fire separation on any side of one (1) story buildings of unlimited area shall be determined by the type of construction and fireresistance rating of the exterior wall adjacent thereto as herein specified:

Type of Construction	Fireresistance Rating of Exterior Bearing Walls	Minimum Fire Separation**	Fireresistance rating of bearing & nonbearing portions of exterior walls	Minimum Fire Separation
2A	2 hr.	30 ft.	-	-
2B	3/4 hr.	40 ft.	2 hr.*	30 ft.
2C	0 hr.	50 ft.	3 hr.**	30 ft.
3A	2 hr.	40 ft.	3 hr.**	30 ft.
3B	2 hr.	40 ft.	3 hr.**	30 ft.
3C	2 hr.	50 ft.	4 hr.**	30 ft.

* All exterior wall openings shall be protected with one and one-half rated approved opening protectives.

** All exterior wall openings shall be protected with three hour rated approved opening protectives.

*** When the fire separation exceeds the herein specified minimum, the requirements of Table 2-5, Row 1 (Exterior Walls with Fire Separation of 30 ft. or more: Bearing) shall apply.

SECTION 310.0 HEIGHT EXCEPTIONS

310.1 ROOF STRUCTURES: In applying the provisions of the Basic Code governing height limits, the following appurtenant structures shall not be included in the height of the building: roof tanks and their supports; ventilating, air conditioning and similar building service equipment; roof structures other than penthouses; chimneys and parapet walls not exceeding four (4) feet in height; unless the aggregate area of such structures including penthouses, exceeds one-third (1/3) of the area of the roof of the building upon which they are erected.

310.2 AUTOMATIC SPRINKLERS: Except in buildings where automatic sprinkler equipment is a requirement 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 table 2-6 when equipped with an approved one-source automatic sprinkler system.

311.0 STREET ENCROACHMENTS

No part of any building hereafter erected and no additions to an existing building heretofore erected shall project beyond the lot lines or beyond the building line when such line is established by

the zoning law or any other statute controlling building construction, and irrespective of any other allowance for such encroachments, the following regulations shall apply:

311.1 BELOW GRADE: No part of a building hereafter erected below grade that is necessary for structural support of the building shall project beyond the lot lines except that the footings of street walls or their supports located at least eight (8) feet below grade may project not more than twelve (12) inches beyond the street lot line.

311.2 ABOVE GRADE: All projections hereafter permitted beyond the street lot line or the building lot line above grade shall be so constructed as to be readily removable without endangering the safety of the building.

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 health or 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 restructions that may be otherwise prescribed by law, ordinance or rule of the authorities having jurisdiction over streets or public spaces.

311.4 PERMIT REVOCABLE: Any permit granted or permission expressed or implied in the provisions of the Basic Code to construct a building so as to project beyond the street lot line or building line shall be revocable by the municipality at will.

311.5 EXISTING ENCROACHMENTS: Parts of existing buildings and structures which already project beyond the street lot line or building line may be maintained as constructed until their removal is directed by the proper municipal authorities.

SECTION 312.0 PERMISSIBLE STREET PROJECTIONS

Subject to such provisions as may be otherwise prescribed by law or ordinance, or by rule of the municipal authorities having jurisdiction over streets, highways, and public spaces, the following projections shall be permitted beyond the street lot line or the building line, as the case may be:

312.1 MAIN CORNICES OR ROOF EAVES located at least twelve (12) feet above the curb level shall project not more than three (3)feet;

312.2 BELT COURSES, LINTELS, SILLS, ARCHITRAVES, PEDIMENTS and similar architectural decorations shall project not more than four (4) inches when less than ten (10) feet above the curb level, and not more than ten (10) inches when ten (10) feet or more above the curb level;

312.3 ORNAMENTAL COLUMNS, OR PILASTERS including the bases and moldings which emphasize the main entrance of the building shall project not more than twelve (12) inches;

312.4 ENTRANCE STEPS shall project not more than twelve (12) inches and shall be guarded by cheek pieces not less than three (3) feet high or shall be located between ornamental columns or pilasters;

312.5 ORIEL WINDOWS with the lowest position at least ten (10) feet above the curb level shall project not more than two and one-half (2½) feet;

312.6 BALCONIES located at least ten (10) feet above the curb level shall project not more than three (3) feet except that when the balcony is required in connection with a fire escape or exterior stairway as an element of a means of egress, the projection may be increased, but not to exceed four (4) feet.

312.7 AWNINGS AND MARQUEES.

312.71 AWNINGS: Retractable or fixed awnings shall have clearances above the grade and shall be installed in accordance with the requirements of section 315.

312.72 MARQUEES: For the purpose of this section a marquee shall include any object or decoration attached to or a part of said marquee.

PROJECTION AND CLEARANCE - The horizontal clearance between a marquee and the curb line shall be not less than two-thirds (2/3) of the distance from the property line to the curb shall be not less than ten (10) feet above the ground or pavement below.

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.

ROOF CONSTRUCTION - The roof or any part thereof may be a skylight of approved plastics, or wired glass not less than one-fourth (¼) 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.

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 exitway discharge from the building or the installation or maintenance of street lighting.

CONSTRUCTION - A marquee shall be supported entirely from the building and constructed of noncombustible material. Marquees shall be designed and constructed to withstand wind of other lateral loads

and live loads as required in article 7 of this Code. Structured members shall be protected to prevent deterioration as required by article 8.

312.8 AWNING COVERS OR BOXES located at least eight (8) feet above the curb level shall project not more than three (3) feet.

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 shall project not more than three (3) feet beyond the face of the wall.

313.2 STEPS AND ARCHITECTURAL FEATURES: Steps, window sills, belt courses and similar architectural features, rain leaders and chimneys shall project not more than two (2) feet beyond the face of the wall.

313.3 EXTERIOR STAIRWAYS AND FIRE ESCAPES: Outside stairways, smoke-proof tower balconies, fire escapes or other required elements of a means of egress shall project not more than four (4) feet beyond the face of the wall.

SECTION 314.0 SPECIAL AND TEMPORARY PROJECTIONS

314.1 ALLEY PROJECTIONS: The permissible projection beyond street lot lines shall apply in general to building projections into alley-ways except as may be modified by the local administrative authority having jurisdiction 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 (¼) 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 portion of the hood or awning when supported on removable steel or other approved noncombustible supports.

SECTION 315.0 AWNINGS AND CANOPIES

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 315.11, 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 discharge to a public street.

315.11 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 where the awning does not project ober the public street or over any court or yard serving as a passage from a required exitway to a public street.

315.2 INSTALLATION OF AWNINGS.

315.21 RETRACTABLE AWNINGS: There shall be a minimum clearance of seven (7) feet from the sidewalk to the lowest part of the framework or any fixed portion of any retractable awning, except that the bottom of the valance of canvas awnings may extend to six (6) feet nine (9) inches above the sidewalk. Retractable awnings shall be securely fastened to the building and shall not extend closer than twelve (12) inches from the curb line. 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.

315.22 FIXED OR PERMANENT AWNINGS: The clearance from the sidewalk to the lowest part of any fixed or permanent awning shall be the same as required in section 315.21 for retractable awnings. Fixed or permanent awnings installed above the first story shall not project more than four (4) feet.

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 SPECIAL APPLICATIONS OF AWNINGS: Rigid 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 315.5 for design and structure. Such structures shall be braced as required to provide rigidity.

315.5 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 the Basic 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 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 into areas not exceeding three thousand (3,000) square feet 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 317.0 TEMPORARY STRUCTURES

Pursuant to a variance granted by the local board of appeals under the provisions of section 126.0, 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 year.

317.1 SPECIAL APPROVAL: All temporary construction shall conform to structural strength, fire safety, means of egress, light, ventilation and sanitary requirements of this Code necessary to insure public health, safety and general welfare.

317.2 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 local board of appeals.

ARTICLE 4

SPECIAL USE AND OCCUPANCY REQUIREMENTS

SECTION 400.0 SCOPE

In addition to the general requirements of the Basic Code governing the location, construction and equipment of all buildings and structures and the fireresistive, height and area limitations of tables 2-5 and 2-6 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, the applicable standards listed in the reference standards of this article 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 the Basic 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 USES INVOLVING EXPLOSION HAZARDS: The provisions of this article shall apply to all uses 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; liquefied 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 the fire hazard potential exceeds that which would be considered within the range of fire loading acceptable for high hazard use, the requirements of table 2-5 may be increased to provide additional fireresistance in proportion to the excess fire loading. Where high hazard uses exceed five (5) stories or sixty-five (65) feet in height, requirements in excess of those required by table 2-5 may be specified in proportion to the anticipated additional fire hazard.

400.3 MEANS OF EGRESS: The means of egress for buildings of 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: Whenever 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 globes 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 the Massachusetts State Electrical Code.

400.6 BOILER AND HAZARDOUS EQUIPMENT ROOMS: 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 uses, without openings in the enclosure walls and with means of direct ingress 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 uses 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 uses and occupancies.

400.9 RESTRICTED LOCATIONS: No high hazard use may be located within two hundred (200) feet of the nearest wall of a building classified in a public assembly or institutional use group.

SECTION 401.0 DEFINITIONS

AIRPLANE HANGAR, PRIVATE: a hangar for the storage of four (4) or less single motor 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."

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 passageway to the street or other public space.

FLAMMABLE: Subject to easy ignition and rapid flaming combustion.

FOYER: the enclosed space surrounding or in the rear of the auditorium of a theatre or other place of assembly which is completely shut off from the auditorium and is used as an assembly or waiting space for the occupants.

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 garage for four (4) or less passenger motor vehicles with no provision for repairing or servicing such vehicles for profit.

GARAGE, PUBLIC: a building or structure for the storage or parking of more than four (4) passenger motor vehicles, or more than one (1) commercial motor vehicle, and in which provision may be made for the dispensing of gasoline, oil or similar products for the servicing of such vehicles. Public garages shall be classified according to their specific use in one (1) of the following groups:

-GROUP 1: a public garage in which provision is made for the care, storage, repair or painting of motor vehicles.

-GROUP 2: a public garage used exclusively for passenger vehicles that will accommodate not more nine (9) passengers.

GRANDSTAND: any structure, except movable seating and sectional benches, intended primarily to support individuals for the purposes of assembly, but shall not apply to the permanent seating in theatres, churches, auditoriums and similar buildings.

KEROSENE: an oil or liquid product of petroleum which does not emit a flammable vapor below a temperature of one hundred and fifteen (115) degrees F. when tested in a Tag closed-cup tester.

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.

MOBILE HOME: a dwelling unit built on a chassis and containing complete electrical, plumbing and sanitary facilities, and designed to be installed on a temporary or permanent foundation for permanent living quarters.

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 REPAIR SHOP: a building, structure or enclosure in which the general business of repairing motor vehicles is conducted including a public garage.

PARKING STRUCTURE, OPEN: a structure for the parking of passenger cars wherein two (2) or more sides of such structure are not less than fifty (50) percent open on each floor or level for fifty (50) percent of the distance from the floor to the ceiling and wherein no provision for the repairing of such vehicles is made. Such open parking structures are not classified as public garages, but shall comply with the requirements of section 905.2.

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.

STAGE: a partially enclosed portion of an assembly building which is designed or used for the presentation of plays, demonstrations, or other entertainment wherein scenery, drops, or other effects may be installed or used; and where the distance between the top of the proscenium opening and the ceiling of the stage is more than five (5) feet; and the stage extends seventeen (17) feet or more in back of the proscenium arch or there is a gridiron.

TRAVEL TRAILER: a vehicular, portable structure built on a chassis and designed to be used for temporary occupancy for travel, recreational or vacation use; with the manufacturer's permanent identification "Travel Trailer," thereon; and when factory equipped for the road, being of any length provided its gross weight does not exceed forty-five hundred (4500) pounds, or being of any weight provided its overall length does not exceed twenty-eight (28) feet.

SECTION 402.0 EXPLOSION HAZARDS

Every structure, room or space occupied for uses 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 uses or in accordance with approved engineering standards and practice.

402.1 VENTING DEVICES: Venting devices to relieve the pressure resulting from explosive air-vapor mixtures shall consist of windows, sky-lights, vent flues or releasing roof or wall panels which discharge directly to the open air or to a public place or other unoc-

cupied 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 means of egress facilities 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 sq. ft. for 80 cubic feet of volume
Light structural steel frame and ordinary construction	1 sq. ft. for 65 cubic feet of volume
Light wood frame construction	1 sq. ft. 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) percent of the area of the enclosure walls, with not less than fifty (50) percent 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 CONTROL OF USE.

403.11 INSIDE STORAGE: Refer to FPR-4, FPR-8, and FPR-13 for requirements.

403.12 HANDLING: Refer to FPR-4 for requirements.

403.13 CONSTRUCTION OF ENCLOSURES: Process rooms shall be separated from other uses and occupancies by walls, floors and ceilings of not less than two (2) hours fireresistance with one and one-half (1½) hour fire doors or the approved labeled equivalent complying with article 9. The interior door openings shall be provided with non-combustible sills not less than six (6) inches high and the room shall be vented as required in section 402. Floors shall be waterproofed and drained to comply with section 871.

403.14 FIRE PROTECTION: First aid fire appliances and automatic sprinklers or other extinguishing equipment shall be provided in accordance with article 12 and the standards listed in the reference standards of this article.

403.2 MAIN STORAGE: Main storage system of volatile flammable liquids shall be constructed and installed in accordance with the applicable standards listed in this article subject to the approval of the fire official. Any tank greater than ten thousand (10,000) gallons capacity shall be subject to the provisions of the Department of Public Safety Board of Boiler Rules. Such storage may be either outside underground, outside aboveground, inside underground, or outside storage house. No above ground bulk storage tank shall be located less than three hundred (300) feet from any assembly buildings (use group F) or institutional (use group H) uses.

403.21 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 table 4-1.

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

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.

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 table 4-1.

403.22 OUTSIDE ABOVEGROUND SYSTEM: Above ground tanks shall be located only outside the fire limits; 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 table 4-2. Tanks in excess of ten thousand (10,000) gallon capacity shall be subject to the Department of Public Safety Board of Boiler Rules.

403.23 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.

Table 4-2 - Capacity of Outside Aboveground Tanks for Volatile Flammable Liquids

Fire seperation in feet	Quantity of Storage in gallons
50	50,000
40	30,000
30	24,000
20	12,000

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 and fire officials.

403.24 OUTSIDE STORAGE HOUSE: All outside storage houses shall be constructed of noncombustible (type 2) construction or better. 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 part of the installation.

403.25 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.

SECTION 404.0 EXISTING BUILDINGS

404.1 SPECIAL PERMIT FOR EXISTING USES: Any existing hazardous use which was heretofore authorized by a permit issued under the provisions of law or the regulations of the fire official may be continued by special permit provided the continuance of such use or occupancy does not endanger the public safety.

404.2 EXISTING USE PROHIBITED: No existing building of frame (type 4) construction which is more than two (2) stories in height or more than five thousand (5000) square feet in area shall be continued in use or hereafter occupied for any use which represents an exceptional hazard with respect to fire or explosion.

404.3 PLACES OF ASSEMBLY.

404.31 CHANGE OF USE: 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.

404.32 EXISTING USE 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) percent of the physical value of the building as defined in section 106.5, 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) percent 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 means of egress.

404.33 INCREASE OF 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 parts thereof shall be made to comply in all respects with the requirements for a new building hereafter erected for such public assembly use.

SECTION 404.4 SWIMMING POOLS

404.41 CHANGE OF USE: No existing pool used for swimming or bathing or accessory equipment of part thereof shall be altered or converted for any other use unless it complies with all provisions of this Code applicable to the use intended.

404.42 CONTINUATION OF EXISTING USE: Existing swimming pools may be continued without change, provided the safety requirements are observed where required by the building official.

SECTION 405.0 LIQUEFIED PETROLEUM GASES

The provisions of this section shall apply to the design, construction, location, installation and operation of propane, butane and other petroleum gases, normally stored in the liquid state

under pressure for use in all buildings and structures. Refineries, tank farms and utility gas plants shall be subject to special approvals in accordance with accepted engineering practice as defined in the reference standards of this article.

405.1 THE COMMONWEALTH OF MASSACHUSETTS REGULATIONS: 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 the Massachusetts State Fire Prevention Regulations, FPR-5; the Department of Public Safety Board of Boiler Rules; and other standards listed in the reference standards of this article.

SECTION 406.0 PYROXYLIN PLASTICS

The provisions of this section, including the reference standards of this article shall regulate all buildings, structures and parts thereof used for the storage, handling or fabrication of pyroxylin plastics permitted by Massachusetts law whether as raw material, process, finished product or scrap.

406.1 EXCEPTIONS: The provisions of this section shall not apply to the manufacture, use or storage of nitro-cellulose film or the incidental storage of articles manufactured from pyroxylin plastics offered for sale in mercantile buildings. (See section 205.)

406.2 RESTRICTIONS: No permit for the storage or manufacture of pyroxylin plastics, except as specified in section 406.1, shall be issued for a building or structure hereafter erected, altered or used which is occupied or located as follows:

406.21 PLACE OF ASSEMBLY: Within fifty (50) feet of the nearest wall of a school, theatre or other place of public assembly;

406.22 RESIDENTIAL BUILDING: As a residential building, use groups L-1, L-2 or L-3;

406.23 HIGH HAZARD USES: In quantities exceeding one thousand (1000) 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;

406.24 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 nitro-cellulose products;

406.25 TENANT FACTORY BUILDING: In quantities exceeding one hundred (100) pounds in any tenant factory building (use Group D) in which more than five (5) people are employed or likely to congregate on one floor at any one time.

406.3 INSIDE STORAGE: All pyroxylin raw material and products intended for use in further manufacture shall be stored as herein provided:

406.31 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 (1000) pounds in any workroom or space enclosed in floors, walls and ceilings of not less than two (2) hours fireresistance;

406.32 VAULTS: Quantities of more than one thousand (1000) 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) hours fireresistance. The interior storage volume of the vault shall be not more than fifteen hundred (1500) cubic feet and the vault shall be constructed vapor and gastight in accordance with the approved rules, with one and one-half (1½) 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.

406.33 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 official with the approval of the fire official;

406.34 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 stairway, fire escape or exitway discharge. The area of the vent shall be not less than one (1) square inch for each seven (7) pounds of pyroxylin stored;

406.35 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;

406.36 FIRE PROTECTION: Vaults located within buildings for the storage of raw pyroxylin shall be protected with an approved automatic sprinkler system capable of discharging one and sixty-six one-hundredths (1.66) gallons per minute per square feet over the area of the vault.

406.4 ISOLATED STORAGE BUILDINGS: Pyroxylin products in quantities greater than permitted for interior storage shall be housed in isolated storage buildings. Such buidings shall be used for no purpose other than packing, receiving, shipping and storage of pyroxylin plastics unless otherwise approved by the building official.

406.41 CAPACITY: The maximum storage in any fire area enclosed in construction of four (4) hours fireresistance 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 table 4-3. 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) percent. Such systems shall be provided with not less than one (1) automatic sprinkler head for each thirty-two (32) square feet of protected area.

Table 4-3 - Exposure Distance for Pyroxylin Storage Buildings

Maximum quantity stored in pounds	Fire separation from lot line or other buildings in feet
1,000	40
2,000	50
3,000	60
4,000	70
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

406.5 FIRE PROTECTION.

406.51 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.

406.52 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.

406.53 STANDPIPES: First-aid standpipes shall be provided for each five thousand (5000) square feet of floor area equipped with one and one-half (1½) inch hose, complying with article 12.

406.54 AUTOMATIC SPRINKLERS: All manufacturing and storage spaces and vaults where required shall be protected with an approved automatic sprinkler system as herein specified and with fire pails and portable fire extinguishers complying with article 12.

406.55 SPECIAL PROTECTION: Special chemical extinguishers and other first aid fire appliances shall be provided around motors and other electrical equipment in accordance with the approved rules.

SECTION 407.0 USE AND STORAGE OF FLAMMABLE FILM

407.1 PERMIT REQUIRED: No permit for handling, use, storage or recovery of flammable film shall be issued for any building located as specified in section 406.2; except that those restrictions shall not apply to the screening and projection rooms of theatres and other places of amusement or instruction. It shall be unlawful to store, stock or use any nitro-cellulose or other flammable film in quantities of more than two thousand (2000) feet in length or more than ten (10) pounds in weight unless approved by the fire official. All installations shall comply with the applicable standards listed in the reference standards of this article.

407.2 STORAGE: Other than motion picture projection and rewind rooms, or as herein specifically exempted, all rooms in which flammable film is stored or handled shall be enclosed in not less than two (2) hour fireresistive construction complying with the provisions of article 9. All film, except when in process or use, shall be kept in approved closed containers.

407.21 CABINETS: Flammable film in amounts of twenty-five (25) to one thousand (1000) pounds shall be stored in approved noncombustible cabinets constructed and vented in accordance with the approved rules. No one cabinet shall contain more than three hundred and seventy-five (375) pounds. All cabinets with a capacity of more than seventy-five (75) pounds shall be equipped with not less than one (1) automatic sprinkler head.

407.22 VAULTS: Flammable film in amounts greater than one thousand (1000) pounds shall be kept in vaults constructed as provided in section 406; except that the interior storage volume shall not exceed seven hundred and fifty (750) cubic feet.

407.23 ROOMS: Unexposed film may be stored in the original approved shipping cases complying with the rules of the Interstate Commerce Commission in rooms equipped with an approved one-source sprinkler system complying with the provisions of section 406.36.

407.24 VENTILATION: Storage rooms shall be ventilated as specified in section 406.34 with the vents arranged to open automatically in the event of fire, in accordance with the approved rules.

407.25 LIGHTING: Artificial illumination shall comply with section 400.5 except that other approved forms of lights may be used in film studios.

407.26 HEATING: All heating equipment and installations shall conform to the requirements of section 406.51. The duct systems of warm air heating and air conditioning systems shall comply with article 18, and shall be protected with automatic fire dampers to cut off all rooms in which film is handled from all other rooms and spaces in the building. The heating of film vaults shall be automatically controlled to a maximum temperature of seventy (70) degrees F.

407.27 FIRE PROTECTION: Approved automatic sprinkler systems shall be provided in all buildings and structures and parts thereof in which flammable film is stored or handled in amounts of more than fifty (50) pounds and as herein specifically required, except in projection booths and rewind rooms conforming to the requirements of section 407.3 and 407.4.

407.3 PROJECTION ROOMS: Every room 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.

407.31 CONSTRUCTION OF PROJECTION ROOMS: The size of the room shall be adequate to accommodate the apparatus and equipment and permit manual operation, 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. The enclosure shall be constructed smoke and vapor-tight of not less than two (2) hour fireresistance. Observation and projector openings shall in no case exceed twelve (12) inches in any dimension and shall be equipped with automatic metal, or other approved noncombustible shutters capable of auxiliary manual operation from the outside.

407.32 MEANS OF EGRESS FROM PROJECTION ROOMS: At least two (2) means of egress shall be provided, equipped with three-quarter (3/4) hour self-closing fire doors, or their approved labeled equivalent, opening outwardly, not less than two and one-half (2½) feet by six (6) feet in size, unless otherwise approved by the building official.

407.33 VENTILATION OF PROJECTION ROOMS: 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 lamp, plus two hundred (200) cubic feet per minute for the volume of the room. The ventilation system may be extended to serve rewind rooms associated therewith, but shall not be connected in any way with ventilating or air conditioning systems serving other portions of the building. 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 with the port shutters.

407.34 LIGHTING CONTROL: Provision 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 416.8.

407.35 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 the 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.

407.36 FILM CAPACITY: The film storage capacity of each projection or rewind room shall be not more than one hundred and twenty-five (125) pounds.

407.4 REWIND AND AUXILIARY ROOMS: Rewinding of film shall be done in the booth in accordance with the approved standards or in a special rewind room not less than eighty (80) square feet in area constructed as provided in this section for the projection room. Special auxiliary rooms may be provided for film storage of not more than one hundred and twenty-five (125) pounds capacity; but the total storage capacity of projection, rewind and auxiliary rooms shall be not more than two hundred and fifty (250) pounds.

407.41 TOILET: A toilet room with approved toilet facilities shall be connected directly with the projection booth.

407.5 TRIAL EXHIBITION ROOMS: Preview rooms shall provide a seating capacity of not more than one hundred (100) persons, with not less than two (2) approved means of egress complying with article 6. Such rooms shall be enclosed in three-quarter (3/4) hour fire-resistive partitions with self-closing fire doors or their approved labeled equivalent at the openings. All seats shall be permanently fixed in position and the arrangement shall comply with the requirements of section 416.3.

407.6 TEMPORARY MOTION PICTURE INSTALLATIONS: Temporary motion picture installations shall require a building permit from the building official and shall be of approved construction.

407.7 MOTION PICTURE STUDIOS.

407.71 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.

407.72 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.

407.73 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.

407.74 FILM STORAGE: All film shall be stored as required in section 407.2 and no surplus film shall be kept on the studio stage except loaded magazines in the cameras and sound recording apparatus. All extra loaded magazines shall be stored in a separate magazine room enclosed in two (2) hour fireresistive construction.

407.8 FILM LABORATORIES: No film laboratories shall be conducted in other than fireproof (type-A) buildings or structures, equipped throughout with an approved automatic sprinkler system.

407.9 FILM EXCHANGES: All film exchanges and depots shall be housed in buildings and structures of fireproof (type 1-A) construction equipped throughout with an approved automatic sprinkler system. All flammable film other than that in process of receipt, delivery or distribution shall be stored in vaults complying with the requirements of section 406.32.

SECTION 408.0 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 scrap and clippings in excess of one thousand (1000) pounds. All such uses shall be subject to the Massachusetts State Fire Prevention Regulations, FPR-13, and the following provisions:

408.1 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 table 2-6 for high hazard use (use group A) except as follows:

408.11 SPECIAL LIMITS: No single storage room or space shall be more than twelve hundred and fifty (1250) 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;

408.12 FLOOR LOADS: The floors of all buildings designed for the storage of combustible fibers shall not be loaded in excess of one-half (½) 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;

408.13 SALVAGE DOORS: Every exterior wall shall be provided with a door to each storage compartment arranged for quick removal of the contents;

408.14 WALL OPENINGS: All openings in outside walls shall be equipped with approved fire doors and fire windows complying with article 9;

408.15 ROOF OPENINGS: All skylights, monitors and other roof openings shall be protected with galvanized wire or other approved corrosion-resistive screens with not less than thirty-six (36) meshes to the square inch or with wired glass in stationary frames;

408.16 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 (1½) hour fire doors or their approved labeled equivalent.

408.2 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 fire official, a system of outside hydrants and hose shall be provided.

408.3 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 (7200) cubic feet of fiber shall be stored in the open; and fire-extinguishing equipment shall be provided as directed by the fire official.

408.4 SPECIAL TREATMENTS: When combustible fibers are packed in special noncombustible containers or when packed in bales covered with wrappings to prevent ready ignition, or when treated by approved chemical dipping or spraying processes to eliminate the flash fire hazard, the restictions governing combustible fibers shall not apply.

SECTION 409.0 COMBUSTIBLE DUSTS, GRAIN PROCESSING AND STORAGE

The provisions of this section 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. The applicable standards listed in the reference standards of this article, except as herein specifically required, shall be deemed to conform to the requirements of the Basic Code.

409.1 CONSTRUCTION REQUIREMENTS.

409.11 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 3-A) construction, within the height and area limits of high hazard uses (use group A) of table 2-6, except that when erected of fireproof (type 1-A) construction, the height and area of grain elevators and similar structures shall be unlimited, and when of heavy timber (type 3-A) construction, the structure may be erected to a height of sixty-five (65) feet; and except further that in isolated areas, the height of type 3-A structures may be increased to eighty-five (85) feet.

409.12 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 fireresistance when the area is not more than three thousand (3000) square feet and of not less than four (4) hour fireresistance when the area is greater than three thousand (3000) square feet.

409.13 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 Massachusetts State Electrical Code.

409.2 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.

409.3 GRAIN ELEVATORS: Grain elevators, malt houses and buildings for similar uses shall not 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.

409.4 COAL POCKETS: Coal pockets located less than thirty (30) feet from interior lot lines or structures on the same lot shall be constructed of not less than protected noncombustible (type 2-A) construction. When more than thirty (30) feet from interior lot lines, or erected along a railroad right of way, such structures may be built of lumber sizes qualifying for heavy timer or laminated construction, provided they are not more than sixty-five (65) feet in height.

SECTION 410.0 PAINT 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 of similar purposes. All such construction and equipment shall comply with the approved rules and the applicable standards listed in the reference standards of this article.

410.1 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 in accordance with accepted engineering practice.

410.2 CONSTRUCTION.

410.21 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.

410.22 SPRAY BOOTHS: All spray booths shall be constructed of approved noncombustible materials equipped with mechanical ventilating systems.

410.23 SPRAY ROOMS: All spray rooms shall be enclosed in partitions of not less than three-quarter (3/4) hour fireresistance. Floors shall be waterproofed and drained in an approved manner. Floor drains to the building drainage system and the public sewer shall be prohibited.

410.24 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-wall 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 fireresistance 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 material shall be stored in buildings in which exceptionally highly combustible materials are manufactured or stored.

410.3 VENTILATION OF SPRAYING PROCESSES: The ventilation system shall comply with the provisions of section 402 and shall be adequate to exhaust all vapors, fumes and residue of spraying material directly to the outer air. Fresh air shall be admitted to the spraying spaces in an amount equal to the capacity of the fan in such manner as to avoid short-circuiting the path of air in the working space and to provide air movement with a velocity of not less than one hundred (100) feet per minute at the face of the spray booth. All ducts and vents shall be constructed and installed to comply with sections 1017 and 1117 and article 18. Unless equipped with approved explosion-proof motors with nonferrous blade fans, the mechanical exhaust equipment shall be located outside of spray spaces. Make-up air shall be supplied from a point outside the spraying or dipping space such that it will be uncontaminated by the process exhaust fumes.

410.31 VENTILATING: Ventilating ducts shall run directly to the outer air and be protected with a hood against the weather. Such ducts shall not terminate within ten (10) feet horizontally of any chimney outlet, or within twenty (20) feet of any exit or any opening in an adjoining wall.

410.32 The exhaust system for 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.

410.4 ELECTRICAL EQUIPMENT: Artificial lighting and electric equipment shall comply with section 400.5.

410.5 FIRE PROTECTION: Sprinkler heads shall be provided in all spray, dip and immersing spaces and storage rooms and shall be installed in accordance with accepted engineering practice and the standards listed in the reference section of article 12. Where 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 411.0 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 the approved rules and the applicable standards listed in the reference standards of this article.

411.1 CLASSIFICATION: For the purpose of the Basic Code, all dry cleaning and dry dyeing establishments shall be classified as follows:

411.11 HIGH HAZARD: All such establishments shall be classified as high hazard which employ gasoline or other solvents having a flash point below seventy-five (75) degrees F. (Tag. closed-cup) in quantities of more than three (3) gallons, or more than sixty (60) gallons of flammable solvents with a flash point between seventy-five (75) and one hundred and forty (140) degrees F. (Tag. closed-cup).

411.12 MODERATE HAZARD: All such establishments employing less than three (3) gallons of volatile flammables with a flash point of less than seventy-five (75) degrees F. or less than sixty (60) gallons of solvent with a flash point between seventy-five (75) and one hundred and forty (140) degrees F. (Tag. closed-cup) shall be classified as moderate hazard.

411.13 LOW HAZARD: All such establishments using solvents of other than volatile flammable liquids or solvents with a flash point more than one hundred and forty (140) degrees F. (Tag. closed-cup) in cleaning and dyeing operations shall be classified as low hazard.

411.2 CONSTRUCTION OF DRY CLEANING PLANTS

411.21 HIGH HAZARD: The construction of new high hazard dry cleaning plants, and the installation of high hazard dry cleaning establishments in new locations shall be prohibited.

411.22 MODERATE HAZARD: Moderate hazard dry cleaning plants as herein defined may be located in buildings or structures of any type of construction other than frame (type 4) buildings subject to the fire district limitations of article 3 and the height and area limitations for high hazard buildings (use group A) of table 2-6. 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) means of egress from each dry cleaning or dry dyeing room or space.

411.23 LOW HAZARD: Low hazard dry cleaning plants shall not be restricted as to type of building construction within the height and area limitations for use group E of table 2-6; except that such uses shall not be located in basements nor in a building used for public assembly (use group F) or institutional (use group H) purposes.

411.24 ROOF CONSTRUCTION OF DRY CLEANING PLANTS: The roof over high hazard dry cleaning plants shall be flat without attic or concealed spaces and shall be provided with a pivot type skylight or other approved vent complying with section 402, arranged to release outwardly under explosion pressures.

411.25 FLOOR CONSTRUCTION OF DRY CLEANING PLANTS: The floor finish in high hazard dry cleaning plants shall be constructed of impervious noncombustible materials with nonsparking surfaces. There shall be no openings, vaults or pits below the floor.

411.26 EXTERIOR WALLS OF DRY CLEANING PLANTS: Exterior walls of high hazard dry cleaning plants having a fire separation of less than thirty (30) feet shall be solid masonry without openings, but in no case shall more than two (2) sides of the building be enclosed in blank walls. Opening protectives of exterior doors and windows shall have not less than three-quarter (3/4) hour fireresistance or the labeled equivalent construction, and the windows shall be pressure-releasing to comply with section 402.

411.27 BASEMENTS OF DRY CLEANING PLANTS: The basements of all buildings in which high or moderate hazard dry cleaning establishments are conducted shall be completely separated from the superstructure with unpierced floor construction of not less than two (2) hours fireresistance. The access to such basements shall be from the exterior only.

411.3 BOILER ROOM SEPARATION: Boiler rooms and heating equipment for moderate hazard dry cleaning plants shall be separated from drying room, dry cleaning and dry dyeing rooms with unpierced walls of not less than two (2) hours fireresistance; or such boiler rooms shall be located in a separate building.

411.4 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. Exhaust of all process fumes shall be directly to the outside air.

411.5 SOLVENT STORAGE: All volatile flammable solvents with a flash point under seventy-five (75) degrees F. (Tag. closed-cup) shall be stored underground in accordance with the provisions of section 403. Interior aboveground storage shall be permitted for solvents with a flash point above seventy-five (75) F. (Tag. closed-cup) provided the ag-

gregate 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.

411.6 ELECTRIC WIRING AND EQUIPMENT: All electrical equipment and wiring shall conform to the requirements of the Massachusetts State Electrical Code for hazardous locations; and the cylinders and shells of all washing machines, drying tumblers, drying cabinets, extractors, and all aboveground storage containers shall be grounded as therein required.

411.7 FIRE PROTECTION: Every dry cleaning room and dry dyeing room employing high and 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.

SECTION 412.0 PRIVATE GARAGES

412.1 ATTACHED GARAGES.

412.11 ONE AND TWO-FAMILY DWELLINGS: Private garages, wherever attached or adjoining a one or two-family dwelling, shall have a fireresistance rating of not less than three-quarter (3/4) hours. The sills of any door communicating with the dwelling shall be raised at least four (4) inches above the garage floor. The doors shall be three-quarter (3/4) hour fire doors complying with article 9 or one and three-quarter (1-3/4) inch solid core wood door.

412.12 MOTELS AND MULTI-FAMILY DWELLINGS: Private garages located above or beneath motels and 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 fireresistance.

412.13 OTHER CONDITIONS: All private garages not falling within the purview of sections 412.11 and 412.12 attached to or located beneath a building shall comply with the requirements of section 413.13 for public garages.

412.2 MEANS OF EGRESS: Where living quarters are located above a private garage, required means of egress facilities shall be protected from the garage area with three-quarter (3/4) hour fireresistive construction.

SECTION 413.0 PUBLIC GARAGES

Public garages shall comply with the applicable requirements of the following sections. The portions of such buildings and structures in which gasoline, oil and similar products are dispensed shall comply

with the requirements of section 414; the portions in which motor vehicles are repaired shall comply with section 415; and the portions in which paint spraying is done shall comply with the requirements of section 410. All garages shall be subject to the provisions of FPR-4.

413.1 CONSTRUCTION: All group one (1) public garages hereafter erected shall be classified as storage buildings, moderate hazard (use group B-1) and all group two (2) public garages shall be classified as storage buildings, low hazard (use group B-2) and shall be located on the grade floor and shall comply with the requirements of section 414.

413.11 SPECIAL HEIGHT LIMITATIONS: Public garage buildings shall comply with the height and area limitations of table 2-6 for the classification of the use as specified in section 413. Such heights may be increased one (1) additional story when the building is equipped with an approved sprinkler system.

413.12 BASEMENTS: The first floor construction of public garages of all classifications and public hangars with basements 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 of which shall be directly to the outside independent of the exitways serving other areas of the building.

413.13 MIXED OCCUPANCY: No public garage shall be located within or attached to a building occupied for any other use, unless separated from such use by walls or floors complying with table 9-1 for fireresistance. Such fire division shall be continuous and unpierced by openings; except that door openings equipped with self-closing fire doors complying with article 9 shall be permitted. In buildings of single occupancy not excluding the area limitations of table 2-6 doors without fireresistance shall be permitted between the garage area and salesroom or offices that are operated in connection with the garage.

413.14 ROOF STORAGE OF MOTOR VEHICLES AND AIRPLANES: 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. 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 six (6) inches in height, located so as to prevent any vehicle from striking the parapet wall or guard rail. The use of roofs for airplane storage and landing shall be subject to the approval of the Civil Aeronautics Authority.

413.15 FLOOR CONSTRUCTION AND DRAINAGE: Floors of public garages and airplane hangars shall be graded to drain through oil separators or traps to avoid accumulation of explosive vapors in building drains or sewers as provided in the Massachusetts State Plumbing Code. The floor finish shall be of concrete or other approved nonabsorbent noncombustible material.

413.2 VENTILATION: All public garages and airplane hangars shall be provided with mechanical or natural ventilation adequate to prevent the accumulation of carbon monoxide or exhaust fumes in excess of one (1) part in ten thousand (10,000) (.01 percent) explosive limit. The building official may require a test by a qualified testing laboratory to determine the adequacy. The cost of such test shall be borne by the owner. The building official may require certification of the adequacy of the system by a qualified registered professional engineer.

413.21 BELOW GRADE: Public garages below grade shall be equipped with mechanical ventilation adequate to provide the ventilation required under section 413.2. The ventilation system shall be operated at all times the garage areas are occupied by human beings.

413.22 REPAIR SHOPS OR ROOMS: Products of combustion from internal combustion engines shall be collected directly from the exhaust and discharged directly to the outside air by means of a positive induced draft. The discharge from such system 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.

413.23 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 413.2. The ventilation system shall be operated at all times the pits are occupied by human beings.

413.3 SPECIAL HAZARDS: Any process conducted in conjunction with public garages involving volatile flammable solvents shall be segregated or located in a detached building or structure, except as provided in section 403 for the storage and handling of gasoline and other volatile flammables. The quantity of flammable liquids stored or handled in public garages other than in underground storage and in the tanks of motor vehicles shall be not more than five (5) gallons in approved safety cans.

413.4 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.

413.5 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.

413.6 SPRINKLER REQUIREMENTS: For sprinkler requirements refer to article 12, table 12-3.

SECTION 414.0 MOTOR FUEL SERVICE STATIONS

414.1 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 table 2-6 for business (use group E) buildings and as modified by sections 303 and 304.0. The canopies and supports over pumps and service equipment when located less than twenty (20) feet from interior lot lines shall be constructed of approved noncombustible materials.

414.11 OPENING PROTECTIVES: All permissible openings in walls with a fire separation 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.

414.12 BASEMENTS: Motor fuel service stations shall have no cellars or basements; and when pits are provided they shall be vented as required in section 413.2.

414.2 GASOLINE STORAGE: All volatile flammable liquid storage tanks shall be installed below ground and vented as specified in section 403. Such tanks shall be subject to the approval of the fire official and comply with the provisions of FPR-4.

SECTION 415.0 MOTOR VEHICLE REPAIR SHOPS

All buildings and structures designed and used for repair and servicing motor vehicles, motor boats, airplanes or other motor driven means of transportation shall be subject to the limitations of tables 2-5 and 2-6 for moderate hazard storage (use group B-1). Such buildings shall be used solely for that purpose.

415.1 ENCLOSURE WALLS: Exterior walls, when located within six (6) feet of interior lot lines or other buildings shall have no openings therein.

415.2 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 413.2 and article 18.

415.3 FIRE PREVENTION: No open gas flames except heating devices complying with section 413.5, 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 416.0 PLACES OF PUBLIC ASSEMBLY

The provisions of this section shall apply to all places of public assembly and all parts of buildings and structures classified in the use group F-1, theatres and in other places of public assembly, use groups F-2, F-3, and F-4, except as specifically exempted in section 417.

416.1 RESTRICTIONS.

416.11 HIGH HAZARD USES: No place of public assembly shall be permitted in a building classified in the high hazard group (use group A).

416.12 FRAME CONSTRUCTION: No theatre with stage, fly gallery and rigging loft shall be permitted in a building of frame (type A) construction.

416.13 LOCATION: All buildings used for assembly purposes shall front on at least one (1) street in which the main entrance and exitway discharge shall be located. The main exitway shall be adequate to accommodate one-third (1/3) the total occupant load, but in any case, the capacity of the main exitway shall be adequate to provide for the total capacity of all exitway elements which lead to the main exitway.

416.14 TRIM, FINISH AND DECORATIVE HANGINGS: All permanent acoustic, insulating and similar materials and temporary hangings shall comply with the flameresistance requirements of article 9. Moldings and decorations around the proscenium openings shall be constructed entirely of noncombustible material.

416.15 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.

416.16 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.

416.2 THEATRE MEANS OF EGRESS REQUIREMENTS.

416.21 TYPES OF EXITWAYS: The required exitways from every tier or floor of a theatre shall consist of grade exitway discharge doors, interior or exterior stairways or horizontal exits which provide direct access to a street, an exitway discharge court, or unobstructed passageway, hallway or lobby leading to a street or open public space. The number, location and construction of all means of egress facilities shall comply with the requirements of article 6 and the provisions of this section.

416.22 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 stairways which shall be loacted on opposite sides of the structure with the following exception: stairs serving the first balcony only or mezzanine thereunder shall not require enclosures; however, such stairs 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 416.21.

416.23 EMERGENCY MEANS OF EGRESS FROM MAIN FLOOR OF AUDITORIUM: In addition to the main floor entrance and exitway, emergency exitway discharge doors shall be provided on both sides of the auditorium which lead directly to a street, or through an exterior passageway to the street independent of other exitways, or to an exitway discharge court as defined in this Code.

416.24 EMERGENCY MEANS OF EGRESS FROM BALCONIES AND GALLERIES: Emergency exitways shall be provided from both sides of each balcony and gallery with direct egress to the street, or to an independent passageway, or to an exitway discharge 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.

416.25 EXITWAY DISCHARGE COURTS: All exitway discharge 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 and fifty (250) persons. Such courts shall extend sufficiently in length to include the side and rear emergency exitways from the auditorium.

416.26 HARDWARE: Refer to section 612.42 for requirements.

416.27 EXITWAY DOORWAY WIDTHS: The maximum width of single exitway doorways shall be forty-two (42) inches and the minimum width of double doorways shall be sixty-six (66) inches.

416.28 "EXIT" LIGHTS: All exitway doors shall be marked with illuminated "Exit" signs complying with section 624 which shall be kept lighted at all times during occupancy of the building.

416.3 THEATRE SEATINGS.

416.31 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 thirty-two (32) inches apart, back to back, measured horizontally. The clear unobstructed distance which can be provided for passage between rows of seats shall be twelve (12) inches.

416.32 NUMBER OF SEATS: Aisles shall be provided so that not more than seven (7) seats intervene between any seat and the aisle or aisles, except that the number of seats in a row shall not be limited when self-raising seats are provided which leave an unobstructed passage between rows of seats of not less than eighteen (18) inches in width leading to side aisle in which exitway doorways are located at not more than twenty-five (25) foot intervals to the exitway corridor or exitway discharge court.

416.33 BOX SEATS: In boxes or loges with level floors, the seats need not be fastened when not more than fourteen (14) in number.

416.34 WHEELCHAIR FACILITIES: Facilities shall be provided for the handicapped according to the provisions of the reference standards of this article.

416.4 THEATRE AISLES.

416.41 LONGITUDINAL AISLES: The width of longitudinal aisles at right angles to rows of seats and with seats on both sides of the aisle shall be not less than forty-two (42) inches. The width of the longitudinal aisles with banks of seats on one (1) side only shall be not less than twenty-four (24) inches.

416.42 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 cross aisles shall be not less than the widest aisle with which they connect or the width of exitway which they serve; 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.

416.43 GRADIENT: Aisles shall not exceed a gradient of one and three-quarters (1-3/4) inches per foot except where subject to requirements for use of handicapped. No aisles or the main floor may be stepped.

416.44 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.

416.45 RAILINGS: Metal or other approved noncombustible railings shall be provided on balconies and galleries as herein prescribed:

At the facia of boxes, balconies and galleries not less than thirty (30) inches in height; and not less than thirty-six (36) inches in height at the foot of steps;

Along cross aisles not less than twenty-six (26) inches in height except where the backs of the seats along the front of the aisle project twenty-four (24) inches or more above the floor of the aisle;

Where seatings are arranged in successive tiers, and the height of rise between platforms exceeds eighteen (18) inches, not less than twenty-six (26) inches in height along the entire row of seats at the edge of the platform.

416.5 THEATRE FOYERS.

416.51 CAPACITY: In every theatre or similar place of public assembly, not including churches, for theatrical use with stage and scenery loft, a foyer or lobby shall be provided with a net floor area, exclusive of stairs or landings, of not less than one and one-half (1½) square feet for each occupant having access thereto. 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.

416.52 EGRESS: When the foyer is not directly connected to the public street through the main lobby, an unobstructed corridor or passage shall be provided which leads to and equals in minimum width the required width of main entrances and exitways.

416.53 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 gradiwnt than one (1) foot in ten (10) feet.

416.54 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.

416.55 WAITING SPACES: Waiting spaces for harboring occupants shall be located only on the first or auditorium floor. Additional capacity of exitway shall be provided for the waiting space occupancy based on an allowance of three (3) square feet for each person.

416.6 THEATRE STAGE CONSTRUCTION.

416.61 STAGE ENCLOSURE WALLS: 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 fireresistance, 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.

416.62 FLOOR CONSTRUCTION: The entire stage, except that portion used for the working of scenery, traps, and other mechanical apparatus for the presentation of the scene, shall be not less than three (3) hour fireresistive construction. All openings through the stage floor shall be equipped with tight-fitting, solid wood trap doors not less than three (3) inches in thickness or other materials of equal physical and fireresistive properties.

416.63 ROOF AND RIGGING LOFT: The roof over the stage shall be of not less than three (3) hour fireresistive construction. The rigging loft, fly galleries and pin rails shall be constructed of approved noncombustible materials.

416.64 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 Massachusetts State Electrical Code, and the switchboard shall be readily accessible and protected from any potential damage.

416.65 STAGE, MEANS OF EGRESS: There shall be provided at least one (1) approved means of egress from each side of the stage leading to an approved discharge area.

416.66 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 equivalent.

416.67 PROSCENIUM CURTAIN: Where required, the proscenium opening shall be protected with an approved automatic fireresistive and smoke-tight curtain, or its approved equivalent, 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 (½) 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 operating device to permit prompt and immediate manual closing of the proscenium opening.

416.68 STAGE VENTILATION: 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. Supplemental means shall be provided for manual operation of the ventilator.

416.7 DRESSING AND APPURTENANT ROOMS.

416.71 CONSTRUCTION: Dressing rooms, scene docks, property rooms, work shops and store rooms and all compartments appurtenant to 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. No such rooms shall be placed immediately over or under the operating stage area.

416.72 OPENING PROTECTIVES: No openings other than to trunk rooms and the necessary doorways at stage level shall connect such rooms with the stage and such openings shall be protected with one and one-half (1½) hour self-closing fire doors or the approved labeled equivalent complying with article 9.

416.73 INTERIOR TRIM: All shelving and closets in dressing rooms, property rooms or storage rooms shall be constructed of flameresistant materials complying with article 9.

416.74 DRESSING ROOM AND STAGE EXITWAYS: Each tier of dressing rooms shall be provided with at least two (2) means of egress, one of which shall lead directly to an exitway corridor, exitway discharge court or street. Exitway stairways from dressing and storage rooms may be unenclosed in the stage area behind the proscenium wall. At least one approved exitway 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 discharge court or passageway to a street. An iron ladder shall be provided from the gridiron to a scuttle in the stage roof.

416.8 LIGHTING.

416.81 EXITWAYS: During occupancy all exitways in places of assembly shall be lighted to comply with the requirements of section 624.

416.82 AUDITORIUMS: Aisles in auditoriums shall be provided with general illumination of not less than one-tenth (1/10) foot candles at the front row of seats and not less than two-tenths (2/10) foot candles at the last row of seats and the illumination shall be maintained throughout the showing of motion pictures or other projections.

416.821 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.

416.822 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.

416.83 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 one (1) foot candle.

416.84 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 407.34 in the motion picture projection room.

416.85 EMERGENCY LIGHTING: In all theatre buildings and similar structures used for public assembly purposes, all exitways shall be lighted by means of electricity so arranged and controlled that the interruption of service on any other circuit inside the building or structure will not interrupt the required exitway lighting, including corridors, stairways, foyers, and lobbies.

416.9 FIRE PROTECTION AND FIRE FIGHTING EQUIPMENT: Every theatre classified in the F-1 use group shall be equipped with fire-extinguishing equipment complying with the requirements of article 12 and as herein specified.

416.91 SPRINKLER SYSTEM: Approved automatic sprinkler systems complying with the provisions of sections 1212 and 1213 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 protection shall be provided 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.

416.92 STANDPIPES: Standpipe fire lines complying with the provisions of sections 1206 and 1207 shall be provided with outlets and hose attachments one on each side of the auditorium in each tier; one in each mezzanine; one in each tier of dressing rooms; and protecting each property, store and work room.

416.93 FIRST-AID STANDPIPES: First-aid standpipes complying with the provisions of section 1209 shall be provided on each side of the stage. Such standpipes shall be not less than two and one-half (2½) inches in diameter, equipped with one and one-half (1½) inch hose and three-eighth (3/8) inch nozzles.

416.94 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.

416.95 FIRST-AID HAND EQUIPMENT: Approved portable two and one-half (2½) gallon fire extinguishers shall be provided and located as follows: two (2) on each tier on 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 fire hooks 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.

SECTION 417.0 PUBLIC ASSEMBLY OTHER THAN THEATRES

Other places of public assembly including auditoriums, armories, bowling alleys, broadcasting studios, chapels, community houses, dance halls, gymnasiums, lecture halls, museums, exhibition halls, night clubs, restaurants, rinks, roof gardens and similar occupancies and uses shall comply with the general exitway requirements of article 6 and the applicable requirements of section 416, except the provisions of sections 416.45 and 416.54 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, except use groups F-1 theatres.

417.1 NUMBER OF EXITWAYS: Every tier, floor level and story of places of public assembly other than theatres, shall be provided with the number of required exitways herein specified of not less than the required width complying with article 6 for the occupancy load. The required exitways shall be remote and independent of each other and located on opposite sides of the area served thereby.

Occupancy Load Per Floor	Minimum Number of Exitways
Not more than 500	2
501 to 900	3
901 to 1800	4
Over 1800	5

417.2 AISLES WITH FIXED SEATS: All rows of seats shall be individually fixed or fixed in rigid units between longitudinal aisles complying with section 416.32 and 416.4 except as provided for chapels and churches in section 610.3. Where permitted, continuous fixed benches shall comply with the provisions of section 421.7.

417.3 AISLES WITHOUT FIXED SEATS: Tables and chairs in all rooms and spaces for assembly use 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.

417.4 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 three-quarter (3/4) hour fireresistance, except for opening protectives; and no required element of exitway shall pass through such areas.

417.5 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 fireresistive construction with floor finish of concrete or other noncombustible, nonabsorbent material.

417.6 SKATING RINKS: No skating rinks shall be located below the floor nearest grade.

SECTION 418.0 AMUSEMENT PARKS

All buildings and structures used as part of an amusement park shall be subject to the provisions of this Code as applicable. Unusual buildings, structures or devices which require a building permit by the provisions of this Code but are beyond the normal scope of applicability of this Code shall be subject to the provisions of section 128.0 and shall be considered to be within those categories of structures listed in section 128.1 as subject to control.

418.1 TEMPORARY AMUSEMENT FACILITIES AND DEVICES: Any moving structure or structure with any moving parts, and any structure, which in the opinion of the local building official, may represent a potential danger or hazard, shall have an affadavit submitted by a qualified registered professional engineer that the structure as designed and constructed is safe for its intended use and he shall provide certification that the structure has been inspected by a qualified registered professional engineer within six (6) months and meets all the requirements necessary to operate safely according to its design use. Furthermore, a qualified registered professional engineer shall be responsible for direction of the erection of such structures and shall certify that they have been erected in compliance with their design requirements. Any such structure, which is to accommodate human use in any way, shall be certified for the number of persons for which it is designed or as may be allowed by the local building official.

SECTON 419.0 STADIUMS AND GRANDSTANDS

Stadiums and grandstands shall be constructed as required by this Code and in accordance with the approved rules and the Standard for Tents and Grandstands Used for Places of Assembly (NFPA 102) listed in the reference standards of this article.

419.1 RAILS: Every ramp, stairway, deck and tier shall have an approved protective railing or guard not less than three (3) feet six (6) inches high on all open sides when three (3) feet or more above grade level or above any other level occupied by the public. Front railings of grandstands when the foot rest is more than two (2) feet above the ground shall be not less than thirty-three (33) inches high.

419.2 SPACES UNDERNEATH SEATS: Spaces underneath grandstand seats shall be kept free of all combustible and flammable materials and shall not be occupied or used for other than exitways; except that when enclosed in not less than three-quarter (3/4) hour fireresistive construction, the building official may approve the use of such spaces for other purposes that do not endanger the safety of the public.

SECTION 420.0 TENTS AND OTHER TEMPORARY STRUCTURES

Tents shall be constructed as required by this Code and in accordance with accepted engineering practice and the Standard for Tents, Grandstands and Air-Supported Structures Used for Places of Assembly (NFPA 102) listed in the reference standards of this article.

420.1 CONDITIONS OF PERMIT AND LOCATION: Tents and other temporary structures may be erected for a period as determined by the building official. Such structures may not be erected within the fire district

for a period of more than twenty-four (24) hours unless such use is reviewed and approved by the fire official, and any such structure erected within the fire district shall be subject to any condition of use and protection as may be determined by the building official.

420.2 TENT CONSTRUCTION: Tents and other temporary structures shall be of an approved type and shall have evidence submitted that the structure satisfies all structural and fire-safety requirements.

420.3 COMBUSTIBLE MATERIALS: No combustible materials shall be permitted under stands or seats at any time. Excessive vegetation shall not be allowed beneath the stands or seats.

SECTION 421.0 RADIO AND TELEVISION TOWERS

Commercial radio and television towers shall have complete structural drawings and specifications submitted by a qualified registered professional engineer, bearing his seal and signature.

SECTION 422.0 SWIMMING POOLS

422.1 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. For purposes of this Code, pools are classified as private swimming pools or public swimming pools, as defined in section 422.2.

422.2 CLASSIFICATION OF POOLS: Any pool intended to be used primarily for swimming and designated as being a private pool for the use only of the occupants of a one- or two-family dwelling shall be designated a private pool. Any pool intended to be used primarily for swimming which is not a private pool as defined above shall be classified as a public pool.

422.3 PLANS AND PERMIT.

422.31 PERMITS: No swimming pool subject to the provisions of this Code shall be constructed, installed, enlarged, or altered until a building permit has been obtained from the building official.

422.32 PLANS AND SPECIFICATIONS: The application for the permit shall be accompanied by copies of the specifications and plans drawn to scale. The plans shall accurately show dimensions and construction of the pool including vertical elevations and sections showing depth in sufficient clarity to clearly indicate the nature of the structure and show all details necessary for conformance with the provisions of this Code. All plans for public pools must be submitted with the seal and signature of a qualified registered professional engineer.

422.4 DESIGN AND CONSTRUCTION.

422.41 GENERAL: Pools shall be constructed so as to be water tight and easily cleaned. They shall provide safe and easy means of egress.

422.42 STRUCTURAL DESIGN: The pool structure shall be engineered and designed in conformance with the normal engineering practices and subject to all the provisions of this Code.

422.43 WALL SLOPES: In public swimming pools, which are designed and constructed subject to the provisions of this Code, the side and end walls 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.

422.44 FLOOR SLOPES: In public pools, the slope of the floor on the shallow side of the transition point between shallow and deep water shall not be more than five (5) feet deep.

422.45 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.

422.46 WALKWAYS: All public swimming pools shall have walkways not less than four (4) feet in width extending entirely around the pool. Where curbs or sidewalks are used around any swimming pool, they shall have a nonslip surface for a width of not less than one (1) foot at the edge of the pool and shall be so arranged to prevent return of surface water to the pool.

422.47 STEPS AND LADDERS: Steps or ladders may be used as approved means of egress from swimming pools. At least one (1) approved means of egress must be provided in any pool constructed subject to the provisions of this Code. Steps must be nonskid and have the following requirements: Width ten (10) inches minimum, area two hundred and forty (240) square inches minimum, risers twelve (12) inches maximum.

In public pools, step holes inserted in the pool wall shall not be accepted as a required means of egress. All steps and ladders shall have handrails on both sides extending onto the deck surface adjacent to the pool. Handrails are not required in private pools where there are four steps or fewer.

In public pools, approved means of egress must be provided for a maximum of seventy-five (75) feet of pool perimeter wherever the height from the bottom of the pool to the ledge or top of the wall exceeds twelve (12) inches.

422.5 WATER SUPPLY, TREATMENT AND DRAINAGE SYSTEMS: All water supply, treatment and drainage systems shall conform to the requirements of Article VI of the Commonwealth of Massachusetts, Department of Public Health Sanitary Code.

422.6 APPURTENANT STRUCTURES

422.61 APPURTENANT STRUCTURES: All appurtenant structures, installations, and equipment; such as showers, dressing rooms, equipment houses or other buildings and structures, including plumbing, heating, and air conditioning, amongst others appurtenant to a swimming pool, shall comply with all applicable requirements of the Basic Code, the Massachusetts State Plumbing Code, the Massachusetts State Electrical Code, and Article VI of the Commonwealth of Massachusetts, Department of Public Health Sanitary Code.

422.62 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.

422.7 SAFETY PRECAUTIONS.

422.71 ELECTRICAL SAFETY: The construction and installation of electrical wiring for equipment in or adjacent to swimming pools, to metalic 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 State Electrical Code.

422.72 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.

422.8 GENERAL SAFETY REQUIREMENTS: Any public swimming pool shall be enclosed by an impassible four (4) foot high fence with a self-latching gate or an equivalent enclosure or means of protection from access to the pool.

SECTION 423.0 OPEN PARKING STRUCTURES

Opening parking structures shall be subject to the provisions of this section, Massachusetts State Fire Prevention Regulation, FPR-4 and NFPA 88 such that those regulations which provide for the greatest public safety shall apply in any case. In addition, where applicable, sections 414, 415 and 410 of this Code shall apply.

423.1 GENERAL REQUIREMENTS: Open Structures for the parking of passenger motor vehicles shall be constructed of noncombustible materials throughout, including structural framing, floors, roofs and walls.

423.11 VEHICLE CAPACITY: 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.

423.12 RAMP TYPE STRUCTURES: 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.

423.13 MECHANICAL TYPE PARKING STRUCTURES: Mechanical type parking structures employ specially designed parking machines, elevators, lifts, conveyors, moving cranes, dollies, or other devices for moving passenger vehicles to and from the street level.

423.2 SEPARATIONS: Parking structures may be erected without enclosure walls with the following exception: when located within fifteen (15) feet of interior lot lines a noncombustible enclosure wall of two (2) hours fireresistance rating with no openings is required.

423.3 MEANS OF EGRESS: Refer to section 609.3.

423.4 BASEMENTS: Basements, if used for parking vehicles, shall be sprinklered in accordance with article 12, and shall comply with the ventilation requirements of section 415.12.

423.5 HEIGHTS AND AREAS: Heights and areas of open parking structures shall not exceed the limits in the following table:

TABLE 4-4 HEIGHT AND LIMITATION FOR OPEN PARKING STRUCTURES

Type of Construction	Height	Area
1A, 1B, 2A	Unlimited	Unlimited
2B	100'	Unlimited
2C	75'	Unlimited

423.51 HORIZONTAL DISTANCE: The horizontal distance from any point on any level to an exterior wall opening on a street, alley, courtyard, or any other permanent open space shall not exceed two hundred (200) feet.

423.52 STREET FRONTAGE INCREASE: The areas of open parking structures shall be subject to the provisions of section 308.1.

423.6 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.

423.7 RAILINGS: Substantial railings or protective guards of non-combustible 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 (3) feet six (6) inches high, and shall be designed in accordance with the requirements of article 7.

423.8 FLOOR OPENINGS: Floor openings shall be protected by enclosure barriers at least six (6) inches high.

SECTION 424.0 GROUP RESIDENCE IN THE COMMONWEALTH OF MASSACHUSETTS

424.1 DEFINITION: A premise, licensed or operated by an agency of the Commonwealth of Massachusetts for the residential care in any single building of not more than twelve (12) unrelated persons between the ages of seven (7) and fifteen (15) inclusive, or up to twenty-five (25) unrelated persons sixteen (16) years of age or over, as may be approved by the licensing or operating state agency, who are capable of self-preservation. The use of such accommodations provided for a group residence as defined herein shall be considered the same as a normal single-family residence for the purpose of these regulations and shall not be construed as being similar to a boarding house, lodging house or dormitory. These provisions will apply to group residence uses providing accommodations for the care of not more than twenty-five (25) individuals.

424.2 NEW AND EXISTING OCCUPANCIES: These regulations apply to existing buildings, which are to be used as group residences as defined in section 424.1 of this Code, and to buildings and/or structures hereinafter erected or altered, which are to be used as group residences as defined in section 424.1 of this Code.

424.21 PLANS AND SPECIFICATIONS: Any existing building whose occupancy is altered for use as a group residency under the provisions of section 424.0 shall have filed with the local building department a complete set of plans showing in detail all rooms, doors, corridors, windows, stairs and stairways, hazard vertical openings (section 424.51), and the location of all fire detection equipment, alarms, and fire suppression equipment.

424.3 HAZARD OF CONTENTS: Any household contents, which represent a fire hazard greater than that which could be expected of ordinary household furnishings, shall not be allowed.

424.4 MEANS OF EGRESS: A means of egress shall be a continous path of travel from any point in a building to the open air outside at ground level.

424.41 PRINCIPAL MEANS OF EGRESS: There shall be a principal means of egress normally used by the occupants to leave the building. Under fire conditions this exit would be the first choice for exiting.

424.42 ESCAPE ROUTE: There shall be a back-up, or escape route, available to each occupant from any occupied portion of the building to preclude any possibility of entrapment in the event that the principal means of egress is blocked by fire, smoke or structural collapse. This escape route shall be so determined as to minimize the likelihood that it can be deliberately compromised.

424.43 TIME FOR EGRESS: The time taken to accomplish total evacuation of the building shall not exceed one (1) minute per floor, with a maximum time of two and one-half (2½) minutes as determined by and to the satisfaction of the licensing agency in accordance with Section 9.1 of 9 CHSR S. 51 Title 9 Code of Human Services Regulations, promulgated by the Executive Office of Human Services of the Commonwealth of Massachusetts.

424.44 REQUIREMENTS FOR EGRESS AND ESCAPE ROUTES: All main egress doors must swing in the anticipated direction of egress or escape where practicable.

424.5 FIRE PROTECTION FEATURES.

424.51 HAZARDOUS VERTICAL OPENINGS: Hazardous Vertical Openings such as laundry chutes, dumb waiters, heating plenums or combustible concealed spaces shall be enclosed or protected with a minimum of three-eights (3/8) inch gypsum sheet rock on the side of the expected exposure to delay the spread of fire and smoke. Automatic detection systems as specified in Section 6 shall be provided in each space.

424.52 SMOKE SCREENS: For the purposes of this Code a solid bonded core smokestop wood door with an automatic closer will be acceptable as a divider in providing two noncrossing, independent, egress routes.

424.53 INTERIOR FINISH: Only Class A and B Interior Finishes shall be permitted in the principal means of egress (to flame spread of seventy-five (75)). In the refinishing of any area, materials with a flame spread rating in excess of two hundred (200) are not allowed.

424.6 ALARM DETECTION SYSTEM: An approved automatic fire/smoke detector system and alarm system shall be provided.

424.61 TYPES AND LOCATIONS OF DETECTORS:

TYPE	LOCATION
Products of Combustion	Principal means of egress on each floor.
Smoke Detectors	Living-Dining-Recreation Areas.
Rate of Rise Detectors	Boiler Room-Kitchen-Bedroom.
Fixed Temperature Detectors	Closets and vent shafts, and concealed spaces.

424.62 TYPES AND LOCATIONS OF ALARMS:

TYPE	LOCATION
Manual Sending	Each exit of principal means of egress.*
Manual Sending	One outdoor alarm of a type acceptable to local Fire Departments; maximum two hundred (200) feet from building.*
Automatic Connection to Manual	From each detector.

*To municipal fire department as well, wherein practicable.

424.63 ALARM SOUNDING AND VISIBLE DEVICES: Alarm sounding devices shall be provided of such character and so distributed as to be effectively heard in every room above all other sounds. Visible alarm devices may be used only in conjunction with an approved back-up system, and where specifically approved.

Every alarm sounding device shall be distinctive in pitch and quality from all other sounding devices.

424.64 MAINTENANCE AND SUPERVISION: Each detector (or system) and alarm shall be provided with a signal (either visible or audible) to indicate when it is not capable of functioning according to its designed purpose; and shall be periodically inspected and certified by the licensing agency. The entire electrical alarm and detector system circuit shall be designed so that the disruption of any part of the continuous circuit will set off an alarm.

424.7 FIRE FIGHTING EQUIPMENT: Manually operated fire-fighting equipment such as hand extinguishers, shall be available to the custodian and other designated personnel.

424.8 INSPECTION: Inspections shall be made frequently by authorized inspectors to insure conformance with this Code. The results of such inspections shall be reported to the licensing agency on a prepared checklist and signed by the authorized inspector.

424.9 FINAL CERTIFICATION OF OCCUPANT: After preliminary certification by those qualified certifying personnel as specified in 9 CHSR S.51 Title 9 Code of Human Services Regulations, Section 51, each occupant must be certified at regular intervals but not less than once every quarter at the place of proposed residency by the licensing agency.

SECTION 425.0 COVERED MALLS

Covered malls shall be constructed in accordance with one of the following options:

425.1 OPTION 1: The covered mall and all buildings connected thereto shall be treated as a single building and shall be subject to the provisions of this Code for the specific use group and type of construction;

425.2 OPTION 2: The mall may be considered to be an accessible unoccupied open space that separates the construction into one or more buildings if the following requirements are met:

a) the covered mall shall be at least thirty (30) feet in width.

b) the least, unobstructed, horizontal dimension at any place in the covered mall shall be ten (10) feet.

c) combustible kiosks or other similar structures shall not be located within the covered mall.

d) kiosks or similar areas (temporary or permanent) located within the covered mall shall be provided with approved fire suppression and detection devices as required by the building official.

e) the minimum horizontal separation between kiosks and similar areas and buildings connected to the covered mall shall be twenty (20 feet.

f) the covered mall shall be of noncombustible or type 3A construction.

g) the covered mall and all buildings connected thereto shall be provided throughout with an approved fire suppression system. The suppression system in the covered mall shall be independent of the suppression systems in the buildings connected to the covered mall.

h) multi-level covered malls shall be sufficiently open, so that a hazardous condition occurring on one level will be readily visible to occupants on all levels.

i) floor-ceiling assemblies and their supporting columns and beams within multi-level covered malls shall be of one (1) hour fire-resistive noncombustible construction.

j) the covered mall shall be provided with break-out panels, skylights mechanical ventilation or other approved method of providing for ventilation of products of combustion in case of fire.

k) one-half (½) of the required number of exitways from each tenant area shall lead to the outside by means other than through the covered mall.

Exception: Tenant areas less than twenty-five hundred (2500) square feet in area.

l) exit signs and directional (exit) signs indicating the nonmall exitways shall be located so as to be easily visible from the mall-tenant area entrance.

m) exitways from the covered mall shall be located so that the length of travel from any mall-tenant area entrance to the exitway shall not exceed two hundred (200) feet.

n) standpipes and hose cabinets shall be provided at two hundred (200) foot intervals along the covered mall.

SECTION 426.0 NURSING HOMES, REST HOMES, CHARITABLE HOMES FOR THE AGED, CONVALESCENT HOMES AND HOSPITALS.

Buildings in use group H-2 used as nursing homes, rest homes, charitable homes for the aged, convalescent homes and hospitals shall meet the provisions of NFPA 101 Life Safety Code, 1967, the applicable provisions of the Basic Code and the following provisions:

426.1 MEANS OF EGRESS.

426.11 CORRIDORS: Corridors shall terminate at stairwells or at doors to grade, except that subsidiary corridors off main corridors, restricted to service areas (linen closets, janitor closets, bathing areas, beauty or barber shops, storage, utility rooms, treatment or examining rooms or offices) may be dead-ended providing they do not extend farther than thirty (30) feet beyond the exit stair, door or corridor and serve a total occupant load of not more than ten (10) persons.

426.12 PATIENT ROOM EGRESS: Two independent egresses shall be provided from each patient's room, one of which may be by communicating door or direct to the outside.

426.13 WARD OR DORMITORY EGRESS: In wards or dormitories with six (6) or more occupants (patients or boarders) there shall be two (2) egresses, one of which shall be directly to the outside.

426.14 COMMUNICATING DOORS: Communicating doors in patients' rooms and the direct-to-the-outside door from wards or dormitories may be omitted from type 1, 2A or 2B construction.

426.15 STAIRWAYS: Stairs shall be a minimum of four (4) feet between walls or between walls and balustrades.

426.16 EGRESS DOORS: All designated egress doors shall open in the direction of egress. Patient bedroom doors may swing in either direction, providing those swinging into a corridor are recessed and will protrude not more than five (5) inches into the corridor when opened ninety (90) degrees.

426.17 EGRESS DOOR WIDTHS: Egress doors to the outside shall be forty-four (44) inches in width. Doors from the patients' rooms to the corridor shall be three (3) feet eight (8) inches in width. Communicating doors between rooms shall be a minimum of two (2) feet eight (8) inches in width.

426.2 CONSTRUCTION REQUIREMENTS: Nursing homes and convalescent homes shall be built only of type 1 and 2 construction.

SECTION 427.0 DAY CARE CENTERS (H-2)

Day care centers shall be subject to the applicable provisions of the Basic Code and the provisions of this section. Day care centers licensed by the Office of Children shall be subject to compliance with the rules and regulations of that authority.

427.1 LOCATION

427.11 HIGH HAZARD RESTRICTION: No day care centers may occupy the same building with or be within two hundred (200) feet of a high hazard occupancy.

427.12 BASEMENT USE: A basement, as defined in the Basic Code, of a type 4B construction structure, may not be used for a day care center.

427.2 MEANS OF EGRESS

427.21 FEWER THAN THIRTY (30) CHILDREN: Where the basement is used as the day care center or part thereof, for fewer than thirty (30) children there shall be two exitways placed as remote from each other as possible. One such exitway shall be directly to the outside at grade level and shall require less than eight (8) feet of vertical travel to reach the exitway discharge. In such an exitway, where stairs are used, the stairway may not be enclosed if the vertical travel is less than four (4) feet. Otherwise, a two (2) hour enclosure is required for the stairway with a one and one-half (1½) hour self-closing fire door.

427.22 THIRTY (30) OR MORE CHILDREN: Where the basement is used as the day care center or part thereof, for thirty (30) or more children, at least two (2) exitways, placed as remotely as possible from each other, shall be provided directly to the outside, one (1) of which shall discharge at ground level.

427.23 EXITWAY REQUIREMENTS: Exitway other than those required by sections 427.21 and 427.22 shall lead to the primary floor for discharge. Stairways for such exitways shall have egress doors which are self-closing and one and one-half (1½) hours fireresistance rating.

427.24 EGRESS ON FLOORS OTHER THAN BASEMENT: Each story shall be provided with not less than two (2) means of egress properly located, and such additional approved egresses shall be located from the occupied spaces so that to reach an egress, it will not be necessary to pass through a common corridor or space.

427.25 EGRESS FROM EACH ROOM: Two (2) approved egresses properly located shall be provided from each occupied room (one (1) of which may be by communicating door) leading to two (2) separate exits so arranged that to reach one it will not be necessary to pass through the common corridor or space.

427.26 STAIRWAYS: All required egress stairways shall be enclosed with not less than one (1) hour fireresistance rating and one (1) hour fire-resistance self-closing doors unless otherwise specified in this section.

427.27 EGRESS LIGHTING: Egress lighting shall be provided as required by the building official and in conformance with article 6, including requirements for emergency lighting.

427.3 DOORWAYS: All exitway doorways shall be at least thirty-six (36) inches in width. All other doorways shall be at least thirty-two (32) inches in width.

427.4 HANDRAILS: All required egress stairways shall be provided with double handrails on both sides, and these shall be continuous including all runs and platforms and shall be built as follows:

a) the upper rail shall be installed at approximately thirty-three (33) inches high measured vertically at the face of the riser.

b) the lower rail shall be installed at approximately twenty (20) inches high measured vertically at the face of the riser.

427.5 HEATERS: Any heaters in spaces occupied by children shall be separated from the occupied space by partitions, guards, screens, or other means. Space and unit heaters using combustibles shall be prohibited.

427.6 BOILER ROOMS: Boilers, furnaces or other fire units shall be enclosed as required in section 1113. No boiler room door shall open into an occupied area.

427.7 FLOOR AND CEILING PROTECTION: When the occupied floor is above any usable space, the floor shall have a three-quarter (3/4) hour fire rating.

SECTION 460.0 SCHOOLHOUSE BUILDINGS

The provisions of this section shall apply to all buildings, structures and parts thereof which are classified as schoolhouse buildings as defined in article 2.

460.1 ADMINISTRATIVE

460.11 INCREASE IN BUILDING SIZE: If the building is increased in floor area or number of stories, the entire building shall be made to conform with these regulations in respect to means of egress, fire safety, light and ventilation with the following exceptions: a) Horizontal additions with fire divisions, and b) An increase in floor area of ten (10) percent or less for nonclassroom use--are permitted provided compliance with the area limitations of Table 2-6 and of section 304 are maintained for the existing building.

460.12 STATEMENT OF COMPLIANCE: All drawings submitted in compliance with section 113 shall be prepared by a registered architect, a registered surveyor, and/or a registered professional engineer and shall bear their registration stamp. The first sheet of their respective drawings shall bear signed statements by them that the materials and construction indicated conforms to at least the requirements of this Code.

460.2 SPECIAL USE AND OCCUPANCY REQUIREMENTS

460.21 WELDING

460.211 Welding booths shall be constructed of noncombustible material and in a manner which will permit escape by slight pressure.

460.212 In a multi-storied building, the floor and ceiling of a room where welding is being performed shall be of type 1 or type 2 construction.

460.213 Each shop where welding is performed shall have two (2) individual means of egress not less than three (3) feet wide leading to separate exits remote from each other. One of these means of egress shall be direct to the outside and shall be equipped with an outward swinging, panic equipped escape door. Doors for such shops shall be constructed of a fire resistant material or be metal clad. Doors shall be equipped with automatic door closers.

460.214 Walls for shops shall be not less than two (2) hour noncombustible and constructed of solid masonry or of concrete blocks with metal wall reinforcement in alternate courses.

460.22 GLASS

460.221 Nonshattering glass, or guard rails or comparable protection shall be used when glass is installed below a height of thirty-two (32) inches, except that nonshattering glass or double

guard rails shall be provided below a height of forty-eight (48) inches in corridors or congregating areas. Guard rails shall be placed on the exterior if the adjacent outside area is paved.

460.222 In control screens and smoke screens, glass shall be nonshattering and three-quarter (3/4) hour fireresistant.

460.223 Glass used in doors shall comply with the American National Standard known as Z97-1 (1966) except where required to be wire glass to achieve a degree of fireresistance. This section shall also apply to sliding glass doors, storm doors, shower doors, bathtub enclosures and fixed glass panels adjacent to entrance and exit doors which because of their location, size and design may be mistaken as a means of ingress or egress.

460.224 Each light of safety glazing material installed as required by section 460.223 shall be permanently labeled by means of etching, sandblasting or firing of ceramic material to identify the labeler, whether manufacturer, fabricator or installer, and the nominal thickness and the type of safety glazing material and the fact that said material meets the test requirements of section 856.37.

460.23 SANITATION: Design total student population for calculating sanitation requirements shall be certified by the architect or owner.

All sanitation requirements shall be those as specified in the applicable provisions of the Massachusetts State Plumbing Code.

460.231 FACILITIES FOR HANDICAPPED: Sanitation for the handicapped shall conform to the Rules and Regulations of the Board to Facilitate the Use of Public Buildings by the Physically Handicapped, Form PHR-1, dated December 18, 1968.

460.24 CEILING HEIGHT: Classrooms shall have an average height of eight (8) feet six (6) inches minimum under the beams or ceilings. In establishing the average, a minimum of seven (7) feet shall be used.

460.3 LIGHT AND VENTILATION

460.31 LIGHTING: All rooms, corridors, stairways and exits, including outside steps, shall be suitably lighted when in use.

460.311 All classrooms used for students below grade 7, and a minimum of fifty (50) percent of all other classrooms shall be provided with natural lighting from transparent glass windows in outside walls. Colleges and universities are excepted from this requirement.

460.312 Artificial lighting shall be so designed to provide minimum intensities "maintained" as listed below. Except where noted, illumination measurements shall be made in a horizontal plane thirty (30) inches above floor level.

460.313 Classrooms, laboratories, study halls, libraries, offices, shops, combination-use rooms if used as study halls or libraries, and other instruction areas: 30-foot candles.

460.314 Drafting rooms, sewing rooms and sight-saving classrooms: 50-foot candles.

460.315 Gymnasiums, lunchrooms, playrooms and multi-purpose rooms: 20-foot candles.

460.316 Auditoriums and corridors: 10-foot candles.

460.317 Stairways: 10-foot candles, measured at the edge of the tread.

460.318 Toilet rooms: 20-foot candles.

460.319 Rooms designed for more than one (1) instructional purpose shall be illuminated at the highest level required for any of the activities they are designed to serve.

460.32 LIGHTING FIXTURES: The lighting fixtures in assembly halls, gymnasiums, and rooms used for instruction or study shall be of a type which will provide proper illumination. Protection against accidental breakage shall be provided in any areas used for physical activities.

460.33 VENTILATION: General mechanical means of ventilation shall be provided for all schoolrooms with a minimum capacity of twenty-four (24) cubic feet of standard air per minute for each occupant.

460.331 The air supply shall be taken from a source as free from dust or other impurities as possible. There shall be at least six (6) feet between the air intake of any unit and any other exhaust outlet.

460.332 OUTSIDE AIR: A minimum of ten (10) c.f.m. shall be fresh outdoor air. The volume of supply air shall be maintained constant by proper operation of the equipment and shall slightly pressurize the room. Provision shall be made for the removal of nine (9) c.f.m. of standard air per student in each room, through openings located at or near the floor or ceiling, vent ducts, etc., with proper means to control and regulate same. In determining the amount of outdoor air to be supplied to a given space, the amount required per student, together with enough to slightly pressurize the room and a proportionate amount of make-up air to contribute to any unsupplied but ventilated areas (corridors, toilet rooms, etc.) shall be used.

460.333 STUDENT POPULATION: The design total student population of each area for calculating ventilation requirements in accordance with section 113.5 shall be certified by the architect and the owner.

460.334 SPECIAL EXCEPTIONS TO VENTILATION REQUIREMENTS

460.335 BUILDINGS NOT OCCUPIED: The ventilation system shall be kept in operation at all times during normal occupancy of the building or space so used. When a space is not occupied, its ventilation system may be shut down and its outside air supply closed.

460.336 COLD WEATHER CONDITIONS: At outdoor air temperatures below thirty-five (35) degrees F., the minimum outside air requirements (508.2) may be reduced progressively to as low as zero (0) c.f.m. per occupant at a winter outdoor design temperature of zero (0) degrees or below.

460.337 AIR CONDITIONED CLASSROOMS: Classrooms provided with air conditioning equipment designed to provide a maximum temperature of seventy-eight (78) degrees F. at a relative humidity not to exceed fifty (50) percent when the outside temperature is at ninety-three (93) F.D.B. and seventy-five (75) degrees F.W.B., the minimum outside air requirement of section 508.2 may be reduced to not less than five (5) cubic feet per minute per occupant during the cooling cycle. The air to be removed also shall be proportionately reduced.

460.34 VENTILATION OF SPECIAL SPACES

460.341 Lunchrooms, auditoriums, gymnasiums, and locker-shower rooms: In lunchrooms, auditoriums, gymnasiums, and locker-shower rooms, the supply of air shall be equivalent to one and one-half (1 1/2) cubic feet of standard air per minute per square foot of floor area, of which one-half (1/2) shall be fresh outdoor air. The removal of air shall provide a minimum of four (4) air changes per hour of three-quarter (3/4) cubic feet per minute per square foot of floor area, whichever is less. Where such rooms, except those used for lunchrooms, have a ceiling height exceeding fifteen (15) feet, with a minimum outside wall exposure of forty (40) percent, provisions for the removal of air may be reduced to two (2) air changes or three-quarter (3/4) cubic feet per minute per square foot of floor area, whichever is less. Removal of air from the gymnasiums may be partially taken through the locker and shower rooms, provided that this air is passed through a heating coil to raise the temperature of the air to seventy-five (75) degrees F.

460.342 Kitchens: The kitchen areas shall be exhausted separately. The lunchrooms may be partially exhausted not more than thirty-three and one-third (33 1/3) percent through the kitchen exhaust system, provided that the lunchroom air is taken by ducts from near the floor level at the wall between the kitchen and lunchroom from the lunchroom side, or through grills near the floor.

460.343 Coat room, wardrobe and locker ventilation: All coat rooms shall be ventilated through proper ducts provided for this purpose.

460.344 Classrooms may be vented through wardrobes installed in

classrooms, provided they are mechanically exhausted.

460.345 Wardrobes shall be provided with permanent inlet openings at or near the floor, equivalent to an opening four (4) inches high and the full length of the wardrobe.

460.346 In classrooms which have individual, independent mechanical exhausts or with the classroom exhaust grills located at the floor of the wardrobes, the wardrobes shall be provided with top and bottom openings.

460.347 Lockers installed in corridors, locker rooms or other areas which are not mechanically ventilated shall have doors with top and bottom openings or grills.

460.348 Chemistry, laboratories, welding shops and automotive shops ventilation: Every chemistry room shall be provided with one or more fume cabinets. In lieu thereof, metal vent hoods shall be placed over each experiment table. Every welding booth or work bench space shall be provided with a metal hood close to the work. Every paint spray booth or rooms shall be provided with a separate direct mechanical exhaust. Every automative shop shall be provided a special gasoline fume exhaust to remove air from the lowest part of the floor or pit, and if the floor is provided with a floor drain, the exhaust shall be from the trap thereof.

If internal combustion engines are to be operated in the shops, approved gravity or mechanical muffler connections for exhaust of fumes direct to outside atmosphere shall be provided. All hoods, cabinets and exhausts shall be connected through suitable vent ducts to mechanical exhaust fans for removing the fumes and gases. Where necessary, there shall be bottom vents to provide a source of air. Proper shut-off dampers and manual controls shall be provided.

These special vents and ducts shall be separated from and in addition to the required classroom ventilation. In areas where there may be noxious gases, one-half (1/2) the classroom exhausts may be placed on the upper wall.

460.35 TOILET ROOM VENTILATION

460.351 VENTILATION THROUGH WALL OPENINGS: Each water compartment or urinal shall be provided with a proper vent opening into a duct leading to an exhaust fan or a heated flue, provided that wall ventilation shall not be permitted for stall urinals. Each vent opening shall be provided with a substantial "lock type" register, the bottom of which shall be placed not less than twelve (12) inches from the floor nor more than four (4) feet above the floor.

As alternative to compartment ventilation, toilet rooms may be provided with one (1) or more large substantial "lock type" registers on the fixture wall, the bottom of which may be placed

approximately at the top of the compartment partitions.

The exhaust fan shall have a capacity of sixty (60) cubic feet of air per minute for each water closet compartment vent, and in no case of less capacity than shall provide a change of air in the toilet room eight (8) times an hour. If the total number of compartment vents connected to the duct leading to the exhaust fan or heated flue, rated at sixty (60) cubic feet per minute each, is not sufficient to accomplish an eight (8) minute air change in the toilet room, an additional vent opening from the room into the duct leading to the exhaust fan or heated flue shall be provided.

460.352 DIRECT FIXTURE VENTILATION: When the ventilation of toilet rooms is effected through local vent openings on water closet and urinal fixtures, the exhaust therefrom shall be by means of a mechanical exhaust fan or fans. Each water closet so ventilated shall have an integral raised vent of not less than eight (8) square inches net area unobstructed by waterways or connections, which shall be connected to the fan inlet through a tight sheet metal duct having a minimum cross-sectional area of twenty (20) square inches, and enlarging in size eight (8) square inches for each fixture connected thereto.

Stall urinals shall be ventilated by not less than two (2) inch inside diameter brass, copper or cast iron vent pipe beneath the fixture and connecting to the duct, having not less than two (2) inch tight connections to toilet room vent flues, or through a vent not less than two (2) inches from beneath an integral hood at top of the fixture. The ducts leading to the fan inlet shall be proportioned as in the preceding paragraph.

The mechanical exhaust fan for fixture ventilation shall be rigidly constructed and quiet in operation, with a capacity of thirty-five (35) cubic feet of air per minute for each water closet and urinal fixture, and in no case of less capacity than will provide a change of air in toilet rooms of six (6) times an hour. If the total number of fixture vents connected to the duct leading to the fan rated thirty-five (35) cubic feet of air per minute for each fixture is not sufficient to accomplish a ten (10) minute air change in the toilet room, an additional vent opening from the room into the duct leading to the fan shall be provided.

The vent duct shall have a minimum cross-sectional area of fifty (50) square inches, and shall increase in area forty-two (42) square inches for each compartment vent connected thereto. This shall apply to heat-activated gravity systems only.

460.353 Ventilation shall not be directly into a "utility space," so called, but the duct to which the vents shall be connected may be run in such space.

460.354 Individual toilet rooms may be ventilated at the ceilings.

460.355 TOILET ROOM VENT DUCTS: The ducts connecting the local vents from water closets, urinals, and compartments shall pitch up sharply from the fixtures and outlets to the toilet room vent-flue or fan inlet with a minimum rise of one (1) inch to each foot of run.

460.356 SEPARATION OF TOILET ROOM VENTILATION: All toilet room ventilation systems shall be distinct and apart from all other ventilation.

460.357 VENTILATING EQUIPMENT AND DISTRIBUTION DUCTS: The mechanical ventilation systems, equipment, and distributing ducts shall be installed in accordance with the provisions of articles 11 and 18.

460.36 EXISTING SCHOOLHOUSE BUILDINGS

460.361 UNSAFE CONDITIONS: In all existing rooms or spaces in which the provisions for light and ventilation do not meet the requirements of this Code and which in the opinion of the building official are dangerous to the health and safety of the occupants, he shall order the required repairs or installation to render the building or structure in compliance with this Code.

460.362 ALTERATIONS: No schoolhouse building shall hereafter be altered or rearranged so as to reduce either the size of a room or the fresh air supply or the amount of available natural light to less than that required for buildings hereafter erected; or to create an additional room unless made to conform to the requirements of this Code. The building official may permit new rooms to be of the same height as existing rooms in the same story unless in his opinion greater provision of artificial light and ventilation is deemed necessary to insure healthful living conditions.

460.4 INTERCOMMUNICATING FLOOR LEVELS

Where necessary for the functional design of the building, any structure other than one classified in occupancy group H-2, 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. The entire area, including all communicating floor levels, shall be sufficiently open and unobstructed so that it may be reasonably assumed that the occupants of this area will be aware that a fire or other dangerous condition exists. The combined areas of the intercommunicating floor levels shall not exceed thirty thousand (30,000) square feet.

460.41 ARRANGEMENT: The arrangement of any intercommunicating floor levels shall comply with the requirements of Table 2-6.

460.42 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.

460.43 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 capcity 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.

460.44 ENCLOSING WALLS: The enclosing walls of the space created by the communicating floor levels shall have a fireresistive rating of not less than that required for interior exitway stairways as specified in 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.

406.5 MEANS OF EGRESS: For all areas, spaces or rooms with an occupancy load of ten (10) or more persons used for instructional or assembly purposes there shall be at least two independent means of egress leading to separate exits remote from each other, so arranged that to reach one it will not be necessary to pass through a common corridor or space. For the purpose of this section, a smoke screen barrier shall be construed as effectively dividing a corridor or space into independent areas.

460.51 DEAD END CORRIDORS: The maximum length of travel of a dead end corridor for classroom buildings shall be thirty (30) feet with no more than one (1) classroom on each side of the corridor.

460.52 AISLE AND CORRIDOR WIDTHS: Aisle and corridor widths shall be as provided for in section 610.3 with the following minimum total widths:

460.521 Corridors with classrooms on both sides shall have a clear width of seventy-two (72) inches for four (4) and five (5) classrooms; eighty-four (84) inches for six (6) and seven (7) classrooms; and ninety-six (96) inches for eight (8) or more classrooms.

460.522 Corridors with classrooms on one (1) side shall have a minimum clear width of seventy-two (72) inches.

460.523 Corridors not over thirty (30) feet in length leading to no more than two (2) shops or non-classroom spaces, averaging not more than twenty-five (25) persons per room may be four (4) feet wide.

460.524 Corridors of the lobby type serving as assembly areas in connection with cafeterias shall have a minimum clear width of ten (10) feet.

460.525 Corridors providing side exits shall be a minimum clear width of four (4) feet to a minimum three (3) foot six (6) inch door, properly marked with exit signs in the main corridor.

460.526 With lockers or coat-hanging spaces along one (1) wall of the above corridors add twelve (12) inches to the minimum clear width; along both walls, add twenty-four (24) inches to the minimum clear width.

460.53 AISLE: When fixed seating is used, the aisle in classrooms shall be not less than the following widths:

All clear aisles	1 foot 5 inches
Wall aisles next to window	3 feet
Other wall aisles	2 feet 6 inches

460.54 REQUIRED MEANS OF EGRESS DOORWAYS

460.541 Doors to shops having not more than thirty (30) pupils and doors to rooms formed by two (2) classrooms connected with a folding partition may swing in.

460.542 All classroom doors may swing in either direction, providing those swinging into a corridor are recessed and will protrude not more than five (5) inches into the corridor when fully open.

460.543 CLASSROOM GRADE EXIT DOORS: A five (5) inch step is permitted where a classroom door opens to the outside, and where a designated exit is not protected from the weather; otherwise, the outside platform shall be approximately at floor level.

460.55 STAIRWAYS

460.551 VERTICAL RISE: The height of vertical rise shall not exceed nine (9) feet between landings and intermediate platforms

460.552 MINIMUM DIMENSIONS: In addition to the provisions of section 616.4, 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 (25) inches. The height of risers shall not exceed seven and one-half (7 1/2) inches, and treads, exclusive of nosing, shall be not less than ten (10) inches wide. Every tread less than eleven (11) inches wide shall have a nosing, or effective projection, of approximately one (1) inch over the level immediately below that tread. The height of the riser shall not exceed six and one-half (6 1/2) inches and the width of the tread shall not be less than twelve (12) inches for all exterior entrance stairways.

460.553 SUPPLEMENTAL STAIRWAYS: Monumental stairs, either inside or outside, may be accepted as required exits if all requirements for exit stairs are complied with, including required enclosures and minimum width of tread, except that curved stairs may be accepted with a radius of twenty-five (25) feet or more at the inner edges.

460.56 EXITWAY SIGNS AND LIGHTS: Exitway signs and lights shall conform to the requirements of section 623 except for existing schoolhouses having means of egress signs reading "EXIT" in red letters at least five (5) inches high on a white background or in other approved distinguishable colors, illuminated by an electric light of not less than twenty-five (25) watts, visible from the exit approach and supplemented by directional signs in the access corridors indicating the direction and ways of egress. Such signs may be internally illuminated with an enclosing noncombustible case through ruby glass. The letters of internally illuminated signs shall not be less than four and one-half (4 1/2) inches high.

460.57 MEANS OF EGRESS LIGHTING

460.571 In auditoriums, multi-purpose rooms and gymnasiums, where used for assembly purposes, provisions shall be made for control of general artificial illumination from the rear of the room, the projection room (if any) and the probable location of a projector.

460.572 EMERGENCY LIGHTING REQUIREMENTS: Emergency lighting shall be provided for all exits, corridors, passages and stairways. In addition, emergency lighting shall be required in all gymnasiums, auditoriums, multi-purpose rooms, and rooms without natural lighting. Rooms less than four hundred (400) square feet of floor area without natural lighting used as service or storage areas will not require emergency lighting. Emergency lighting shall be installed in accordance with the requirements of sections 624.4 and 624.41.

460.6 FIRERESISTIVE PARTITIONS

460.61 EXCEPTION: Fireproof Construction - In all buildings and structures of other than schoolhouse institutional (use group H) of fireproof (type 1), or of protected noncombustible (type 2) construction, space and office dividers, not including 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 and spaces, provided they do not establish a public corridor or a private corridor serving an occupant load of fifty (50) or more and not exceeding ten thousand (10,000) square feet between fireresistive or fire partitions, fire walls and fireresistive floors. 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) percent increase in area.

460.62 LATCHES AND ASTRAGALS: Latches and astragals for Class C doors in path of egress may be omitted in use Group F-3 and F-4 occupancies if required to be self-closing. Frames shall be of steel or metal-covered wood of label construction. Doors shall be steel, metal-covered core and of label construction.

460.63 FIRE DOORS

460.631 SPECIAL SITUATIONS: Shop and chemistry laboratory doors shall be Class C doors.

460.632 GLASS PANELS: Wired glass panels shall be permitted in fire doors within the limitations of section 919 and as herein specifically prescribed.

460.633 Smoke barriers or screens shall consist of noncombustible partitions containing or not containing wire glass panels and/or smoke stop doors conforming to the following: Smoke stop doors shall be self-closing, swinging doors of metal, metal-covered, aluminum, or one and three-quarter (1 3/4) inch 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 solid core wood with clear wire glass panels, unless the doors are also used as horizontal exits in which case they shall comply with the provisions of section 917.21 for Class B or Class C doors as the exitway may require. 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 meeting the requirements of section 612.44.

460.634 WIRED GLASS: For schoolhouses, the maximum dimension of twelve (12) inches in section 919.2, the maximum twelve (12) inch height for Class B door in section 919.4, and the size limitation of section 919.5 shall not apply.

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	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			Board of Boiler Rules
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
Mass-DPH	Article VI	1969	Minimum Standards for Swimming Pools
NFPA	Vol. 1	1969-70	Flammable Liquids
NFPA	24	1973	Outside Protection (Yard Piping)
NFPA	30	1973	Flammable and Combustible Liquids Code
NFPA	32	1972	Dry Cleaning Plants
NFPA	33	1973	Spray Finishing Using Flammable and Combustible Materials
NFPA	34	1966	Dip Tanks Containing Flammable or Combustible Liquids
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 Store
Mass-DPS	PHR-1		Rules and Regulations of the Board to Facilitate the Use of Public Buildings by the Physically Handicapped

NFPA	58	1972	Liquefied Petroleum Gases, Storage and Handling
NFPA	59	1968	Liquefied Petroleum Gases at Utility Gas Plants
NFPA	60	1973	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	1971	Industrial Plants, Fundamental Principles for Prevention 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	1973	Air Conditioning and Ventilating Systems
NFPA	101	1967,1971 1973	Life Safety Code
NFPA	102	1972	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	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	Flameresistant Textiles and Films, Standard Method of Tests for

LIGHT AND VENTILATION

SECTION 500.0 SCOPE

The provisions of this article shall govern the means of light and ventilation required in all habitable and occupiable spaces and rooms. Every building and structure hereafter erected and every building, room or space which is changed in use shall be constructed, arranged and equipped to conform to the requirements of this article and the applicable standards listed in the reference section of this article.

500.1 OTHER REGULATIONS: Nothing in this article shall be construed to nullify the provisions of the local zoning by-laws or ordinances or subdivision controls promulgated under authority of Chapter 41, or Chapter 40A respectively of the Massachusetts General Laws Annotated as amended.

500.2 OTHER STANDARDS: Compliance with the applicable provisions of the standards listed in the reference section of this article shall be deemed to meet the requirements of this article, unless otherwise specifically provided herein.

SECTION 501.0 DEFINITIONS

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 side thereof opening on to a street, alley, or yard or other permanent open space.

HABITABLE ROOM: a room or enclosed floor space arranged for living, eating, and sleeping purposes (not including bathrooms, water closet compartments, laundries, pantries, foyers, hallways and other accessory floor spaces).

HABITABLE ROOM, MINIMUM HEIGHT: a clear height from finished floor to finished ceiling of not less than seven and one-half (7½) feet, except that in attics and top half-stories the height shall be not less than seven and one-third (7-1/3) feet over not less than one-third (1/3) the area of the floor when used for sleeping, study or similar activity.

HABITABLE ROOM, MINIMUM SIZE: a room with 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.

OCCUPIABLE ROOM: a room or enclosed space designed for human occupancy in which large numbers of individuals congregate for amusement, educational, or similar purposes or in which occupants are engaged at labor; and which is equipped with means of egress, light, and ventilation facilities meeting the requirements of the Basic Code.

VENTILATION. (See section 1801.0.)

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.

YARD: an open unoccupied space on the same lot with a building extending along the entire length of a street, or rear, or interior lot line.

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 and when means of artificial lighting and ventilation are required, the application shall include sufficient 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

In the application of the provisions of this article, the standard of natural light for all habitable rooms, unless otherwise specifically required by the provisions of article 4 for special uses and occupancies, shall be based on two hundred and fifty (250) foot candles of illumination on the vertical plane adjacent to the exterior of the light transmitting device in the enclosure wall and shall be adequate to provide an average illumination of six (6) foot candles over the area of the room at a height of thirty (30) inches above the floor level.

503.1 WINDOW AND SKYLIGHTS: All habitable rooms or spaces shall contain windows, skylights, monitors, glazed doors, transoms, glass block panels or other light transmitting media opening to the sky or on a public street, yard or court complying with the provisions of this article. The light transmitting properties and the area of the devices used shall be adequate to meet the minimum daylighting requirements specified herein.

503.2 WINDOW SIZE: Windows and exterior doors may be used as a natural means of light and when so used their aggregate glass area shall amount to not less than one-tenth (1/10) of the floor area served.

503.3 INTENSITY OF ILLUMINATION: In all required exitways, except in one and two-family dwellings, and wherever natural lighting is not available, artificial lighting shall be provided to furnish not less than three (3) foot candles at the floor level of all required exitways.

503.4 STAIRWAYS AND EXITWAYS IN RESIDENTIAL AND INSTITUTIONAL BUILDINGS

503.41 WINDOWS: In all multi-family dwellings (use group L-2) and in institutional buildings for the care or treatment of people (use group H-2) required interior stairways shall be provided with windows to the outer air having a glass area of not less than ten (10) square feet which opens on a required street, alley, yard or court, or with the equivalent source of light for each story through which the stairway passes; and such additional artificial lighting to provide the equivalent illumination at all times that the building is occupied as specified in section 624.0.

503.42 SKYLIGHTS: When the building is not more than three (3) stories in height, a ventilating skylight of the required area may be used in lieu of windows.

503.43 HALLWAYS: Hallways shall have at least one window opening directly on a street or on a required yard or court in each story, located so that light penetrates the full length of the hallway, with additional windows for each change of direction of the hallway; or the equivalent artificial lighting shall be provided. Every recess or return with a depth or length which exceeds twice the width of the hall, and every corridor separately shut off by a door, shall be treated as a separate hall in applying the provisions of this section.

SECTION 504.0 STANDARDS OF NATURAL VENTILATION

Natural Ventilation shall be from unobstructed windows, skylights, monitors, doors, louvres, 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 located on the same lot and which complies with the requirements of Section 512.

504.1 AREA OF NATURAL VENTILATING OPENINGS: Natural ventilating openings from habitable spaces shall have a free area when open of at least 5 percent of the floor area of the space ventilated. The

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 screening.

504.2 VENTING OF SPECIAL SPACES

504.21 ALCOVE ROOMS: When alcove rooms open without obstruction into adjoining rooms, the required window openings to the outer air shall be based on the combined floor area of room and alcove. No such alcove space shall be more than sixty (60) square feet in area and the opening to the adjoining room shall be not less than eighty (80) per cent of the superficial area of the dividing wall, unless provided with separate means of light and ventilation.

504.22 ATTIC SPACES: All attic spaces and spaces between roofs and top floor ceilings shall be ventilated by not less than two (2) opposite windows, louvres, or vents with a total clear area of opening not less than one-third (1/3) of one (1) per cent of the horizontally projected roof area.

504.23 CRAWL SPACES: In buildings and structures constructed without basements, in which the first floor construction does not bear directly on the ground, a space shall be provided under the first floor not less than eighteen (18) inches in depth; and such space shall be vented with screened openings having a clear area of not less than one-third (1/3) of one (1) per cent of the enclosed building area, or shall be provided with other means of ventilation approved by the building official. When floating mat foundations are provided in accordance with section 734.0, the requirement for ventilation shall not apply.

SECTION 505.0 VENTILATION OF INSTITUTIONAL BUILDINGS FOR FORCED DETENTION

In buildings of the Institutional use group used for enforced detention, all rooms shall comply with the requirements of this article for light and ventilation. However, where necessary, alternate means of complying with these provisions may be approved, providing that it can be shown that they fulfill all the requirements of these provisions for light and ventilation as applicable.

SECTION 506.0 EXISTING BUILDINGS

506.1 UNSAFE CONDITION: In all existing rooms or spaces in which the provisions for light and ventilation do not meet the requirements of this article and which in the opinion of the building official are dangerous to the health and safety of the occupants, he shall order the required repairs or installations to render the building or structure livable for the posted use and occupancy load.

506.2 ALTERATIONS: No building shall hereafter be altered or rearranged so as to reduce either the size of a room, or the fresh air supply, or the amount of available natural light to less than that required for buildings hereafter erected; or to create an additional room unless made to conform to the requirements of section 503. The building official may permit new rooms to be of the same height as existing rooms in the same story unless in his opinion greater provision of artificial light and ventilation is deemed necessary to insure healthful living conditions.

506.3 UNCOVERED YARD AND COURT AREA: No building shall be hereafter enlarged, nor shall the lot on which it is located be diminished so as to decrease the required courts or yards to less than that prescribed in this article for the lighting and ventilation of new buildings.

SECTION 507.0 STANDARDS OF ARTIFICIAL LIGHT

507.1 ARTIFICIAL LIGHT REQUIREMENTS: Adequate means for providing 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.

507.2 MEANS OF EGRESS: Means of egress lighting shall comply with the requirements of article 6.

507.3 PLACES OF ASSEMBLY: Artificial lighting shall be provided as required in articles 4 and 6.

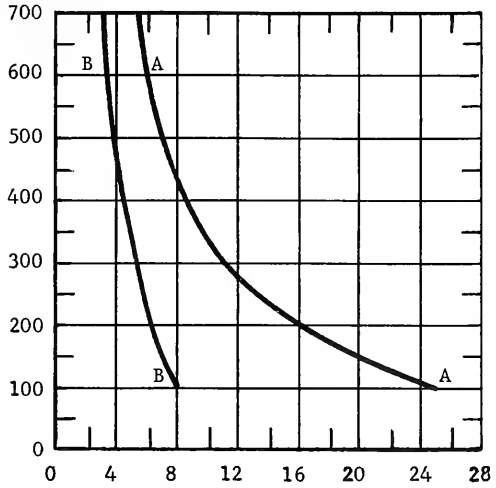
507.4 BATHROOMS AND TOILET ROOMS: Artificial lighting of bathrooms and toilet rooms shall be provided to produce an average of three (3) foot candles thirty (30) inches above the floor.

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.

508.21 FIGURE 5-1 MINIMUM OUTSIDE AIR REQUIREMENTS FOR VENTILATION AND AIR CONDITIONING



Minimum Outside Air, Cu. Ft. Per Person Per Min.

508.22 CURVE A - VENTILATION ONLY: The values obtained from Curve A in Figure 5-1 represent the minimum volume of outside 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) per cent for areas in which the occupancies contain or involve:

   1) Grade school children
   2) Light smoking
   3) Food Service
   4) Other occupancies involving air contamination

b) Values of Curve A shall be increased fifty (50) per cent 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.

508.23 CURVE B - MECHANICAL COOLING: The values obtained from Curve B in Figure 5-1 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 duct of the system apparatus. When exhaust is to a return duct, the system apparatus shall be equipped to mix outdoor and return air under conditions which assure 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 (c) above, 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 RECIRCULATION: Portions of the fresh air supply required in this section may consist of recirculated air as stated herein, subject to the prohibited use requirements of section 508.51 and the allowance for adsorption devices of section 508.6.

508.51 PROHIBITED USE OF RECIRCULATED AIR: The use of the air from Kitchens, Lavatories, Toilet Rooms, Bathrooms, Rest Rooms, Laboratories and Garages for recirculation shall be prohibited.

508.52 HABITABLE ROOMS: Recirculation of up to seventy-five (75) percent of the air supplied may be permitted in habitable rooms except kitchens, provided the air recirculated does not come from a plenum or system fed with air returned from habitable rooms in other dwelling units, or from stairways or common hallways. Recirculation of one-hundred (100) percent of the air supplied may be permitted if the system supplied only a single dwelling unit.

508.53 WORK ROOMS: Recirculation of not more than seventy-five (75) percent of the air supplied may be permitted in work rooms, provided the air is free from harmful dusts, fumes, vapors, mists, or gases.

NOTE: Recirculation of air removed by local exhaust systems is prohibited unless the contaminant is removed by an approved method to a safe limit of concentration. The amount of air supplied to replace all air exhausted by local exhaust ventilation systems shall be considered as fresh air in the calculation of the requirements in section 505.31 and 505.32 provided that the air supplied is free from contamination and is from an approved source. This provision also applies to cold air douches used in hot industries.

508.54 RESTAURANTS AND DINING HALLS: Not more than fifty (50) percent of the air supplied to restaurants and dining halls shall be recirculated.

508.55 OFFICES AND PUBLIC INSTITUTIONAL BUILDING: Not more than seventy-five (75) percent of the air supplied to offices and public and institutional buildings shall be recirculated.

508.56 HOSPITALS AND MEDICAL CARE FACILITIES: Hospitals and Medical Care Facilities may employ recirculated air in compliance with the approved methods and systems of the reference section of this article.

508.6 USE OF ADSORPTION DEVICES: If recirculation of air is permitted, the required outdoor air supply may be reduced to 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 absorption devices shall be acceptable to the building official and in conformance with good engineering practice.

a) Improper maintenance - Should absorption 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 100 percent of the outdoor air required by this section or section 508.0.

b) 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 an approved agency at least twice every six months. The records of such tests shall be maintained for a period of at least two years, and shall be available for inspection by the building official.

SECTION 509.0 VENTILATION OF SPECIAL SPACES

509.1 KITCHENS: Kitchens shall be ventilated as follows:

a) 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:

   1) Natural means complying with section 504.0.

   2) Mechanical means exhausting at least two (2) cfm of air per square foot of floor area.

b) 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:

   1) Natural means complying with section 504.0 or mechanically air-cooled means complying with Figure 5-1 Section 508.21 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.

   2) 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 and fifty (150) cfm.

c) 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:

1) Natural ventilation complying with section 504.0.

2) Mechanical ventilation complying with section 508.0.

d) Air shall be exhausted through ducts or chimneys constructed in accordance with the provisions of articles 10, 11 and 18.

e) 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:

a) When ventilated by natural means, the natural ventilation openings shall comply with section 504.0 except:

1) In no case shall the net free area of the ventilation openings be less than one and one-half (1½) square feet.

2) In occupancy groups H-1 and H-2, the ventilation openings 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.

b) 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 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.

c) When a bathroom or toilet room is not ventilated by a natural ventilation as required by this section, it shall be mechanically ventilated as follows:

1) Rooms containing only one water closet or urinal shall be mechanically ventilated by an exhaust system capable of exhausting at least forty (40) cfm.

2) 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.

3) Toilet exhaust systems shall be arranged to expel air directly to the outdoors.

d) 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 person shall be ventilated at a rate of four changes of air per hour or as required by Section 508.22, 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 504.0 to provide ventilating openings equivalent to at least two and one-half (2½) percent of the floor area.

c) In occupancy groups H-1 , H-2 and L-2, mechanical supply of at least one-half (½) cubic foot of outdoor air per minute per square foot of floor area.

SECTION 510.0 VENTILATION OF SHAFTS OTHER THAN ELEVATOR AND DUMBWAITER HOISTWAYS

All enclosed vertical shafts extending through more than two (2) stories of every building or structure, except elevator or dumbwaiter hoistways, shall be automatically vented to the outer air as herein required or as specified in section 911.0.

510.1 EXTENDING TO ROOF: Shaft enclosures extending to the roof shall be provided with a metal skylight constructed to comply with section 927.2 or with windows of equivalent area or with other approved automatic means of removing hot air and gases.

510.2 THERMOSTATIC CONTROL: The automatic 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.

510.3 NOT EXTENDING TO ROOF: Shaft enclosures not extending to the roof shall be provided with gas and smoke relief vents or adequate mechanical means of ventilation in conformity to the provisions of section 911.4 and article 18.

SECTION 511.0 INDUSTRIAL BUILDINGS WITH UNPIERCED ENCLOSURE WALLS

511.1 AIR CONDITIONING: When light and ventilation yards, courts or other required open spaces are not provided as herein specified, buildings may be erected for industrial and commercial uses within the height and area limitations of article 3 and table 2-6 when such buildings and structures are equipped with approved artificial lighting, ventilating and air conditioning systems furnishing the equivalent light and ventilation. The installation of all such systems shall comply with the provisions of article 18.

511.2 FIRE PROTECTION: Buildings and structures without exterior window openings in all stories which are provided with approved mechanical ventilating and air conditioning systems shall be equipped with the fire protection and fire-extinguishing media herein prescribed complying with the requirements of article 12;

511.21 ACCESS PANELS: Fire Access Panels of the required size and location shall be installed in the enclosure walls as specified in section 858.0.

511.22 FIRE ALARMS: Interior Fire Alarm signal systems shall be provided and maintained as specified in article 12;

511.23 SPRINKLERS: Two-Source Automatic Sprinkler systems with supervisory service and fire department connections shall be installed to comply with article 12;

511.24 FIRE-VENTING: The building or structure shall be fire-vented as prescribed in section 514.

SECTION 512.0 COURTS

All courts required to serve rooms for light and ventilation purposes shall comply with the requirements of this section.

512.1 WIDTH OF COURT.

512.11 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.

512.12 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.

512.2 AREA OF COURT: The cross-sectional area of a required court shall be not less than one and one-half (1½) times the square of its width; nor shall the length of any court be more than twice its width.

512.3 ACCESS TO COURT: A door or other means of access shall be provided at the bottom of every court that is not otherwise conveniently accessible for purposes of cleaning.

512.4 AIR INTAKES TO COURT.

512.41 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 intake or passage of fireresistive construction. Such intake or 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 intake.

512.42 FIRERESISTANCE: The walls, floors and ceiling of such intakes or passages shall have a fireresistance rating of 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.

512.5 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.

512.6 COURT DRAINAGE: The bottom of every court shall be properly graded and drained to a public sewer or other approved disposal system complying with the Massachusetts State Plumbing Code; and shall be paved with concrete or other non-absorbent material when required by the building official.

SECTION 513.0 OBSTRUCTION OF COURTS AND YARDS

513.1 PERMISSIBLE PROJECTIONS: Every required court and yard shall remain unobstructed for its required area and full height, except for the projections permitted in section 313.0. 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.

SECTION 514.0 FIRE EMERGENCY VENTILATING SYSTEM

In all buildings and structures herein required to have fire emergency ventilating systems, the common hallways 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 ventilating or 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.

514.1 WHERE REQUIRED: Fire emergency ventilating systems shall be provided:

a) in buildings used for H-1 and H-2 (institutional) use 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 buildings used for L-1 and L-2 (hotel and apartment house) use groups which:

   1) same as 1 above,

   2) same as 2 above,

   3) same as 3 above.

c) in all fully enclosed industrial building without provision of exterior openings for ventilation purposes.

514.2 FIRE VENT DUCTS: When the common hallways and exit ways are not ventilated by windows opening directly to the outer air as required in section 503, a system of collecting fire ducts shall be provided in each story of aggregate size to remove the smoke, hot air and noxious fumes or gases in event of fire. Each duct shall be not less than one (1) square foot in area located in the common hallways with screened openings complying with the approved rules, constructed as provided for hot air ducts in sections 1019 and 1119.

514.3 THERMOSTATIC OPERATION: When not connected to a vent stack the inlet openings on each story shall be controlled by automatic heat-operated devices as required in section 510.2 and in accordance with the approved rules.

514.4 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 one floor or enclosed fire area, 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 automatic cowl or ventilator outlet above the roof.

514.5 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.

514.6 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 exitway 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.

514.7 STACK CONSTRUCTION: The stack enclosure shall be constructed to be vapor and smoke tight with walls of not less than two (2) hours fireresistance, with no openings other than the fire duct inlets and the top automatic ventilator outlet.

514.8 MECHANICAL EXHAUST SYSTEMS: When mechanical exhaust is required to operate the emergency ventilating 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 515.0 FIRE VENTILATION OF OPEN WELLS

Unenclosed well openings for moving stairways constructed in accordance with the provisions of ELV-2 and not accepted as a required element of an exitway shall be permitted in mercantile buildings when equipped with an approved two-source supervised automatic sprinkler system and protected on every floor pierced by the opening with an approved automatic exhaust system or by other approved methods as herein required to prevent the passage of fire, smoke and gases to the story above.

515.1 EXHAUST SYSTEM: The approved automatic exhaust system may be a separate unit or integrated with an approved air conditioning system and shall be thermostatically controlled to operate simultaneously with the detection of fire.

515.11 CAPACITY OF EXHAUST SYSTEM: The exhaust system shall be of adequate capacity to create a down draft in the open well with sufficient velocity of flow over the entire area of the well opening under normal conditions of window and door openings in the building. In air conditioned buildings the system shall operate satisfactorily to the building official with the normal air conditioning fans shut off.

515.2 WATER CURTAIN: An approved water curtain with baffles shall be located to form a continuous water barrier extending from floor to ceiling on all exposed sides of the well opening. Such water curtain shall be formed and operated automatically, either with open sprinklers or spray nozzles or with approved automatic sprinklers, or other approved thermostatically controlled devices.

515.3 POWER CONTROL: The power lines to all parts of the exhaust system and fresh air intake shall be furnished from an independent power supply complying with article 15 and the reference standards of this article for the control of automatic fire pumps and blower and exhaust systems.

515.4 AIR CONDITIONED BUILDINGS: The exhaust system herein required, when installed in an air conditioned building, shall be so arranged so to automatically stop the operation of the mechanical air conditioning and ventilating systems and close the dampers of the return air duct connection in the event of fire.

SECTION 516.0 WINDOW CLEANING SAFEGUARDS

All buildings and structures over fifty (50) feet or four (4) stories in height, in which the windows are cleaned from the outside, shall be provided with anchors or other approved safety 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.

Reference Standards - Article 5

USHEW	HRA-74-4000		General Standards of Construction and Equipment for Hospital and Medical Facilities
Mass-DPH	Article II	1969	Minimum Standards of Fitness for Human Habitation
ASHRAE		1967	Guide and Data Book, Handbook of Fundamentals
ASHRAE		1968	Guide and Data Book, Applications
ASHRAE		1969	Guide and Data Book, Equipment
Mass-DPS	ELV-2	1971	Board of Elevator Regulations: Elevator, Dumbwaiter, Escalator, and Moving Walk Regulations

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 thereafter altered to a new occupancy load, or manner of use, or inherent fire hazard. Existing buildings and uses shall be controlled by the provisions of section 605.

600.1 MODIFICATION OF EXITWAY REQUIREMENTS: When strict compliance with the provisions of the Basic 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, section 101.22.

600.2 MINIMUM REQUIREMENTS: It shall be unlawful to alter any building or structure in any manner that will reduce the number of exitways or the capacity of exitways 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 the standard listed at the end of this article shall be deemed to meet the requirements of this article, unless otherwise specifically provided herein.

SECTION 601.0 DEFINITIONS

AUTOMATIC FIRE DOOR: (see section 901.0)

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.

COMMON HALLWAY: a common corridor or space separately enclosed which provides any of the following in any story:

a) common access to the required exitways of the building, or
b) common access for more than one (1) tenant, or
c) common access for more than thirty (30) persons.

DOORWAY: the clear width of the opening protected by a door, subject to the width reduction provisions of this Code.

ESCALATOR: a moving stairway.

EXITWAY: that portion of a means of egress which is separated from all other spaces of a building or structure by construction or equipment as required in this Code to provide a protected, unobstructed way of travel to the exitway discharge.

EXITWAY ACCESS: exitway access is 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 termination of an exitway and a public space with access to a public way or street.

FIRE DOOR: (see section 901.0)

FIRE DOOR ASSEMBLY: (see section 901.0)

FIRE WINDOW: (see section 901.0)

FLOOR AREA, GROSS: for the purpose of determining the number of persons for whom exits are to be provided, gross floor area shall be the floor area within the perimeter of the outside walls of the building under consideration, with no deduction for hallways, stairs, closets, thickness of walls, columns, or other features.

FLOOR AREA, NET: for the purpose of determining the number of persons for whom exits are to be provided, net floor area shall be the actual occupied area, not including accessory unoccupied areas or thickness of walls.

GRADE HALLWAY, GRADE LOBBY, GRADE PASSAGEWAY: an enclosed hallway or corridor that is an element of an exitway, terminating at a street or an open space or court communicating with a street.

HALLWAY, GRADE: (see grade hallway)

HORIZONTAL EXIT: a way of passage from one building or fire area to an area of refuge in another building or fire area on approximately the same level, which affords safety from fire or smoke from the area of escape and areas communicating therewith.

MEANS OF EGRESS: a continuous and unobstructed path of travel from any point in a building or structure to a public space 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 shall include intervening room spaces, doors, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts and yards.

MOVING STAIRWAY: escalator.

SELF-CLOSING: as applied to a fire door or other opening protective, means normally closed and equipped with an approved device which will insure closing after having been opened for use.

SLIDESCAPE: a straight or spiral chute erected on the interior or exterior of a building which is designed as a means of human egress direct to the street or other public space.

SMOKEPROOF TOWER (FIRE TOWER): an interior enclosed stairway, with access from the floor area of the building either through outside balconies or ventilated vestibules opening on a street or yard or open court, and with a separately enclosed direct exitway leading directly to an exitway discharge at the street or grade floor.

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. A flight of stairs, for the purposes of this article, must have three (3) or more risers.

WINDER: a step in a winding stairway.

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 in compliance with the provisions of this Code.

602.2 NUMBER OF OCCUPANTS: In other than one and two-family and multi-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 exitways shall be determined by the occupancy load prescribed in section 606. The posted occupancy load of the building shall be limited to that number.

SECTION 603.0 USE AND OCCUPANCY REQUIREMENTS

603.1 NEW BUILDINGS: Every building and structure and part thereof hereafter erected shall have the required number of exitways complying with the requirements of this Code. Exitways in combination with the exitway access and exitway discharge shall provide a safe and continuous means of egress to a street or to an open space with direct access across to a street.

603.2 MIXED OCCUPANCY GROUPS: When a building is classified in more than one (1) 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 MULTIPLE TENANTS: When more than one (1) tenant occupies any one floor of a building or structure, each tenant shall be provided with direct access to approved exitways.

603.4 BUILDING ACCESS FOR HANDICAPPED: All buildings and parts thereof classified in use groups C (Mercantile), D (Industrial), E (Business), F (Assembly), H (Institutional), L-1 and L-2 (Residential) shall have at least one primary entrance accessible to and usable by the handicapped. 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 one (1) in ten (10) and comply with the other provisions of this article for access to the handicapped.

SECTION 604.0 AIR-CONDITIONED BUILDINGS

604.1 LOCATION OF STAIRWAYS: In all buildings, without exterior window openings in all stories, that are artificially ventilated and air-conditioned as provided in section 511, 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 858.0 or as otherwise approved in at least alternate stories of the building.

604.2 EXHAUST DUCTS: No exhaust ducts or vents of air-conditioning systems shall discharge into stairway or elevator enclosures nor shall corridors serving as exitway access 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 605.0 EXISTING BUILDINGS

605.1 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.

605.2 UNSAFE MEANS OF EGRESS

605.21 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.

605.3 NO CHANGE IN USE: When there is no change in use group or occupancy load, the minimum exitway requirements shall be as follows:

605.31 NEW EXITWAYS: If new or altered exitway facilities are installed or construction, they shall comply with all the requirements for new buildings.

605.32 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-five (75) occupants above or more than forty (40) occupants below grade floor, all existing enclosed stairways shall be enclosed with partitions and opening protectives of two (2) hour fireresistance rating complying with article 9; doors shall be self-closing. Existing enclosures of substandard fireresistive construction shall be covered on the stair side only with the component materials required for a two (2) hour fireresistive assembly.

605.33 FIRE ESCAPES: In buildings not over five (5) stories or sixty-five (65) feet in height, fire escapes complying with the requirements of section 621 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.

605.4 EXISTING USE CHANGED: In every building or structure in which there is a change from one use group to another with special requirements, 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 606.0 OCCUPANCY LOAD

606.1 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:

606.11 The actual number of occupants for whom each occupied space, floor, or building, as the case may be, is designed for; or,

606.12 The number of occupants computed at the rate of one (1) occupant per unit of area as prescribed in table 6-1; or,

606.13 The number of occupants of any space as computed in section 606.11 or 606.12 above plus the number of occupants similarly computed for all spaces that discharge through space in order to gain access to an exitway.

606.2 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 exits shall be designed for the total occupancy load thus established.

606.3 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.

606.4 SPECIAL USES: For areas in other use groups not specified in the Basic Code, the building official shall establish the occupancy load to be assumed in the design.

606.5 CONFLICTS: 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.

TABLE 6-1 FLOOR AREA ALLOWANCE PER OCCUPANT

USE	FLOOR AREA IN SQUARE FEET PER OCCUPANT
Areas without fixed seats	12 net
Areas with fixed seats (theatres, bleachers, etc.)	6 net (Note 1)
Areas with fixed seats (restaurants, bars, etc.)	8 net
Standing space	3 net
Bowling alleys, allow five (5) persons for each alley, including fifteen (15) feet of runway, and for additional areas	10 net
Business areas	100 gross
Court rooms	40 net
Day nurseries	35 net
Educational	(Note 2)
Garages and open parking structures	250 gross
Industrial areas	200 gross
Institutional	
Sleeping areas:	
Single occupant room	125 net
Multiple occupant room	90 net per occupant
In-patient areas	240 gross
Kitchens (non-residential)	200 gross
Locker rooms	20 gross
Mercantile, basement and grade floor area	30 gross
Areas on other floors	60 gross
Schoolhouses (Note 3)	
Classrooms	20 net
Shops and vocational	50 net
Assembly (conference rooms, dining rooms, refreshment areas, exhibit rooms, gyms, lounges)	15 net
Storage, shipping areas	100 gross
Residential	200 gross
Stages	
Performing areas	15 gross
Other areas	50 gross
Storage areas, mechanical equipment room	300 gross

Note 1: The occupant load for an assembly area having fixed seats shall be determined by the number of fixed seats installed.

Note 2: Standards for Educational uses are subject to the provisions of Reference Standard F-6, Building Regulations for Schoolhouses, of the State Building Code Commission.

Note 3: The capacity or occupant load permitted in a building or portion thereof may be increased above that specified if the necessary aisles and exits are provided subject to the approval of the building official.

SECTION 607.0 TYPES AND LOCATION OF EXITWAYS

All approved exitways, including doorways, passageways, corridors, hallways, interior stairways, exterior stairways, moving stairways, smokeproof towers, ramps, horizontal exits, bridges, balconies, fire escapes and combinations thereof shall be arranged and constructed as provided herein and in article 9 for fire enclosure requirements.

607.1 ARRANGEMENT: All required exitways shall be so located as to be visible and readily accessible with unobstructed access thereto and 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.

607.2 SEPARATION OF EXITWAYS: Whenever more than one (1) exitway 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.

607.3 LENGTH OF TRAVEL: All exitways shall be so located that the maximum length of exitway access travel, measured from the most remote point to an approved exitway along the natural and unobstructed line of travel shall not exceed the distances given in table 6-2; except that in buildings of residential, mercantile or institutional use groups where the area is subdivided into rooms or compartments, and the egress travel in the room or compartment is not greater than fifty (50)* feet, the distance shall be measured from the exitway access entrance to the nearest exitway.

* May be increased to 100 feet, in use groups equipped with automatic sprinklers.

607.4 FLOORS BELOW GRADE: In buildings of all use groups the permissible length of exitway access travel on any floor more than one (1) story below grade shall not exceed seventy-five (75) feet.

TABLE 6-2 MAXIMUM LENGTH OF EXITWAY ACCESS TRAVEL (FEET)

USE GROUP	LENGTH '	LENGTH WITH FIRE SUPPRESSION SYSTEM
High Hazard (A) ...	--	75
Storage (B)	100	150
Mercantile (C)	100	150
Industrial (D)	150	250
Business (E)	200	300
Assembly (F)	150	200
Institutional (H) .	100	200
Residential (L) ...	100	150

SECTION 608.0 CAPACITY OF EXITS

608.1 UNIT OF EXIT WIDTH: The basic whole unit of clear exit width is twenty-two (22) inches and its whole multiples. The allowance for excess width of twelve (12) inches to twenty-one (21) inches is one-half (1/2) unit. (No credit given for excess width less than twelve (12) inches.

22" to 33" = 1 unit	33" to 43" = 1 1/2 units*
44" to 55" = 2 units	56" to 65" = 2 1/2 units
66" to 77" = 3 units	78" to 87" = 3 1/2 units

*A door 40" in width = 2 units; a single door 33" to 39" = 1 1/2 units; 40" to 44" = 2 units.

608.2 DESIGN CAPACITY ALLOWANCE: Specific modifications: article 4

Means of Computation:
Design Capacity = units of egress width (608.1) x number of persons per unit egress width (table 6-3).

TABLE 6-3 CAPACITY PER UNIT EGRESS WIDTH

	Without Suppression System Number of Occupants		With Suppression System Number of Occupants	
USE GROUP	Stairways and Ramps	Doors and Corridors	Stairways and Ramps	Doors and Corridors
High Hazard (A)	--	--	60	100
Storage (B)	60	100	90	150
Mercantile (C)	60	100	90	150
Industrial (D)	60	100	90	150
Business (E)	60	100	90	150
Assembly (F)	75	100	113	150
Assembly (F-6) (Classroom areas)				
1 or 2 stories	90	100	120	150
3 stories or more	75	100	120	150
Institutional (H)	22	30	33	45
Residential (L)	75	100	113	150

NOTE: The main exitway of a bowling alley shall be of sufficient capacity to accommodate fifty (50) percent of the total occupant load, without regard to the number of aisles which it serves.

SECTION 609.0 NUMBER OF EXITWAYS

The following general requirements apply to buildings of all use 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.

609.1 MINIMUM NUMBER: Except in one and two-family dwellings, there shall be two (2) or more approved independent exitways serving every floor area above and below the grade floor, one (1) of which shall be an interior enclosed stairway. Exitways in dwellings shall be so arranged that they may be reached without passing through another living unit.

609.11 EXITWAYS IN RESIDENTIAL USE GROUPS: In all multi-family residential use groups (L-2), except as provided in section 609.12, each apartment shall have access to at least two (2) independent exits which are remote from each other; such exits shall be so arranged that to reach either exit it will not be necessary to pass through a public corridor which serves the other.

609.12 EXITWAYS IN TYPE 1-A, 1-B, 2-A AND 2-B, L-2 USE GROUPS: In buildings of type 1-A, 1-B, 2-A and 2-B construction a single exitway shall be permitted for every room, or group of less than four (4) rooms used for residential occupancy on multi-family floors, provided that elevator lobbies on all floors except the ground floor are enclosed with self-closing fire doors, so that no entrance door of any room or apartment shall be more than fifty (50) feet from the nearest egress or segregating fire partition. Doors from elevator lobbies, doors in segregating fire partitions, and doors to stair enclosures, shall not be over two hundred (200) feet apart. Sleeping facilities shall be limited to not more than six (6) persons beyond the enclosed stairs. Rooms other than bedrooms connected with the same living unit may be permitted.

609.2 BASEMENT RECREATION ROOMS: In residential buildings (use 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 ceiling of not less than three-quarter (3/4) hour fireresistive construction. A direct secondary exit from the basement to streets, yards or courts leading to the street, shall be acceptable in lieu of the requirement for an enclosed stairway.

609.3 OPEN PARKING STRUCTURES: Parking structures shall have at least two (2) or more exitways from each parking tier, except that where vehicles are mechanically parked, only one (1) exitway need be provided in structures not exceeding eighty-five (85) feet in height. The maximum distance from any point on a parking tier to an exitway at that tier shall be three hundred (300) feet. Ramps used for the movement of vehicles need not be enclosed and may be considered as required exitways in structures not exceeding eighty-five (85) feet in height where

vehicles are attendant parked and in other structures having not less than two (2) enclosed stairways. The construction of stairways, ramps and stairway enclosures shall comply with the applicable requirements of this Code; except that stairways in a structure where vehicles are attendant parked and the height of the structure does not exceed fifty (50) feet, or in structures not exceeding eighty-five (85) feet in height where vehicles are mechanically parked, only one (1) stairway need be enclosed.

SECTION 610.0 EXITWAY ACCESS PASSAGEWAYS AND CORRIDORS

610.1 ACCESS PASSAGEWAYS: Direct exitway access shall be provided to required exitways through continuous passageways, aisles or corridors, conveniently accessible to all occupants and maintained free of obstruction.

610.11 TURNSTILES AND GATES: Access through turnstiles, gates, rails or similar devices shall not be permitted unless such a device is equipped to readily swing in the exiting direction of travel under a total pressure of not more than fifteen (15) pounds.

610.2 DEAD ENDS: Exitway access passageways and corridors in all stories which serve more than one (1) exitway shall provide direct connection to such exitways in opposite directions from any point in the corridor, insofar as practicable. In no case shall the length of a dead end corridor be more than twenty (20) feet except in type 1A and 1B the corridor length may be thirty (30) feet.

610.3 WIDTHS: The unit exit width and occupancy allowance of aisles and corridors, unless otherwise provided for special uses and occupancies in article 4, shall be the same as for exitway stairways (table 6-3) with a minimum total width of forty-four (44) inches in buildings of the storage, business, industrial and assembly use groups; sixty (60) inches in mercantile and institutional buildings other than those used for the movement of beds which shall be ninety-six (96) inches; and seventy-two (72) inches in church schools; except that in churches and chapels, side aisles may be one-half (½) the width but in no case less than thirty-two (32) inches clear.

610.4 OPENING PROTECTIVES: All door assemblies from rooms opening onto a common corridor, required by table 2-5 to be of three-quarter (3/4) fireresistive construction, shall be equipped with approved automatic or self-closing:

a) three-quarter (3/4) hour fire doors; or,
b) one and three-quarter (1-3/4) inch thick solid core wood doors; or,
c) their approved equivalent.

All door assemblies from rooms opening onto a common corridor, required by table 2-5 to be of two (2) hour fireresistive construction, shall be one and one-half (1½) hour fire doors.

SECTION 611.0 GRADE PASSAGEWAYS AND LOBBIES USED AS AN EXITWAY ELEMENT

611.1 ENCLOSURES OF PASSAGEWAYS: Every required interior and exterior exitway element 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.

611.2 WIDTH AND HEIGHT: The effective width of the lobby or other enclosed passageway shall be not less than three-quarters (3/4) of the aggregate width of all required exitway stairways leading thereto and all required exitway doorways opening into the passageway. Such passageway shall have a minimum width of forty-four (44) inches and a minimum clear ceiling height of eight (8) feet.

611.3 MAXIMUM STAIRWAY LIMITATIONS: Not more than fifty (50) percent of required exitway capacity shall discharge through the same passageway.

611.4 CONSTRUCTION: The enclosures of grade passageways and lobbies connecting required means of egress to the street shall be of the firerated construction required for exitways in table 2-5. All openings which are elements or components of a required means of egress shall comply with the requirements of article 9 relative to opening protectives.

When there are accessory uses within the grade passageway or lobby a fire suppression system will be required.

SECTION 612.0 MEANS OF EGRESS DOORWAYS

The requirements of this section shall apply to all doorways serving as a component or element of a means of egress; except this section shall not apply to doorways leading to or from required stairways (see sections 616.6, 618.5, and 619.3).

612.1 NUMBER OF DOORWAYS: Every room with an occupancy load of more than fifty (50) or which exceeds one thousand five hundred (1500) square feet in area shall have at least two (2) egress doorways and the doors shall be hung to swing in the direction of exit travel without obstructing the required width of exitway.

612.11 ENTRANCE AND EGRESS DOORWAYS: Where separate doors are provided for entrance and egress use, the entrance door shall be clearly marked "ENTRANCE ONLY" in letters not less than six (6) inches in height and legible from both inside and outside; unless such doors are 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. Unless so equipped, doors swinging inward only shall not be accepted as part of the required egress elements. When doors are operated by mechanical opening device they shall comply with the requirements of section 612.44.

612.2 SIZE OF DOORWAYS: The minimum width of single doorways shall be thirty-two (32) inches and the maximum width shall be forty-four (44) inches with the following exception:

Access for the handicapped: In all buildings and parts thereof subject to the provisions of section 603.4 primary entrance and access doorways shall be thirty-six (36) inches or greater in width.

When the doorway is subdivided into two (2) or more separate openings, the minimum clear width of each opening shall be at least thirty-two (32) inches, and each opening shall be computed separately in determining the number of required units of exit width.

The minimum clear width of single doorways in one and two-family dwellings and from retail stores and similar spaces on the grade floor to the street, when not required as access for the handicapped, shall be thirty (30) inches or greater in width.

The height of doorways shall be at least six (6) feet eight (8) inches. In applying the provisions of this Code, the normal doorway opening with the allowance for door jambs as provided in section 612.21 shall be used for computing the required size doorways.

612.21 DOORWAY WIDTH REDUCTION: Door jambs may project into required width of an exit door opening not more than one (1) inch for each full twenty-two (22) inch exit unit.

612.3 LOCATION OF DOORS: The required doorways opening from a room or space within a building leading to an exitway access 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 607.3 and table 6-2.

612.4 DOOR HARDWARE

612.41 OPERATION: Locks and fastenings on egress doors shall be readily opened from the inner side without the use of keys. Draw bolts, hooks and other similar devices shall be prohibited. The locking device must be of a type that will be readily distinguishable as locked. These requirements shall apply in any case only during the normal hours of occupancy.

612.411 LOCKS IN MULTI-FAMILY DWELLINGS: Requirements for locks in multi-family dwellings are subject to the provisions of section 3R of Chapter 143 of the Massachusetts General Laws Annotated, as amended.

612.42 PANIC PROOF: In rooms of use group F-2 (assembly) with an occupancy load of more than fifty (50) and in rooms of use groups F-1 and F-3 (assembly) with an occupancy load of more than three hundred (300), egress doors shall be equipped with approved panic proof latches or bolts which release under a pressure of fifteen (15) pounds.

612.43 REMOTE CONTROL: In rooms of use group H-1 (institutional) occupied as places of detention, approved releasing devices with remote control shall be provided for emergency use.

612.44 MECHANICAL OPERATIONS: Except as may be otherwise provided for openings in fire and fire division walls, all fire doors shall be self-closing and shall be closed during occupancy of the building or part thereof, except that fail safe electro-magnetic holders when activated by approved rate of temperature raise and approved smoke detection devices located on both sides of the opening and connected to the central fire alarm stations may be used on all exit and smoke screen doors in horizontal hallways, exitways and corridors but not on doors connected to stairwells. Where egress 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 load of not more than fifteen (15) pounds applied in the direction of exitway travel.

612.5 DOOR CONSTRUCTION: All required egress doors that serve as an element of an exitway shall be self-closing or automatic fire doors with approved hardware, except for grade floor exitway discharge doors and revolving exitway doors as provided for in sections 612.51 and 613.0.

612.51 GRADE EXITWAY DISCHARGE DOORS: Plate glass doors having one or more unframed edges may be used provided they are constructed of tempered glass not less than three-quarter (3/4) inches thick. Glass doors and adjacent lights which may, in the opinion of the building official, constitute a hazard by virtue of not being readily visible as a barrier, must be of approved safety glasing material.

SECTION 613.0 REVOLVING EXITWAY DOORS

613.1 LIMITATIONS OF USE

613.11 WHERE PERMITTED: Except in places of use group F (assembly) with an occupancy load of more than two hundred (200) and in buildings of use 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 but not to exceed fifty (50) percent of the total required grade floor exits.

613.12 PROHIBITED CONSTRUCTION: Braces or other devices that prevent normal operation of the automatic releasing mechanism shall be prohibited.

613.13 SUPPLEMENTAL EXITS: Approved swinging doors shall be provided to furnish one-half (½) the required exitway width in accordance with the provisions of this article. In any case, there shall be a minimum of two (2) approved swinging doors provided, one on each side and immediately adjacent to the revolving door.

613.2 WIDTH OF PASSAGE

613.21 UNIT EXIT WIDTH: Automatic collapsible revolving doors approved as an element of a required exitway shall provide a minimum clear unit exit width of passageway through the vestibule when the leaves are in a collapsed position.

613.22 MINIMUM DIAMETER: The minimum diameter of approved revolving doors shall be adequate to provide the required clear exit width when collapsed, but in no case less than six and one-half (6½) feet in diameter.

613.3 SPEED CONTROL: All approved automatic collapsible revolving doors shall be equipped with an approved speed control governor adjustable to safe traffic speed, but in no case more than fifteen (15) nor less than ten (10) revolutions per minute.

613.4 CONSTRUCTION: All approved automatic collapsible revolving doors shall be constructed as follows:

613.41 OPERATING MECHANISM: The collapsing mechanism shall be constructed of stainless steel or other approved corrosion-resistive materials;

613.42 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, providing the construction is at least equivalent to that of a solid core three-quarter (3/4) hour fire rated door construction;

613.43 FLOOR COVERING: Approved mats of other floor coverings, complying with the provisions of article 9, not more than one-half (½) inch thick, may be installed within the enclosure when permanently secured to the structural flooring and finishing flush with the adjacent floor area;

613.44 GLAZING: The doors shall be glazed with not less than seven thirty-seconds (7/32) inch plate glass.

613.5 INSPECTION AND MAINTENANCE: The owner shall be responsible for the care, operation and maintenance of all revolving door installations after such doors are placed in operation. The building official may from time to time, and shall annually between December first and March first, examine each revolving door within his jurisdiction. If the buidling official finds that any revolving door fails to comply with the provisions of these regulations, he shall notify the owner of the changes which are necessary for compliance, and if the owner fails to make the necessary changes within thirty (30) days, shall order in writing the removal of the door. Periodic inspections shall be made by the person or firm responsible for the installation at intervals of not more than three (3) months and shall maintain all parts in proper working order.

TABLE 6-4 MINIMUM CLEAR DOORWAY WIDTHS

LOCATION	USE			Maximum Single Doorway Door Width
	1 AND 2-FAMILY DWELLINGS RETAIL STORES	E	ALL OTHER USE GROUPS	
GRADE EXIT DOORWAY	30" (Ref. section 612.2)	32"	32"	44"
DOORWAYS SERVING AS COMPONENT OR ELEMENT OF MEANS OF EGRESS	32"	32" (Ref. section 612.2) Doorway divided into 2 or more doors: 28" each		44"
STAIRWAY EXIT DOORWAY	36" (Ref. section 616.61)	42" (Ref. section 616.61)	As calculated by section 608.1	44"
SMOKEPROOF TOWERS 1) Interior stairs to vestibule 2) Vestibule or balcony to stairway 3) Stairway exit	No Requirements	42" (Ref. section 620.3)	As calculated by section 608.1	44"
EXTERIOR STAIRWAYS ACCESS	32" If part of required means of egress	As calculated by section 608.1		44"
DOORWAY REQUIRED AS ACCESS FOR HANDICAPPED	36" in retail stores	36"; doorway divided into 2 or more doors: 32" each		44"

SECTION 614.0 HORIZONTAL EXITS

Horizontal exits as herein defined shall be accepted as an approved element of a required means of egress when complying with the requirements of this article. The connection between the areas of refuge as herein specified may be accomplished by protected openings in a fire wall, by a vestibule, or by an open-air balcony or bridge.

614.1 OPENING PROTECTIVES: One side of the opening in fire walls or fire divisions which are required to have a fireresistance rating of two (2) hours or more shall be protected with a one and one-half (1½) hour self-closing fire door, swinging in the direction of exitway travel, and on the opposite side with an approved automatic fire door or water curtain. When serving as a dual element of a means of egress, there shall be adjacent openings with swinging fire doors opening in opposite directions.

614.2 SIZE OF DOORS: Size of openings in fire walls shall comply with the provisions of section 908, but in no case shall the width of one opening used as a required exit be greater than eighty-eight (88) inches nor shall the area exceed eighty (80) square feet.

614.3 AREA OF REFUGE: The areas connected by the horizontal exit shall be either public areas or spaces occupied by the same tenant and each such area of refuge shall be adequate to house the total occupancy load of both connected areas as provided in table 6-1.

614.4 UNLOCKED DOORS: Horizontal exit doors shall be kept unlocked and unobstructed whenever the area on either side of the horizontal exit is occupied.

614.5 EGRESS FROM AREA OF REFUGE

614.51 STAIRWAY EXITWAY: There shall be at least one (1) interior enclosed stairway of smokeproof tower on each side of the horizontal exit 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 exit and the required exitway exceed the requirements of section 607.3 and table 6-2.

614.52 AUXILIARY ELEVATOR: When horizontal exits are provided in floors located twelve (12) or more stories above grade, the required stairway shall be supplemented by at least one (1) passenger elevator complying with section 621, maintained ready for use during normal occupancy of the building.

SECTION 615.0 EXITWAY RAMPS

Ramps with a gradient of not more than one (1) in ten (10) may be used as an exitway component and shall comply with all the applicable requirements of required interior stairways as to enclosure, capacity,

and limiting dimensions; except in existing buildings and where specified in article 4 for special uses and occupancies, larger gradients may be permitted, but in no case greater than one and one-half (1½) in ten (10). For all slopes exceeding one (1) in ten (10) and wherever the use is such as to involve danger of slipping, the ramp shall be surfaced with approved non-slip materials. In no case shall ramps required for the use of handicapped persons have a gradient of more than one (1) in ten (10).

615.1 HANDRAILS: Ramps required for use by handicapped persons shall have a handrail on at least one side that is not less than thirty (30) inches nor more than thirty-three (33) inches in height measured from the surface of the ramp. Handrails shall be smooth and shall extend one (1) foot beyond the top and the botton of the ramps and return to walls or ports at the ends.

615.2 LANDINGS: On ramps required for the use of handicapped persons, landings shall be provided at all ramp points of turning, entrance, exitway and doors at a minimum of thirty (30) foot intervals. All landings shall provide a clear distance of forty-two (42) inches from any door swinging to the ramp. Minimum landing length shall be forty-two (42) inches and the bottom landing of any ramp or set of ramps and landings of a straight run shall be a minimum length of seventy-two (72) inches.

SECTION 616.0 INTERIOR EXITWAY STAIRWAYS

616.1 CAPACITY OF EXITWAY STAIRS: The capacity of stairways and doors per unit of exit width shall be computed in accordance with section 608.

616.2 MINIMUM DIMENSIONS

616.21 WIDTH: All required interior stairways shall be at least forty-two (42) inches in width except that such width may be reduced to thirty-six (36) inches in buildings of use group L-3 (one and two-family dwellings) or in exitways from boiler rooms and similar service spaces not open to the public or in general use by employees.

616.22 HEADROOM: The minimum headroom in all parts of the stair enclosure shall be not less than six and two-thirds (6-2/3) feet.

616.23 RESTRICTIONS: No stairways shall reduce in width in the direction of exit travel.

616.3 LANDINGS AND PLATFORMS

616.31 WIDTH: The least dimension of landings and platforms shall be not less than the required width of stairway.

616.32 VERTICAL RISE: In buildings of use group F (assembly) and use group H (institutional) occupancy, the height of vertical rise shall not exceed eight (8) feet between landings and intermediate platforms.

TABLE 6-5 DOOR CONSTRUCTION

DOOR USE / USE GROUP	REQUIRED EGRESS ELEMENT OF EXITWAY	DOOR USE: GRADE FLOOR EXITWAY DISCHARGE	DOOR USE: STAIRWAY EXITWAY DOOR	DOOR USE: SMOKEPROOF TOWERS DOORS TO VEST. BAL. & STAIR	DOOR USE: EXTERIOR STAIRWAY ACCESS DOOR
ALL	Self-Closing or Automatic Fire Door	Glass (Ref. Sections 612.51 and 859)	Approved Self-Closing Swinging Fire Doors Complying with Article 9	1 1/2 Hours or Approved Labeled Equivalent Per Article 9	3/4 Hour Self-Closing Fire Door
ALL EXCEPT: F WITH MORE THAN 200 OCCUPANTS, AND H		Revolving Doors (Ref. Section 613.11) Materials (Ref. Sections 613.42 - 613.44)			
1 AND 2-FAMILY DWELLINGS	Not Specified	Not Specified	1 3/4 Inch Solid Core Wood	Not Applicable	Not Specified

TABLE 6-6 MINIMUM STANDARDS FOR STAIRWAY AND ENCLOSURE CONSTRUCTION

USE GROUP (ARTICLE 2)	A, B, C, D E, F, H, L	A, B, C, D E, F, H, L	A, B, C, D E L	F, H	L-3 1 & 2-Family Dwelling	L-3 1 & 2-Family Dwelling
TYPE OF CONSTRUCTION (ARTICLE 2)	1, 2, 3, 4	1, 2	3, 4	3, 4	1, 2; 3, 4	1, 2, 3, 4
HEIGHT NO. OF STORIES	> 3	≤ 3	≤ 3	≤ 3	≤ 3	> 3
HEIGHT OR FEET	> 40	≤ 40	≤ 40	≤ 40		
NO. OF OCCUPANTS ABOVE GRADE	> 75	≤ 75	≤ 75	≤ 75	Not applicable	Not applicable
NO. OF OCCUPANTS BELOW GRADE	--	--	--	--		
NO. OF OCCUPANTS BELOW GRADE	> 40	≤ 40	≤ 40	≤ 40		
STAIRWAYS	Non-combustible	Non-combustible	No requirements	Non-combustible	No requirements	No requirements
ENCLOSURES	Non-combustible	Non-combustible	Note 1 No require.	Note 1 No require.	No requirements	No requirements
FIRE RATING	2 hrs	3/4 hr.	3/4 hr.	3/4 hr.	No requirements	3/4 hr.

Note 1: 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; fire-stopped as specified in sections 876, 909 and 921; and the space below the stairs shall be solidly enclosed with fireresistive partitions.

In all other buildings, no stairway shall have a height of rise of more than fifteen (15) risers between landings, nor shall any single stairway have less than three (3) risers.

616.4 TREADS AND RISERS

616.41 MINIMUM DIMENSIONS: The height of risers and the width of treads in inches shall be as follows:

Use Group	Maximum Risers[1]	Minimum Tread[2]
One and two-family dwellings (use group L-3)		
All stairs with closed risers	8-1/4 inches	9 inches
Stairs with open risers	8-1/4 inches	9 inches
Assembly and Institutional	7-1/2 inches	10 inches
All others	8 inches	9 inches

[1]The maximum allowable variation in the height of risers is ± one-quarter (1/4) inches.

[2]All treads shall have an effective nosing of one (1) inch to one and one-quarter (1-1/4) inches and shall be the same for the entire stairway.

616.42 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.

616.5 STAIRWAY GUARDS AND HANDRAILS: Unless otherwise specifically provided for in this Code all stairways, except accessory stairways in one and two-family dwellings, 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.

616.51 HANDRAIL DETAILS:

a) handrails may project not more than three and one-half (3½) inches into the required stair width.

b) handrails shall be not less than thirty (30) inches nor more than thirty-three (33) inches, measured vertically, above the nosing of the treads.

c) stairways provided for use by handicapped persons shall have handrails which shall extend eighteen (18) inches beyond the top and bottom step if a guard or wall exists. All handrails covered by this section shall be returned to walls or posts at the ends of the stairways.

d) handrails shall be designed to support an applied load of two hundred (200) pounds in any direction at any point.

616.52 GUARD DETAILS:

a) guards shall be not less than thirty (30) inches in height measured vertically above the nosing of the tread.

b) 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 of the following methods:

1) 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 ten (10) inches (measured vertically) from the tread nosing.

2) balusters spaced not more than six (6) inches apart.

3) 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 preceeding paragraphs.

4) walls.

5) any combination of the foregoing.

616.6 STAIR EXITWAY DOORS

616.61 WIDTH: The clear width of every exitway doorway to or from a stairway shall be not less than the number of units of exit width required for the capacity of the stairway which services the floor or floor area from which the exitway door leads; but in no case shall such a doorway width be less than thirty-six (36) inches nominal in use group L-3 buildings (one and two-family dwellings) and forty-two (42) inches nominal width in use group E (business buildings).

616.62 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.

616.63 DOOR CONSTRUCTION: All doorway opening protectives, including the frames and hardware, shall be approved self-closing swinging fire doors complying with article 9 except in one and two-family dwellings where one and three-quarter (1-3/4) inch solid core wood doors are permitted.

616.7 SPIRAL STAIRWAYS: Spiral stairways of noncombustible construction may be used as an element of a means of egress from mezzanine areas not more than two hundred fifty (250) square feet in area nor more than one-third (1/3) the area of the floor below. The minimum width shall be twenty-two (22) inches for the accommodation of not more than ten (10) persons.

616.8 SUPPLEMENTAL STAIRWAYS: Monumental, ornamental, or accessory stairways shall not be allowed without required enclosures in use groups D (Industrial), F (Assembly), and H (Institutional), and structures of type 3B, 3C, 4A, and 4B construction, unless specifically allowed in section 418.22. In all other structures, monumental, ornamental or accessory stairways extending from the grade floor to the basement or to the second floor, when not required as an element of exitway and not connecting more than two (2) adjoining stories, shall be allowed without enclosures. Monumental, ornamental or accessory stairways shall be additional to and shall not obstruct or interfere with required exitways.

616.9 STAIRWAY CONSTRUCTION: Unless herein otherwise provided, all required interior stairways shall be built entirely of noncombustible materials with solid risers, treads and landing platforms and all finish floor surfaces on non-slip noncombustible materials; except that wood handrails shall be permitted, complying with the requirements of section 616.5. In one and two-family dwellings, open risers may be used.

616.91 STRENGTH: All stairways, platforms, landings and exitways in other than one and two-family dwellings, shall be adequate to support a live load of one hundred (100) pounds per square foot.

616.92 MINIMUM STANDARDS FOR STAIRWAY AND ENCLOSURE CONSTRUCTION: Reference table 6-6.

SECTION 617.0 ACCESS TO ROOF

617.1 BY STAIRWAY: In buildings four (4) stories or more 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. 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.

617.2 ROOF ENCLOSURES: Stairways extending through roofs shall be enclosed in roof structures of fireresistive construction meeting the requirements of section 927.

SECTION 618.0 SMOKEPROOF STAIRWAY ENCLOSURE

618.1 WHERE REQUIRED: Al least one (1) of the required exitways shall be a smokeproof stairway enclosure in buildings over five (5) stories or over seventy (70) feet in height when one (1) of the following use groups:

a) C (Mercantile)
b) D (Industrial)
c) E (Business)
d) F-2, F-3, F-4, F-5, F-6, F-7 (Assembly buildings other than theatres)
e) H (Institutional)
f) L-1 (Hotel, dormitory)

618.2 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 and a minimum dimension of seventy-two (72) inches in the direction of exit travel.

618.3 DOOR OPENINGS: Door openings from interior spaces to the vestibule or balcony and from the vestibule or balcony to the stairway shall be as required in section 612.2. The doors from interior spaces to the vestibule shall have a fireresistance rating not less than one and one-half (1½) hours and shall comply with the requirements of section 616.6 for stair exitway doors. The door from the vestibule to the stairway shall be not less than a one and three-quarter (1-3/4) inch solid wood door set in a steel frame. Wired glass may be used in the door not to exceed one hundred (100) square inches in area and set in a steel frame. Any door assembly must be fitted to ensure minimal air leakage.

618.4 TERMINAL PASSAGEWAY: The smokeproof enclosure shall terminate at grade level and shall provide egress to the street independently of all other exitways. When grade passageways are used, they shall comply with the requirements of section 611, except that there shall be no openings therein other than the smokeproof enclosure and street exit doorways. The passageway walls shall be of four (4) hour fireresistive construction and the floor and roof of three (3) hour fireresistive construction.

618.5 CONSTRUCTION: The construction of smokeproof enclosures shall be of walls with a four (4) hour fireresistive rating without openings other than the required doorways. The vestibule shall be considered to be an element of the exitway and shall be constructed in accordance with the fireresistive requirements of table 2-5. The balcony shall be constructed in accordance with the fireresistive requirements in table 2-5 for floor construction.

The stairshaft vestibule or balcony shall be provided with emergency lighting from an approved independent power source to assure continued illumination in case of emergency. In buildings over seventy (70) feet in height, the emergency lighting system may be integrated with the emergency power system required for fire suppression systems as required in article 12.

618.51 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.

618.52 DOOR WIDTHS: 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 616.6 for exitway doors for stairways, except that the fireresistance rating shall be not less than one and one-half (1½) hours or the approved labeled equivalent complying with article 9.

618.6 VENTILATION OF SMOKEPROOF STAIRWAY ENCLOSURES: Smokeproof stairway enclosures shall be ventilated with natural ventilation or mechanical ventilation meeting the requirements of section 618.7 or 618.8. In buildings over seventy (70) feet in height, ventilation in exitway stairways must conform to the requirements of article 12.

618.7 SMOKEPROOF STAIRWAY ENCLOSURES BY NATURAL VENTILATION: The balcony separating the smokeproof enclosure from the interior building spaces shall have at least one (1) open side adjacent to a street, alley, or yard with four (4) feet high guard railings across the open side(s). One open side of the balcony shall have a minimum open area of sixteen (16) square feet with no dimension less than thirty (30) inches. Doors must be located so as to be openable in any weather. There shall be no step between the balcony and the smokeproof stairway enclosure.

618.8 SMOKEPROOF ENCLOSURE BY MECHANICAL VENTILATION: The stairshaft and vestibule shall be provided with a mechanical ventilation system as specified herein that will be automatically activated on three (3) or more floors in case of emergency. Buildings over seventy (70) feet in height shall conform to the requirements for ventilation of article 12.

618.81 OPERATION OF VENTILATING EQUIPMENT: Vestibule and stairshaft mechanical ventilation may be inactive or may operate at reduced levels for normal operations, but when the detectors referred to herein either fail or are activated, the vestibule and stairshaft mechanical ventilation system shall operate at the levels specified in sections 618.82 and 618.83. The vestibule ventilation system shall be designed and activated in accordance with one of the following methods:

Method 1) - TOTAL SYSTEM. Simultaneous operation of all vestibules. If the vestibule mechanical ventilation system is designed to provide the ventilation in the vestibules on all floors simultaneously, a products-of-combustion detector shall be located outside each vestibule so designed that activation or failure of any one of the detectors will simultaneously activate the vestibule ventilation system on all floors.

Method 2) - ZONED SYSTEM. Simultaneous operation of three or more vestibules. If the vestibule ventilation system is designed as one or more zones to provide the simultaneous ventilation in the vestibules for at least a three (3) floor zone, automatic supply and exhaust dampers shall be provided in all vestibules in order to obtain the zoned control of the ventilation as follows:

A smoke detector shall be located outside each vestibule so designed to open the supply and exhaust duct dampers in the vestibules within the affected zone three (3) or more floors, and to actuate the stairshaft ventilation system in case any detector in the affected zone either fails or is activated.

618.82 VESTIBULE VENTILATION: The vestibule shall have an emergency ventilating system providing not less than one (1) air change per minute supply. The exhaust shall be one hundred fifty (150) percent of the supply. The supply shall be sufficient to maintain a pressure of 0.025 inches of water (0.0009 pounds per square inch) above ambient with all doors closed.

618.83 STAIRSHAFT VENTILATION: The stairshaft shall be provided with emergency mechanical supply and exhaust air. There shall be a minimum of one (1) air change per minute. The supply shall be sufficient to provide a minimum of 0.05 inches of water column pressure (0.00185 pounds per square inch) above ambient with all doors closed. Supply air shall be introduced at the level of the grade exitway discharge.

618.84 STANDBY POWER: Mechanical vestibule stairshaft ventilation systems and detector systems shall be powered by an approved self-contained generator designed to operate whenever there is a loss of power in the normal house current. The generator shall be located in a separate room of two (2) hour fireresistive construction and shall have a minimum fuel supply to operate the equipment for two (2) hours. In buildings over seventy (70) feet high, refer to article 12 for requirements for standby power in fire suppression system.

618.85 EMERGENCY LIGHTING: The vestibules and stairshaft shall be provided with emergency lighting. The standby generator which is installed for the vestibule and stairshaft mechanical ventilation equipment may be used for the standby emergency lighting power supply. In buildings over seventy (70) feet high, refer to article 12 for requirements for standby power in fire suppression systems.

618.86 FIRE PROTECTION INDICATOR PANEL: A fire protection indicator panel may be required by the fire official and located as practical inside the entrance to the smokeproof tower stairshaft at grade. Said panel shall indicate the floor or floors having caused the alarm. Said panel shall have an overriding manual switch capable of deactivating the ventilation equipment. For buildings over seventy (70) feet in height, refer to article 12 for fire protection indicator panel requirements.

618.87 FIRE DEPARTMENT CONNECTION: The fire protection indicator panel shall have a direct connection to the fire department facilities if required by the fire official.

618.88 ACCEPTANCE AND TESTING: Before the foregoing equipment is accepted by the building official, it shall be certified by a qualified registered professional engineer as being designed and capable of operating in compliance with these requirements and the equipment shall be tested and certified by a qualified registered professionsal engineer that it is operating in compliance with the requirements of this section.

618.89 BUILDING OWNERS' RESPONSIBILITY: The building owner shall have tested all the equipment referred to in these requirements at least once every ninety (90) days to ensure that all parts are in operable condition;

and he shall maintain a log attesting to the results. The log shall be available for inspection by the building official and the fire official. Once each year the system shall be inspected, tested and certified by a qualified registered professional engineer that it is in condition and capable of operating to meet these requirements.

SECTION 619.0 EXTERIOR EXITWAY STAIRWAYS

619.1 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 five (5) stories or sixty-five (65) feet in height for other than use group H (institutional) provided there is at least one (1) additional stairway.

Exterior stairways which are accepted as exitway elements in residential buildings of use 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 (section 616.5 and 616.52) and shall be protected from the weather as required in section 619.2.

619.11 LOCATION AND ARRANGEMENT: Exterior stairways may be utilized where at least one (1) door from each tenant space opens onto a roofed-over 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 exitway stairways as specified in section 616.0. Porches and balconies shall not be less than four and one-half (4½) feet in width. The stairways shall be located remotely from each other. The maximum travel distance from any tenant space to the nearest stairway shall be as specified in table 6-2. 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.

619.2 GUARDS AND CANOPIES: Guards shall be provided on all exposed sides of required exterior stairways to a height of five (5) feet, constructed of wire or other noncombustible weather resisting mesh having a maximum opening of one and one-half (1½) inches. The stairway shall be protected by metal or other approved noncombustible material to the extent necessary to ensure that the stairway remains in a safe, unobstructed and easily accessible condition in any weather.

619.3 OPENING PROTECTIVES

619.31 DOORS: Except as specified in section 619.1 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 exit widths.

619.32 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.

619.4 LOCATION

619.41 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 611.

619.5 CONSTRUCTION: Exterior stairs shall be constructed entirely of steel or other approved noncombustible materials with pipe handrails on both sides of stairways and platforms. On buildings of type 3 or type 4 construction, not more than three (3) stories in height, exterior stairways may be constructed of wood members not less than two (2) inches in thickness.

619.6 CAPACITY: The capacity of exterior exitway stairways which are used as a required means of egress are determined by section 608.1.

SECTION 620.0 MOVING EXITWAY STAIRWAYS

620.1 WHEN ACCEPTABLE: Moving stairways of the horizontal non-slip tread type moving in the direction of egress may be accepted as an approved exitway element in buildings of all use groups except assembly and institutional uses, when constructed and approved in accordance with the requirements of this article and the provisions of ELV-2, elevator, dumbwaiter, escalator, and moving walk regulations, promulgated by the Board of Elevator Regulations, of the Commonwealth of Massachusetts, Department of Public Safety. When accepted as an element of a required means of egress, they shall be enclosed with fire-resistive partitions as specified in section 616.

620.2 WIDTH: The width shall be not less than forty (40) inches between guards and the moving tread shall be not less than thirty-six (36) inches in width, and fifteen and three-quarter (15-3/4) inches in depth.

620.3 CAPACITY: The occupancy capacity shall be computed as provided in section 608 for exitway stairways.

620.4 LANDINGS AND PLATFORMS: Landings and platforms shall be provided at the top and bottom of each unit as required for interior exitway stairways.

620.5 RAILINGS: Guards shall be surmounted with moving handrails traveling at the same speed as the stairway.

620.6 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 automatic sprinkler system moving stairways may be accepted for one-third (1/3) the total required exit capacity when discharging through the main grade floor area.

620.7 CONSTRUCTION

620.71 NONCOMBUSTIBLE MATERIALS: Only noncombustible materials shall be used in the construction of moving stairways accepted as a required means of egress except for step wheels, handrails, electrical equipment, and wood veneers not more than one twenty-eighth (1/28) inch thick directly attached to metal or other noncombustible backing with a nonvolatile and nonflammable cement.

620.72 FIRERESISTANCE: The enclosure shall afford the fireresistance required for approved interior exitway stairways as specified in section 616.9.

620.73 HEIGHT OF TRAVEL PER UNIT: No single moving stairway unit shall have a vertical travel height of more than two (2) stories nor more than thirty-five (35) feet.

SECTION 621.0 FIRE ESCAPES

621.1 WHERE PERMITTED: Fire escapes shall be permitted only by special order of the building official, in existing buildings or structures not exceeding five (5) stories or sixty-five (65) feet in height, and when more adequate exitway facilities cannot be provided.

621.2 CONSTRUCTION: The fire escape shall be designed to support a live load of one hundred (100) pounds per square foot and shall be constructed of steel or other approved noncombustible materials, except as specified in sections 621.24 and 621.25. All fire escapes of other than wood, and any wood fire escape three (3) stories or higher, must have drawings and specifications submitted by a qualified registered professional engineer with his seal and signature, which include supporting structures.

621.21 DIMENSIONS: The width of the stairs shall be as specified in 621.22, but in any case shall be at least twenty-two (22) inches wide. Risers will be not more than eight (8) inches in height and treads not less than eight (8) inches in depth. Landings shall be a minimum of forty (40) inches wide by thirty-six (36) inches long, located not more than eight (8) inches below the access window or door.

621.22 CAPACITY: The capacity will provide for the intended occupancy load as designated by the building official and determined by section 608.1, but in no case may the width be less than twenty-two (22) inches. The width will be adequate to provide for the number of occupants.

621.23 OPENING PROTECTIVES: Doors and windows along the fire escape shall be protected with three-quarter (3/4) hour opening protectives in other than residence buildings of use groups L-2 and L-3.

621.24 OUTSIDE FIRE LIMITS: On buildings not over three (3) stories nor more than forty (40) feet in height located outside the fire limits, accommodating not more than twenty (20) persons, fire escapes may be constructed of wood or other approved material of similar combustible characteristics.

621.25 WITHIN FIRE LIMITS: Within Fire District No. 2, fire escapes may be constructed of wood not less than two (2) inches thick on buildings of type 3 or type 4 construction which are not more than three (3) stories in height.

SECTION 622.0 SLIDESCAPES

Slidescapes and safety chutes shall be permitted in buildings of the high hazard use group and in existing school and institutional buildings as emergency means of egress when unusual conditions warrant, as approved by the building official.

622.1 LOCATION: The arrangement and location of slidescapes shall conform to this article for means of egress and shall be designated by exit signs and lights as provided in section 624.

622.2 CONSTRUCTION: All chutes shall be constructed of approved noncombustible materials with a pitch in the line of travel of not less than twenty-four (24) nor more than forty-two (42) degrees measured on the developed circumference of spiral chutes. Straight chutes shall be not less than twenty-four (24) inches and spiral chutes not less than twenty-eight (28) inches wide in the clear; nor more than forty-four (44) inches wide in any case. When erected on the interior of a building, they shall be enclosed as required in section 616.9 for interior stairways with direct means of egress to the street or other public space.

622.3 EXTENSION TO ROOF: Where constituting a supplemental means of egress from roofs, all slidescapes and chutes shall extend to the roof as required for exitway stairways in section 617.

SECTION 623.0 EXITWAY SIGNS AND LIGHTS

623.1 SIZE AND LOCATION: Except in one- and two-family dwellings (L-3), and in exitways serving only three or fewer dwelling units in L-2 multi-family dwelling uses, all required exitways shall be provided with exit signs sufficient in number to indicate at any point in the required exitway the approved direction of egress discharge. Such signs shall incorporate an approved symbol to ensure understanding by non-English reading people and, if so desired, the

word "EXIT." Such symbol and lettering shall be at least six (6) inches in height. Such signs shall have either red outlines on a white background or the reverse, and shall be made of noncombustible material. All required exit signs shall be illuminated in conformance with section 623.2. All types of exit signs must be approved for use in the Commonwealth of Massachusetts by the State Building Code Commission.

623.2 ILLUMINATION: Lighting of all required "EXIT" signs will be adequate and of a character to ensure that the signs can be easily read under normal conditions wherever the building or area served is occupied. The level of light provided on the exposed face of the sign shall be at least twenty-five (25) foot candles or the equivalent.

623.21 POWER LEVELS: All "EXITWAY" signs shall be illuminated at all times when the building or area is occupied, by a power source which can be sustained at the required level for a period of at least the fire rating of the exitway at all times and provide power independent of the failure of any other circuit or source of power. Fire suppression systems incorporating an independent power source required by article 12 may serve as the independent power source for exitway signs and lights.

SECTION 624.0 EXITWAY LIGHTS

624.1 ARTIFICIAL LIGHTING: In all structures except one and two-family dwellings, all stairways, exitways and passageways appurtenant thereto 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. All means of egress in other than one and two-family dwellings 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. In schoolhouses switches controlling these facilities shall not be accessible to the public; a key switch shall be considered meeting this requirement.

624.2 INTENSITY OF ILLUMINATION: The intensity of floor lighting shall be not less than three (3) foot candles measured at floor level and maintained everywhere along the required exitway. There shall be adequate overlap of illumination sources to ensure that no area will be left in darkness due to the failure of a light element.

624.3 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.

624.4 INDEPENDENT POWER SOURCE: Emergency lights shall be provided with a power system ensuring continuous lighting at all times required in section 624.1 and incorporating a power source which can be sustained at the level specified in section 624.2 for a period of at least one and one-half (1½) hours, or as required by section 623.21 for cases in excess of one and one-half (1½) hours, and provide power at all times and independently of the failure of any other circuit or source of power. The independent power source may be the same required by article 12 for fire suppression systems.

624.41 POWER LEVELS: The power system shall be designed to ensure that whenever the voltage of the normal service falls below fifty (50) percent of nominal lamp voltage, emergency lighting service is instantly transferred to the independent power source. The service may be transferred back to the normal supply when that supply can provide at least eighty (80) percent of the nominal lamp voltage.

624.5 PLANS AND SPECIFICATIONS: The building official may require that all plans and specifications for emergency lighting be submitted by a registered professional engineer qualified by background in the design of such electrical circuits, and such plans and specifications shall have the seal and signature of the registered professional engineer certifying that the required systems are in compliance with the requirements of this Code.

Reference Standards - Article 6

NFPA	101	1967	Life Safety Code
NFPA	101	1967	Life Safety Code
NFPA	101	1973	Life Safety Code

ARTICLE 7

STRUCTURAL AND FOUNDATION LOADS AND STRESSES

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 superimposed live and special loads in addition to their own dead load, without exceeding the allowable stresses or design capabilities prescribed in this Code or by accepted engineering practice.

SECTION 701.0 DEFINITIONS

CONTROLLED CONSTRUCTION: the construction of a building or structure or a specific part thereof which has been designated and erected under the supervision of a licensed or registered engineer or architect using controlled materials as herein defined in compliance with accepted engineering practice under the procedure of section 128.0.

CONTROLLED MATERIALS: materials which are certified by an accredited authoritative agency as meeting accepted engineering standards for quality and as provided in sections 722 and 800.

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 WALL: a wall below the floor nearest grade serving as a support for a wall, pier, column or other structural part of a building.

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 sheet or strip steel members less than three-sixteenths (3/16) inch thick.

LOAD

-DEAD LOAD: the weight of all permanent construction including walls, floors, roofs, partitions, stairways and of fixed service equipment.

-DURATION OF LOAD: the period of continuous application of a given load, or the aggregate of periods of intermittent application of the same load.

-EARTHQUAKE LOAD: the assumed lateral load acting in any horizontal direction on the structural frame due to the kinetic action of earthquakes.

-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, not including the wind load, earthquake 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.

ORDINARY MATERIALS: materials which do not conform to the requirements of the Basic Code for controlled materials.

PRIMARY MEMBER: any member of the structural frame of a building or structure used as a column; grillage beam; or to support masonry walls and partitions; including trusses, isolated lintels spanning an opening of eight (8) feet or more; and any other member required to brace a column of a truss.

SECONDARY MEMBER: any member of the structural framework other than a primary member including filling-in beams of floor systems.

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.

STRUCTURAL STEEL MEMBER: any primary or secondary member of a building or structure consisting of a rolled steel structural shape other than formed steel, light gage steel or steel joist members.

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, the building official may require that tests be made of such unit or assembly under the supervision of a qualified registered professional engineer. Such tests shall be made by an approved testing facility and personnel, and the procedures and results of such tests shall be signed and stamped by the said designated qualified registered professional engineer.

SECTION 703.0 TEST SAFE LOAD

703.1 WHEN REQUIRED: When not capable of being accurately analyzed, any system of construction or structural unit and its connections shall be subjected to tests prescribed in article 8 or in the test standards of this article or article 8, or to such other tests which may be certified by a qualified registered professional engineer as being acceptable for providing the information required. Any tests performed shall be conducted as required by the provisions of section 702.2 for testing.

703.2 TEST LOAD: The test load shall be subject to the provisions of section 804.1 and where applicable, deflections shall be limited as provided in section 804.2.

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: The building official shall approve the live load for any use not specificially provided for in Table 7-1.

SECTION 705.0 DESIGN DEAD LOAD

705.1 CONSTRUCTION MATERIALS: In estimating dead load for the purposes of structural design, the actual weights of materials shall be used, but in no case less than the unit dead loads prescribed in the reference standards of this article.

705.2 SERVICE EQUIPMENT: The weight of all building service equipment including plumbing stacks, heating and air conditioning equipment and similar fixtures shall be included in the dead load supported by the structural frame.

705.3 PARTITION LOAD: In office and other buildings, in which subdividing partitions may be subsequently erected, rearranged or relocated, provision shall be made to support the actual weight of such partitions where they occur, or for an equivalent uniform load, which shall be assumed not less than twenty (20) pounds per square foot of floor area, in addition to the specified uniformly distributed live load. Provision for partitions weight shall be made whether or not partitions are shown on the plans, unless the specified live load exceeds eighty (80) pounds per square foot.

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 sections 106.3 or 106.4, the structure may be designed for the loads and stresses applicable at the time of erection, provided the public safety is not endangered thereby.

706.4 POSTED LIVE LOAD: Any existing building heretofore approved, in which there is no change in use to a new use 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, and the public safety is not endangered thereby.

SECTION 707.0 UNIT LIVE LOADS

The plans for all buildings and structures intended for other than residential uses shall specify the live and partition loads for which each floor or part thereof has been designed.

707.1 UNIFORM LIVE LOAD: The minimum uniformly distributed live load in pounds per square foot shall be as provided in Table 7-1 and for all concentrated loads wherever they occur as provided in section 708.

TABLE 7-1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

OCCUPANCY OR USE	LIVE LOAD (PSF)
Apartments (see Residential)	
Armories and drill rooms	150
Assembly halls and other places of assembly:	
Fixed seats	60
Movable seats	100
Platforms (assembly)	100
Balcony (exterior)	100
One- and two-family residences only and not exceeding 100 sq. ft.	60
Bowling Alleys, poolrooms, and similar recreational areas	75
Cornices	60
Corridors:	
First Floor	100
Other Floors, same as occupancy served except as indicated	
Court Rooms	100
Dance halls and ballrooms	100
Dining rooms and restaurants	100
Dwellings (see Residential)	
Elevator Machine Room	150
Fire escapes	100
On multi- or single-family residential buildings only	40
Garages (passenger cars only)	50
For trucks and buses use AASHTO (1) land loads (see table 7-2 for concentrated load requirements	
Grandstands (see Reviewing stands)	
Gymnasiums, main floors and balconies	100
Hospitals	
Operating rooms, laboratories	60
Private rooms	40
Wards	40
Corridors, above first floor	80
Hotels (see Residential)	
Libraries:	
Reading rooms	60
Stack rooms (books & shelving at 65 pcf) but not less than	150
Corridors, above first floor	80
Manufacturing:	
Light	125
Heavy	250
Marquees	75
Office Buildings:	
Offices	50
Lobbies	100
Corridors, above first floor	80
File and computer rooms require heavier loads based upon anticipated occupancy	

TABLE 7-1

OCCUPANCY USE	LIVE LOAD (PSF)
Open parking structures (passenger cars only)	50
Penal institutions:	
Cell blocks	40
Corridors	100
Residential:	
Multi-family houses:	
Private apartments	40
Public rooms	100
Corridors	80
Dwellings:	
First Floor	40
Second floor and habitable attics	30
Uninhabitable attics (2)	20
Hotels:	
Guest rooms	40
Public rooms	100
Corridors serving public rooms	100
Corridors	80
Reviewing stands and bleachers (3)	100
Schoolhouses:	
Classrooms	50
Corridors	100
Flexible and open plan areas	100
Sidewalks, vehicular driveways, and yards, subject to trucking	250
Skating rinks	100
Stairs and exitways	100
Storage warehouse:	
Light	125
Heavy	250
Stores:	
Retail:	
First floor, rooms	100
Upper floors	75
Wholesale	125
Theatres:	
Aisles, corridors and lobbies	100
Orchestra floors	60
Balconies	60
Stage floors	150
Yards and terraces, pedestrians	100

TABLE 7-1

NOTES:

1) American Association of State Highway and Transportation Officials.

2) 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 forty-two (42) inches 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 or trusses or trussed rafters shall be designed to sustain the imposed dead load or ten pounds per square foot (10 psf) whichever be greater, uniformly distributed over the entire span.

3) For detailed recommendations, see the Standard for Tents, Grandstands and Air-Supported Structures Used for Places of Assembly, NFPA 102, 1971.

4) Deflections for floors in areas of public assembly shall be limited to 1/360 the span.

707.2 POSTING OF LIVE LOADS: In every building or other structure or part thereof, used for mechanical, business, industrial or storage purposes, the design and partition loads shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building in a conspicuous place in each space to which they relate. Any plates lost, removed or defaced shall be replaced by the owner.

SECTION 708.0 CONCENTRATED LOADS

Floors of buildings used as specified in Table 7-2 shall be designed to support the uniformly distributed live loads prescribed in Table 7-1 or the following concentrated loads in pounds, whichever produces the greater stresses. Unless otherwise specified, the indicated concentration shall be assumed to occupy an area of two and one-half (2 1/2) feet square and shall be so located as to produce the maximum stress conditions in the structural members.

Floors of schoolhouses used as specified in Table 7-2 shall be designed to support the uniformly distributed live loads prescribed in Table 7-1 following concentrated loads in pounds whichever produces the greater stresses. Unless otherwise specified, the indicated concentration shall be assumed to occupy an area of two and one-half (2-1/2) feet square, and shall be so located as to produce the maximum stress conditions in the structural members; except that in steel joist construction, bridged in accordance with the requirements of section 829, the specified concentration shall be assumed as distributed over three (3) of the secondary members and each individual joist shall be capable of sustaining a concentrated load of eight hundred (800) pounds at the panel point.

TABLE 7-2 CONCENTRATED LOADS

LOCATION	POUNDS
Elevator machine room grating (on area of 4 square inches)	300
Finish light floor plate construction (on area of 1 square inch)	200
Garages	(1)
Manufacturing and Storage Buildings	(2)
Office Floors	2000
Scuttles, skylight ribs and accessible ceilings	200
Sidewalks	8000
Stair treads (on area of 4 square inches at center of tread)	300

Note 1: Floors in garages or portions of buildings used for storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 7-1 or for the following concentrated loads:

a) for passenger cars accommodating not more than nine (9) passengers, two thousand (2000) pounds acting on an area of twenty (20) square inches;

b) mechanical parking structures without slab or deck, passenger cars only, fifteen hundred (1500) pounds per wheel;

c) for trucks or buses, maximum wheel load on an area of twenty (20) square inches.

Note 2: For buildings in which mechanical material handling equipment will be utilized, the structural floor slab shall be designed for the actual concentrated loads.

SECTION 709.0 IMPACT LOADS

The 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 and loads which involve vibration and impact forces.

709.1 ELEVATORS: All moving elevator loads shall be increased one hundred (100) percent for impact and the structural supports shall be designed within the limits of deflection as specified in the Department of Public Safety, Board of Elevator Regulations ELV-2.

709.2 MACHINERY: For the purpose of design, the weight of machinery and moving loads shall be increased as follows, to allow for impact:

TYPE OF MACHINERY	PERCENTAGE
Elevator Machinery	100
Light machinery, shaft or motor driven	20
Reciprocating machinery or power driven units	50
Hangers for floors or balconies	33

These percentages shall be increased when so recommended by the manufacturer.

709.3 CRANEWAYS: All craneways shall have their design loads increased for impact as follows:

a) a vertical force equal to twenty-five (25) percent of the maximum wheel load;

b) a lateral force equal to twenty (20) percent of the weight of the trolley and lifted load only, applied one-half (1/2) at the top of each rail; and

c) a longitudinal force of ten (10) percent of the maximum wheel loads of the crane applied at top of rail.

709.4 ASSEMBLY STRUCTURES: Grandstands, stadiums and similar assembly structures shall be designed to resist a horizontal swaying load applied parallel to the rows of seats, in addition to any wind loads, of not less than twenty-four (24) pounds per lineal foot of seats per row; and of not less than ten (10) pounds per lineal foot of seats applied transversely.

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. In addition to the requirements of section 711, the following requirements shall also apply.

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.

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: Railings around stairwells, balconies and other floor openings, both exterior and interior, shall be designed to resist a load of at least two hundred (200) pounds applied in any direction at any point of the top rail, and also a vertical and a horizontal thrust of fifty (50) pounds per lineal foot applied at the top railing. The concentrated load and distributed loads need not be assumed to act concurrently. Railings and guards of grandstands and similar assembly structures shall be capable of resisting a lateral force of fifty (50) pounds per lineal foot and sustaining a vertical load of one hundred (100) pounds per lineal foot.

710.4 CONSTRUCTION LOADS AND ERECTION STRESSES: Provision shall be made for temporary construction and wind loads which may occur during the erection of the building; and all structural members and connections shall be designed and erected so as to prevent overstressing during construction.

710.5 The following requirements shall apply only to schoolhouses:

710.51 TEMPERATURE LOADS: The design of enclosed buildings more than two hundred fifty (250) feet in plan dimension shall provide for the forces and/or movements resulting from an assumed expansion corresponding to a change in temperatures of 40^{o} 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^{o} F.
For determining required anchorage for piping, the forces shall be determine on the basis of temperature variations for the specific service conditions. Friction forces in expansion bearings shall be considered.

SECTION 711.0 ROOF LOADS

The structural supports of roofs shall be designed to resist wind and where applicable, snow and earthquake loads in addition to the dead load of the construction and the appropriate live loads specified in Table 7-1.

711.1 SNOW LOAD as provided in section 712.0.

711.12 WIND LOAD as provided in section 715.0.

711.13 EARTHQUAKE LOAD as provided in section 718.0.

711.2 MINIMUM ROOF LOADS: Ordinary roofs, either flat, pitched or curved, shall be designed for the live loads as specified in Table 7-3.

TABLE 7-3 MINIMUM ROOF LIVE LOADS*

ROOF SLOPE	TRIBUTARY LOADED AREA in SQUARE FEET for ANY STRUCTURAL MEMBER		
	0 to 200	201 to 600	Over 600
Flat or rise less than 4 inches per foot Arch or dome with rise less than 1/8 of span	20	16	12
Rise 4 inches per foot to less than 12 inches per foot Arch or dome with rise 1/8 of span to less than 3/8 of span	16	14	12
Rise 12 inches per foot and greater Arch or dome with rise 3/8 of span or greater	12	12	12

*In pound-force per square foot of horizontal projection.

711.3 OVERHANGING EAVES: In other than one and two-family dwellings and except where framing of overhang is a continuation of the roof framing, overhanging eaves, cornices and other roof projections shall be designed for a minimum uniformly distributed live load of sixty (60) pounds per square foot.

711.4 PONDING: 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.

711.5 SPECIAL PURPOSE ROOFS: When used for incidental promenade purposes, roofs shall be designed for a minimum live load of sixty (60) pounds per square foot; and one hundred (100) pounds per square foot when designed for roof gardens or assembly uses.

711.51 LANDSCAPED ROOFS: Where roofs are to be landscaped, the design live load shall be the sum of the appropriate uniform live load and the landscaping load shall be considered as a dead load and shall be computed on the basis of saturation of the soil.

SECTION 712.0 SNOW LOAD

The basic snow loads to be assumed in the design of buildings or other structures are given in figure 7-1 of the reference standards of this article.

712.1 DESIGN SNOW LOAD: The map snow loads of figure 7-1 shall be used as the basis for deriving design snow loads for all buildings. Where exceptional conditions can be cited as applying to a particular region, the snow load requirements may be altered by the building official upon approval by the State Building Code Commission.

712.2 ROOF SNOW LOADS: The minimum snow loads for the design of ordinary and multiple series roofs, either flat, pitched or curved, shall be determined from figures 7-2a, 7-2b, 7-2c, 7-3a, 7-3b, 7-4 as applicable. The analysis incorporating snow loading shall be based on the conditions providing the most unfavorable loading result.

SECTION 713.0 WIND LOAD

The structural frame of all buildings, signs, tanks or 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 716 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 rigidity of the structure.

SECTION 714.0 WIND ON VERTICAL SURFACES

The total wind pressures on vertical surfaces of ordinary buildings and structures to be considered in the design of primary members shall be in conformity with the following tables:

Exposure A	Pressure P			
Height (ft.)	Zone 1	Zone 2	Zone 3	Zone 4
Less than 30	10	10	10	12
30	10	10	12	14
50	10	12	14	17
100	12	16	19	23
150	14	18	23	27
200	16	21	27	34
250	18	23	30	36
300	20	26	33	40
350	22	28	35	44
400	23	30	38	46
450	25	31	40	49
500	26	33	42	52
550	27	35	44	55
600	28	36	46	58
650	29	38	47	59
700	30	40	50	62
750	31	41	52	65
800	32	42	54	66

Exposure A: Centers of large cities and very rough, hilly terrain.

Exposure B	Pressure P			
Less than 30	10	13	17	21
30	13	17	21	26
50	16	19	25	31
100	19	25	31	39
150	22	28	36	44
200	23	31	40	50
250	26	34	43	53
300	27	36	45	56

Exposure B		Pressure P		
Height (ft.)	Zone 1	Zone 2	Zone 3	Zone 4
350	28	38	48	59
400	30	40	51	63
450	31	41	52	65
500	32	43	55	66
550	34	44	56	68
600	35	45	57	71
650	36	47	60	74
700	37	48	61	75
750	38	50	62	76
800	39	51	64	80

Exposure B: Suburban areas, towns, city outskirts, wooded areas and rolling terrain.

Exposure C		Pressure P		
Less than 30	14	20	26	34
30	21	27	35	43
50	23	31	40	50
100	30	36	45	57
150	33	39	51	62
200	34	43	53	66
250	35	47	56	68
300	36	48	58	72
350	38	49	61	75
400	39	51	62	76
450	40	52	63	79
500	41	53	65	80
550	42	54	67	83
600	43	55	69	85
650	44	56	70	86
700	45	57	71	87
750	46	58	72	88
800	46	59	73	90

Exposure C: Flat open country, open flat coastal belts and grasslands.

Zone 1 consists of the Counties of Berkshire, Franklin, Hampshire and Hampden.

Zone 2 consists of the County of Worcester.

Zone 3 consists of the Counties of Middlesex, Suffolk, Norfolk, Plymouth and Bristol.

Zone 4 consists of the Counties of Essex, Barnstable, Dukes and Nantucket.

714.1 DISTRIBUTION OF WIND FORCES: The total wind pressure (section 714.0) shall be distributed between opposite walls, two-thirds (2/3) as normal pressure on the windward side and one-third (1/3) as normal outward suction on the leeward side.

714.2 EXTERIOR SECONDARY WALL FRAMING AND WALL PANELS: Internal wind pressure or suction of thirty (30) percent of the prescribed pressures in section 714.1 shall be assumed to occur simultaneously with the external pressures in section 714.3 and 714.4.

714.3 AN EXTERNAL PRESSURE or suction to be considered in the design of secondary wall framing and wall panels and sheathing and their connections shall be one and one-half (1 1/2) times those in accordance with section 714.0 except at corners of all walls.

714.4 AT CORNERS OF ALL WALLS, the external suction to be considered in the design of secondary wall framing and wall panels and sheathing and their connections shall be two (2) times those in accordance with section 714.0. The suction shall be assumed to act on a vertical strip of width one-tenth (1/10) the least width of the building.

714.5 ROOFS OVER NON-ENCLOSED STRUCTURES: Roofs over non-enclosed structures shall be designed to resist wind loads in accordance with standard engineering practice and the reference standards of this article.

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 714.2 for wall elements.

715.1 PITCHED ROOFS: External wind forces on roofs, assumed to be acting upon primary roof framing members shall be not less than the following-listed fractions of the values specified in section 714.0, and shall be based on the average height of the roof eave above grade, the slope of the roof at the location under consideration and the ratio of sidewall height to building width.

EXTERNAL WIND PRESSURE ON ROOFS

Ratio of Sidewall Height to Building Width	FLAT ROOFS	WINDWARD SLOPE OF ROOFS LESS THAN 1:12	1:12 to 4.05:12	405:12 to 6:12	6:12 to 12:12	LEEWARD SLOPE ALL SLOPES
0.2	-.60	-.60	-.06	.12	.19	-.50
0.4	-.60	-.60	-.33	.01	.09	-.50
0.6	-.60	-.60	-.49	-.20	-.06	-.50
0.8	-.60	-.60	-.57	-.30	-.18	-.50
1.0 or more	-.60	-.60	-.60	-.39	-.28	-.50

For all roof surfaces having a slope greater than 12:12 the same wind forces as for vertical surfaces shall be assumed.

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 714.0 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 714.0 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 the walls to foundations so as to resist wind uplift and sliding in excess of seventy-five (75) percent 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 714.0.

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) percent or more of solid surface shall be assumed at 1.2 P and having less than seventy-five (75) percent 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 at 0.7 P applied to the projected area; and for hexagonal or octagonal structures, 1.0 P.

716.41 SPECIAL SHAPES: 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 OVERTURNING AND SLIDING

The overturning moment due to the wind load on all structures shall not exceed seventy-five (75) percent 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 718.0 EARTHQUAKE LOAD

Provisions of section 718 reflect informed judgments regarding the probable intensities of future earthquake ground motions in this region, and their associated probabilities of occurrence. The objective of these provisions is to protect life safety by limiting structural failure.

718.1 GENERAL

a) every building or structure and every portion thereof shall be designed and constructed to resist stresses produced by lateral forces as provided in this section, except detached one and two-family dwellings and minor accessory buildings. Stresses shall be calculated as the effect of a force applied horizontally at each floor or roof level or to building parts above the foundation. The force shall be assumed to come from any horizontal direction.

b) every building or structure and every portion designed and constructed to resist stresses produced by lateral forces as provided in this section shall be constructed and inspected in accordance with the rules and regulations promulgated by the State Building Code Commission.

718.2 DEFINITIONS: The following definitions apply only to the provisions of this section.

BOX SYSTEM: a structural system where the vertical load is carried by bearing walls and structural framing and where the lateral stability and lateral force resisting system consists of shear walls or braced frames.

BRACED FRAME: a vertical truss or its equivalent which is provided to resist lateral forces in which the members are subjected primarily to axial stresses.

CLASS A SOIL: includes all the classes of soil and rock enumerated in section 723.4.

CLASS A SOIL SITE:

a) a site composed exclusively of Class A soil, or

b) a site where Class A soil overlies or includes Class B soil, provided that the depth below foundation level to the uppermost Class B soil and the cumulative thickness of Class B soil meet the criteria in Figure 7-9.

CLASS B SOIL: includes all classes of soil not qualifying as Class A soil.

CLASS B SOIL SITE: any site which does not meet the criteria for Class A soil site.

DUAL BRACING SYSTEM: consists of a moment resisting space frame and shear walls which meet the following design criteria:

a) the space frame and shear walls shall resist the total lateral force in accordance with their relative rigidities considering the interaction of the shear walls and space frame.

b) the shear walls acting independently of the resisting portions of the space frame shall resist the total lateral force.

c) the resisting space frame shall have the capacity to resist not less than twenty-five (25) percent of the total lateral force.

FOUNDATION LEVEL: the lowest of any of the following:

a) the bottom of any spread or combined footing or foundation mat;

b) the bottom of any pile cap;

c) the top of any pier or caisson.

LATERAL FORCE RESISTING SYSTEM: that part of the structural system to which the total lateral forces prescribed in section 718.4 are assigned.

LIQUEFACTION: a term used to describe a group of phenomena occurring in saturated cohesionless sandy and silty soils consisting of a large decrease in effective stress (total stress minus pore pressure) accompanied by large deformations under either static or cyclic loading. The term cyclic mobility should also be included within the scope of the definition of liquefaction.

MOMENT-RESISTING SPACE FRAME: a space frame designed to carry all vertical loads and in which the members and joints are capable of resisting design lateral forces by bending moments.

SHEAR WALL: a wall designed to resist lateral forces parallel to the wall.

SPACE FRAME: a three-dimensional structural system composed of interconnected members, other than bearing walls, designed to function as a complete self-contained laterally stable unit with or without the aid of horizontal diaphragms or floor bracing systems.

718.3 SYMBOLS AND NOTATIONS: The following symbols and notations apply only to the provisions of this section:

C = Numerical coefficient for base shear as specified in section 719.4.

C_p = Numerical coefficient as specified in section 718.4 and as set forth in Table 7-3b.

D = The dimension of the building in feet in a direction parallel to the applied forces.

D_s = The plan dimension of the vertical lateral force resisting system in feet.

$F_i F_n$
F_x = Lateral force applied to level i, n, or x, respectively.

F_p = Lateral force on the part of the structure and in the direction under consideration.

F_t = That portion of V considered concentrated at the top of the structure, at the level n. The remaining portion of the total base shear V shall be distributed over the height of the structure including level n according to Formula (18-5).

$h_i h_n$
h_x = Height in feet above the base to level i, n, or x, respectively.

K = Numerical coefficient as set forth in Table 7-3A.

Level i = Level of the structure referred to by the subscript i.

Level n = That level which is uppermost in the main portion of the structure.

Level x = That level which is under design consideration.

M = Overturning moment at the base of the building or structure.

M_x = The overturning moment at level x.

N = Total number of stories above exterior grade.

T = Fundamental period of vibration of the building or structure in seconds in the direction under consideration.

V = Total lateral load or shear at the base.

$$V = F_t + \sum_{i=1}^{n} F_i$$

where $i = 1$ designates first level above the base.

W = Total dead load including the partition loading where applicable.

EXCEPTION: W shall be equal to the total deal load plus

twenty-five (25) percent of the floor live load in storage and warehouse occupancies; the snow load shall also be included.

w_i = That portion of W which is located at or is assigend to level
w_x i or x respectively.

W_p = The weight of a part or portion of a structure.

γt = Total unit weight.

718.4 MINIMUM EARTHQUAKE FORCES FOR STRUCTURES: The provisions of this section are applicable only to buildings and structures meeting the requirements of section 718.5. All other buildings and structures shall be designed in accordance with section 718.7.

718.41 TOTAL LATERAL FORCE: Every structure shall be designed and constructed to withstand minimum total lateral seismic forces assumed to act nonconcurrently in the direction of each of the main axes of the structure in accordance with the following formula:

$$V = 1/3\ KCSW$$

a) C FACTOR

The value of C shall be determined in accordance with the following formula:

$$C = \frac{0.05}{\sqrt[3]{T}}$$

For all one and two-story buildings or structures the value of C shall be not less than 0.10. For other buildings the maximum value of C need not exceed 0.10.

EXCEPTIONS:

1) C exceeds 0.10 where indicated in Table 7-3b.

2) Buildings or structures which have highly irregular shapes, large differences in lateral resistance or stiffness between different stories or other unusual structural features affecting seismic response shall be designed in accordance with section 718.7.

T is the fundamental period of vibration of the structure in seconds in the direction under consideration. Properly substantiated technical data for establishing the period T may be submitted. In the absence of such data, the value for T for buildings shall be determined by the following formula:

$$T = \frac{0.05h_n}{\sqrt{D}}$$

EXCEPTION: In all buildings in which the lateral force resisting system consists of a moment-resisting space frame which resists one hundred (100) percent of the required lateral forces and which frame is not enclosed by or adjoined by more rigid elements which would tend to prevent the frame from resisting lateral forces:

$$T = 0.10\ N$$

b) K FACTOR

All buildings shall be designed with a horizontal force factor K = 1 except buildings which have a lateral force resisting system listed in Table 7-3A.

TABLE 7-3A HORIZONTAL FORCE FACTOR "K" FOR BUILDINGS OR OTHER STRUCTURES[1]

TYPE OF ARRANGEMENT OF RESISTING ELEMENTS	VALUE OF K
Buildings with a box system as defined in section 718.2	1.33
Buildings with a dual bracing system as defined in section 718.2	0.80
Buildings with a momemt resisting space frame designed to resist the total required lateral force	0.67
Elevated tanks plus full contents, on four or more cross-braced legs and not supported by a building[2]	3.00[3]
Structures other than buildings and other than those set forth in Table 7-3b	2.00

Note 1: Where wind load would produce higher stresses, this load shall be used in lieu of the loads resulting from earthquake forces.

Note 2: The minimum value of "KC" shall be 0.12 and the maximum value of "KC" need not exceed 0.25.

Note 3: The tower shall be designed for an accidental torsion of five (5) percent as specified in section 718.43. Elevated tanks which are supported by buildings or do not conform to type or arrangement of supporting elements as described

above shall be designed in accordance with section 718.45 using "C_p" = 2.

c) S FACTOR

For a Class A soil site, S = 1. For a Class B soil site, S = 1.5. Intermediate values of S may be used, if justified by the results of adequate studies by a qualified registered professional engineer.

718.42 DISTRIBUTION OF LATERAL FORCE

a) VERTICAL DISTRIBUTION

The total lateral force V shall be distributed in the height of the structure in the following manner:

$$F_t = .004V\left(\frac{h_n}{D_s}\right)^2$$

F_t need not exceed 0.15 V and may be considered as 0 for values $\left(\frac{h_n}{D_s}\right)$ of 3 or less, and

$$F_x = \frac{(V - F_t)\, w_x h_x}{\sum_{i=1}^{n} w_i h_i}$$

EXCEPTION: One and two-story buildings shall have uniform distribution.

At each level designated as x, the force F_x shall be applied over the area of the building in accordance with the mass distribution on that level.

b) HORIZONTAL DISTRIBUTION

Total shear in any horizontal plane shall be distributed to the various elements of the lateral force resisting system in proportion to their rigidities considering the rigidity of the horizontal bracing system or diaphragm.

718.43 HORIZONTAL TORSIONAL MOMENTS: Provisions shall be made for the increase in shear resulting from the horizontal torsion due to an eccentricity between the center of mass and the center of rigidity. Negative torsional shears shall be neglected. Where the vertical resisting elements depend on diaphragm action for shear distribution at any level, the shear-resisting elements shall be capable of resisting a torsional moment assumed to be equivalent to the story shear acting with an eccentricity of not less than five (5) percent

of the maximum building dimension at that level.

718.44 OVERTURNING: Every building or structure shall be designed to resist the overturning effects caused by the wind forces and related requirements specified in section 717.0 or the earthquake forces specified in this section, whichever governs.

At any level the incremental changes of the design overturning moment, in the story under consideration, shall be distributed to the various resisting elements in the same proportions as the distribution of the shears in the resisting system. Where other vertical members are provided which are capable of partially resisting the overturning moments, a redistribution may be made to these members if framing members of sufficient strength and stiffness to transmit the required loads are provided.

Where a vertical resisting element is discontinuous, the overturning moment carried by the lowest story of that element shall be carried down as loads to the foundation.

718.45 LATERAL FORCE ON PARTS OR PORTIONS OF BUILDINGS OR OTHER STRUCTURES: Parts or portions of buildings or structures and their anchorage shall be designed for lateral forces in accordance with the following formula:

$$F_p = 1/3 C_p W_p$$

The values of C_p are set forth in Table 7-3b unless a greater value is required by the basic seismic formula V = 1/3 KCSW. The distribution of these forces shall be according to the gravity loads pertaining thereto.

TABLE 7-3B HORIZONTAL FORCE FACTOR "C" FOR PARTS OR PORTIONS OF BUILDINGS OR OTHER STRUCTURES

PART OR PORTION OF BUILDINGS	DIRECTION OF FORCE	VALUE OF C_p
Exterior bearing and nonbearing walls, interior bearing walls and partitions, interior nonbearing walls and partitions over 10 feet in height, masonry or concrete fences over 6 feet in height	Normal to flat surface	0.20
Cantilever parapet and other cantilever walls, except retaining walls	Normal to flat surface	1.00
Exterior and interior ornamentations and appendages	Any direction	1.00
When connected to, part of, or housed within a building: towers, tanks, towers and tanks plus contents, storage racks over 6 feet in height plus contents, chimneys, smokestacks and penthouses	Any direction	0.20[1, 2]
When resting on the ground, tank plus effective mass of its contents	Any direction	0.10
Floors and roofs acting as diaphragms[4]	Any direction	0.10
Connections for exterior panels or for elements complying with section 718.64	Any direction	2.00
Connections for prefabricated structural elements other than walls, with force applied at center of gravity of assembly[5]	Any horizontal direction	0.30

NOTES FOR TABLE 7-3B

Note 1: When located in the upper portion of any building where the "h_n/D" ratio is five-to-one (5/1) or greater the value shall be increased by fifty (50) percent.

Note 2: "W_p" for storage racks shall be the weight of the racks plus contents. The value of "C_p" for racks over two (2) storage support levels in height shall be .16 for the levels below the top two levels.

Note 3: For purposes of determining the lateral force, a minimum ceiling weight of five (5) pounds per square foot shall be used.

Note 4: Floors and roofs acting as diaphragms shall be designed for a minimum value of "C_p" of ten (10) percent applied to loads tributary from that story unless a greater value of "C_p" is required by the basic seismic formula $V = 1/3$ KCSW.

Note 5: The "W_p" shall be equal to the total load plus twenty-five (25) percent of the floor live load in storage and warehouse occupancies.

718.46 LATERAL FORCE ON FOUNDATIONS: Provision shall be made for transmission of the base shear, acting in any direction, between structure and soil or rock, by means of

a) lateral soil pressure against foundation walls, footings, grade beams and pipe caps;

b) lateral soil pressure against piles, piers, or caissons;

c) batter piles, or;

d) side or bottom friction on walls or footings, or;

e) combinations of the foregoing.

Lateral pressure may not be more than one-third (1/3) the passive pressure. Bottom friction may not be relied upon where a building overlies Class B soil and is supported upon piles, piers or caissons. Even if not relied upon to transmit the base shear, foundation walls shall comply with the provisions of section 718.68.

718.5 DESIGN REQUIREMENTS

718.51 CONCRETE: Design and construction of earthquake resisting reinforced concrete framing members and their connections shall conform to the provisions of section 842.1 and of reference standard ACI 318-71 (except Appendix A), and to the special requirements of this section.

a) FLEXURAL MEMBERS OF MOMENT RESISTING SPACE FRAMES

Web reinforcement shall be required throughout the length of each flexural member. The minimum area of such web reinforcement shall be 0.15 percent of the product of the width of the web and the spacing of the web reinforcement along the longitudinal axis of the member.

Where stirrups are used as web reinforcement, the first stirrup shall be located two (2) inches from the face of the support and the next six (6) stirrups shall be spaced not over one-fourth (1/4) of the depth of the member.

Lapped splices located in a region of tension or reversing stress shall be confined by at least two stirrups at each splice.

b) COLUMNS OF MOMENT RESISTING SPACE FRAMES

The spacing of ties at the ends of tied columns shall not exceed four (4) inches for a distance equal to the maximum column dimension but not less than one-sixth (1/6) of the clear height of the column, nor less than eighteen (18) inches, from the face of the joint. The first such tie shall be located two (2) inches from the face of the joint. Joints

of exterior and corner columns shall be confined by lateral reinforcement through the joint. Such lateral reinforcement shall consist of spirals or ties as required at the ends of columns.

c) EARTHQUAKE RESISTING SHEAR WALLS AND BRACED FRAMES

Shear walls and braced frames shall be designed by the strength design method except that the alternate design method of reference standard ACI 318-71 may be used, provided that the factor of safety in shear is equivalent to that achieved with the strength design method. The formulas for required strength U, as provided in reference standard ACI 318-71, shall be modified to:

$$U = 1.4\ (D + L) + 1.4E$$

$$U = 0.9D + 1.4E$$

except that 2.E shall be used in the calculation of shear stresses in shear walls of buildings without a moment resisting space frame capable of carrying all vertical loads and lateral forces.

1) SHEAR WALLS

a) Special vertical boundary elements shall be provided at the edges of concrete shear walls in buildings with a dual bracing system as defined in section 718.2. These elements shall be composed of concrete encased structural steel elements of A36, A440, A441, A572 (except Grades 60 and 65) or A588 Grades A, B, or C, or shall be concrete reinforced as required for columns with special transverse reinforcement as desribed in Item 3) below for the full length of the element. The boundary vertical elements and such other similar vertical elements as may be required shall be designed to carry all the vertical stresses resulting from the wall loads in addition to tributary dead and live loads and from the design lateral forces. Horizontal reinforcing in the walls shall be fully anchored to the vertical elements.

b) Similar confinement of horizontal and vertical boundaries at wall openings also shall be provided unless it can be demonstrated that the unit compressive stresses at the opening have a load factor two (2) times that given by the formulae in this subsection for required strength U.

c) Wall reinforcement required to resist wall shear shall

be terminated with not less than a ninety (90) degree bend plus a twelve (12) bar diameter extension beyond the boundary reinforcing at vertical and horizontal end faces of wall sections. Wall reinforcement terminating in boundary columns shall be fully anchored into the boundary elements.

2) BRACED FRAMES

a) Reinforced concrete members of braced frames subject primarily to axial stresses shall have transverse reinforcement as specified in 3) below through the full length of the member. Tension members shall additionally meet the requirements for compressive members.

b) In buildings without a moment resisting space frame capable of carrying all vertical loads and the total required lateral force, all members in braced frames shall be designed for 1.25 times the force determined in accordance with section 718.4. Connections for these members are not permitted the thirty-three (33) percent stress increase for earthquake.

3) TRANSVERSE REINFORCEMENT

Where transverse reinforcement is required by the provisions of this section, the amount of such reinforcement shall be not less than that specified below.

The volumetric ratio of spiral reinforcement shall be not less than that specified for reinforced concrete columns, nor less than

$$0.12\ f'_c/f_{yh}$$

Rectangular hoop reinforcement shall be spaced not more than four (4) inches apart and shall have a total cross-sectional area not less than the greater of

$$A_{sh}=0.30\ s_h h_c f'_c/f_{yh}\ (A_g/A_{ch}-1)$$

or

$$A_{sh}=0.12\ s_h h_c f'_c/f_{yh}$$

Single or overlapping hoops may be provided to meet this requirement.

Supplementary cross ties of the same size and spacing as hoops using 135-degree minimum hooks engaging the periphery hoop and secured to a longitudinal bar may

be used. Supplementary cross ties or legs of overlapping hoops shall be spaced not more than fourteen (14) inches on center transversely.

718.52 STEEL: Design and construction of earthquake resisting steel framing members and their connections shall conform to the provisions of section 827 and of reference standard AISC 1969 and to the special requirements of this section.

a) MOMENT-RESISTING SPACE FRAMES

1) GENERAL

Design and construction of steel framing in moment-resisting space frames shall conform to the provisions of section 827.0 and the requirements of this section.

2) DEFINITIONS

a) JOINTS: The joint is the entire assemblage at the intersections of the members.

b) CONNECTIONS: The connection consists of only those elements that connect the member to the joint.

3) CONNECTIONS

Each beam or girder moment connection to a column shall be capable of developing in the beam the full plastic capacity of the beam or girder.

EXCEPTION: The connection need not develop the full plastic capacity of the beam or girder if it can be shown that adequately ductile joint displacement is provided with a lesser connection.

4) LOCAL BUCKLING

Members in which hinges will form during inelastic displacement of the frames shall comply with the requirement for "plastic design sections".

5) SLENDERNESS RATIOS

The effective length "kl" used in determining the slenderness ratio of an axially loaded compression member in the moment-resisting space frame depends on its own bending stiffness for the lateral stability of the building, even if bracing or shear walls are provided.

6) NONDESTRUCTIVE WELDING TESTING

Welded connections between primary members of the moment-resisting space frame shall be tested by nondestructive

methods for compliance with the Code and job specifications. A program for this testing shall be established by the person responsible for structural design. As a minimum, this program shall include the following:

a) All complete penetration groove welds contained in joints and splices shall be tested one hundred (100) percent either by ultrasonic testing or by radiography.

EXCEPTION: The nondestructive testing rate for an individual welder may be reduced to twenty-five (25) percent subject to the concurrence of the design engineer of record, provided the reject rate is demonstrated to be five (5) percent or less of the welds tested for the welder. A sampling of at least forty (40) completed welds shall be made for such reduction evaluation. Reject rate is defined as the number of welds containing rejectable defects divided by the number of welds completed. For evaluating the reject rate of continuous welds over three (3) feet in length, each twelve (12) inch increment shall be considered as one weld. For evaluating the reject rate for continuous welds greater than one (1) inch thick, each six (6) inches of length shall be considered one (1) weld.

b) Partial penetration groove welds when used in column splices shall be tested either by ultrasonic testing or radiography as required by the design engineer of record.

b) BRACED FRAMES

1) All members in braced frames of K=1.0 and K=1.33 buildings shall be designed for 1.25 times the force determined in accordance with section 718.4. Connections for these members are not permitted the thirty-three (33) percent stress increase for earthquake.

718.53 MASONRY: Masonry shall be subject to the provisions and reference standards of Article 8.

718.54 TIMBER: Design and construction of earthquake resisting timber structures shall conform to the provisions of section 851 supplemented by the reference standards of Article 8 pertaining to Lumber and Construction and the Timber Construction Manual (second Edition 1974) by the American Institute of Timber Construction, and to the requirements of this section.

a) DIAPHRAGMS

Lumber and plywood diaphragms may be used to resist wind or horizontal earthquake forces.

Design of diaphragms shall conform to the accepted engineering practice as presented in the Timber Construction Manual.

b) Axial and shear forces produced in wood members by wind or earthquake shall be transferred by positive connections and adequate anchorage. Uplift or horizontal displacement of seated connections shall be prevented by positive anchors. Toenailing or nails subject to withdrawal are not acceptable for connections resisting such forces or displacements.

Sheathing materials may be used as tension ties provided the tension force does not provide cross-grain bending or cross-grain tension in the peripheral members or other framing members to which the sheathing connects.

718.55 PREFABRICATED CONSTRUCTION: All structural elements within the structure which are considered to resist seismic forces or movement and/or are connected so as to participate with the structural system shall be designed in accordance with the provisions of this Code in accordance with "Accepted Engineering Practice Standards" (ACI 318-71 for Precast Concrete). Connections shall accommodate all design forces and movement without loss of load carrying capacity of the interconnected members and shall conform to section 718.57.

718.56 OTHER MATERIALS OR METHODS OF CONSTRUCTION: Materials other than concrete, steel, clay masonry, concrete block masonry and wood and structural systems other than structural steel, reinforced concrete, reinforced masonry, wood frame or heavy timber shall not be relied on to resist lateral forces and deformations in building structures unless it can be demonstrated to the building official that the structure can safely withstand lateral distortion eight (8) times that computed for the lateral forces specified in section 718.4. The building official shall require drawings and calculations submitted by a registered professional engineer to verify the requirements of this provision.

718.57 CONNECTIONS

a) Connections with transfer forces between members which resist seismic forces in flexure shall be designed for the required forces and also shall either:

1) Develop the full plastic moment of the member

OR

2) Be capable of deforming to form a reversible plastic hinge.

b) Members which are part of the lateral force resisting system and resist seismic motion by direct axial force shall have connections designed to develop the axial capacities of the members.

c) Connections of structural members, which are not part of the lateral force resisting system, to supporting members shall be designed to resist the required seismic forces without reliance on frictional forces.

d) Column splices, base plate anchors and other types of connections that act primarily in bearing shall be designed to resist the required forces, and also shall be capable of resisting the forces resulting from the full seismic loading combined with two-thirds (2/3) of the dead load forces acting concurrently.

e) Connections between diaphragms and resisting shear walls and bracing shall be designed for twice the computed force.

718.6 OTHER DESIGN REQUIREMENTS

718.61 LATERAL FORCE RESISTING SYSTEM: Rigid elements that are assumed not to be part of the lateral force resisting system may be incorporated into buildings provided that their effect on the action of the system is considered and provided for in the design.

718.62 MOMENT RESISTING SPACE FRAMES: Moment resisting space frames may be enclosed by or adjoined by more rigid elements which would tend to prevent the space frame from resisting lateral forces where it can be shown that the action or failure of the more rigid elements will not impair the vertical and lateral load resisting ability of the space frame.

718.63 BUILDING SEPARATIONS: All portions of structures shall be designed and constructed to act as an integral unit in resisting horizontal forces unless separated structurally by a distance sufficient to avoid contact under deflection from seismic action or wind forces.

718.64 SETBACKS: Buildings having setbacks wherein the plan dimension of the tower in each direction is at least seventy-five (75) percent of the corresponding plan dimension of the lower part may be considered as a uniform building without setbacks for the purpose of determining seismic forces.

For other conditions of setbacks the tower shall be designed as a separate building using the larger of the seismic coefficients at the base of the tower determined by considering the tower as either a separate building for its own height or as part of the overall structure. The resulting total shear from the tower shall be applied at the top of the lower part of the building which shall be otherwise considered separately for its own height.

EXCEPTION: Nothing in this subsection shall be deemed to prohibit the submission of properly substantiated technical data for establishing the lateral design forces by a dynamic analysis in accordance with section 718.7

718.65 COMBINED VERTICAL AND HORIZONTAL FORCES: In computing the effect of seismic force in combination with vertical loads, gravity load stresses induced in members by dead load plus design live load, except roof live load, shall be considered.

718.66 EXTERIOR ELEMENTS: Precast, nonbearing, non-shear wall panels, parapets, or other elements which are attached to, or enclose the exterior, shall accommodate movements of the structure resulting from lateral forces or temperature changes. The concrete panels or other elements shall be supported by means of poured-in-place concrete or by mechanical fasteners in accordance with the following provisions:

a) Connections and panel joints shall allow for a relative movement between stories of not less than two (2) times story drift caused by wind or seismic forces; or one quarter (1/4) inch whichever is greater.

b) Connections shall have sufficient ductility and rotation capacity so as to preclude fracture of the concrete or brittle failures at or near welds. Inserts in concrete shall be attached to, or hooked around reinforcing steel, or otherwise terminated so as to effectively transfer forces to the reinforcing steel.

c) Connections to permit movement in the plane of the panel for story drift may be properly designed sliding connections using slotted or oversize holes or may be connections which permit movement by bending of steel.

718.67 MINOR ALTERATIONS: Minor structural alterations may be made in existing buildings and other structures, but the resistance to lateral forces shall be not less than that before such alterations were made, unless the building as altered meets the requirements of this section of the Code.

718.68 DRIFT: Lateral deflections or drift of a story relative to its adjacent stories shall be considered in accordance with accepted practice. Lateral deflection of diaphragms shall be considered in addition to the deflection of vertical bracing elements.

Rigid elements that are assumed not to be part of the lateral force resisting system may be incorporated into buildings provided that the effect of the action of the system is considered and provided for in the design. In addition, the effects of the drift on such rigid elements themselves and on their attachment to the building structure shall be considered.

718.69 INTERCONNECTIONS OF FOUNDATIONS: Pile, pier and caisson caps shall be interconnected by ties when the caps overlie Class B soil. Each tie shall carry by tension or compression a horizontal force equal to ten (10) percent of the larger pile, pier or caisson cap loading, unless it can be demonstrated that equivalent restraint

can be provided by other means. At sites where footings are underlain at shallow depths by cohesionless granular soils, the blow counts of which only slightly exceed the criteria given in Figure 7-10, adequate consideration shall be given to the lateral and vertical movements of footings that may occur during the design earthquake specified in section 718.7.

718.70 RETAINING WALLS: Retaining walls shall be designed to resist at least the superimposed effects of the total static lateral soil pressure, excluding the pressure caused by any temporary surcharge, plus an earthquake force of $0.045\gamma_t H^2$ (Horizontal backfill surface). Surcharges which are applied over extended periods of time shall be included in the total static lateral soil pressure and their earthquake lateral force shall be computed and added to the force of $0.045\gamma_t H^2$. The earthquake force from the backfill shall be distributed as an inverse triangle over the height of the wall. The point of application of the earthquake force from an extended duration surcharge shall be determined on an individual case basis. If the backfill consists of loose saturated granular soil, consideration shall be given to the potential liquefaction of the backfill during the seismic loading.

718.71 DYNAMIC ANALYSIS: Any building or structure is deemed to have complied with the provisions of section 718 if a qualified registered engineer determines that there is negligible risk to life safety if the building or structure experiences an earthquake with a peak acceleration of 0.12g and a frequency content similar to that implied by the appropriate response spectrum in Figure 7-10. A copy of the studies upon which the determination may be based upon shall be filed with the building official. Such a determination may be based upon

a) a dynamic analysis, based upon generally acceptable procedures, together with evidence that the building or structure can safely withstand the computed displacements and distortions;

b) a comparison of the building or structure with similar buildings or structures having similar foundations and subsoil conditions, that have withstood a similar actual earthquake; or

c) other accepted procedures.

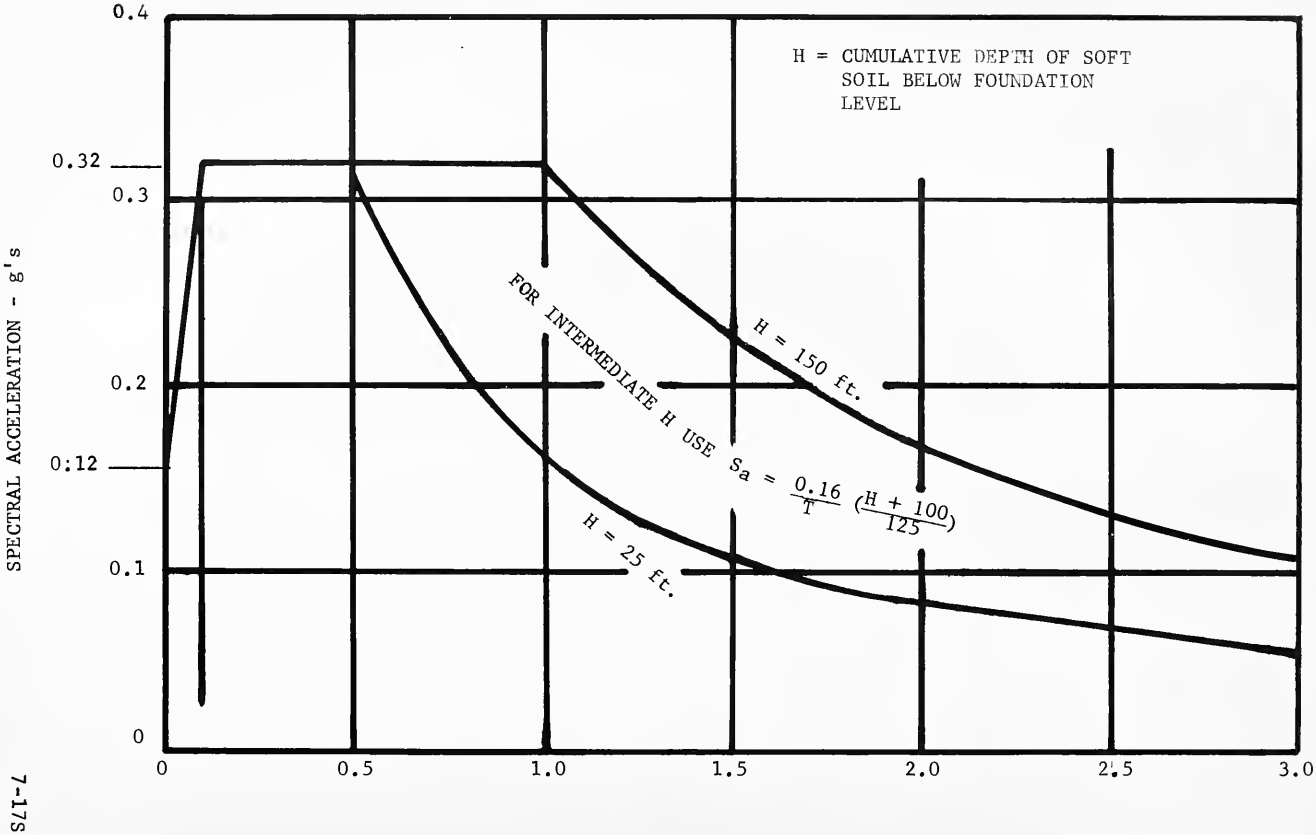


FIGURE 7-10 DESIGN RESPONSE SPECTRUM

SECTION 719.0 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:

719.1 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 1/3) percent.

719.2 WITH 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 1/3) percent.

719.3 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 720.0 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.

720.1 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) percent per square foot of area supported by the members; except that no reduction shall be made for areas to be occupied as places of public assembly. The reduction shall exceed neither R as determined by the following formula, nor sixty (60) percent:

$$R = 23 (1 + D/L)$$

R = reduction in percent
D = dead load per square foot of an area supported by the member
L = design live load per square foot of area supported by the member.

720.2 LIVE LOADS MORE THAN 100 POUNDS: 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) percent.

SECTION 721.0 ALLOWABLE WORKING STRESSES

721.1 CONTROLLED MATERIALS: All structures controlled by the provisions of section 128.0, and all other materials subject to control in the building regulatory system, shall be identified as to manufacture, grade, and whatever other specifications as may be necessary to conform with the requirements for design and analysis of such controlled structures or materials.

721.2 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 the reference standards of this article.

721.3 NEW MATERIALS: For materials which are not specifically provided for in the Basic Code, the working stresses shall be established by tests as provided in sections 703 and 803.

SECTION 722.0 LIGHT WEIGHT METALS

Aluminum and other light weight metals and their alloys may be used in the design and construction of buildings and 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, and provided that plans and calculations are submitted by a registered professional engineer or architect.

SECTION 723.0 BEARING VALUE OF SOILS

All applications for permits for the construction of new buildings or structures, and for the alteration of a permanent structure which require changes in foundation loads and distribution, shall be accompanied by a statement describing soil in all bearing strata, including sufficient records and data to establish their character, nature and load bearing capacity. Such records shall be certified by a qualified registered professional engineer or architect.

723.1 SATISFACTORY FOUNDATION MATERIALS: Satisfactory bearing strata to provide structural support shall be considered to include the following, provided they are of a standard consistent with engineering applications: natural strata of rock, gravel, sand, inorganic silt, inorganic clay, or combinations of these materials. Compacted fills when designed and placed under the supervision of a qualified registered professional engineer or architect and certified by him as meeting the design requirements, may be accepted by the building official. Other conditions of unsatisfactory bearing materials which are altered under

the supervision of a qualified registered professional engineer or architect and certified by him as meeting the design requirments may be accepted by the building official. Sites involving medium and fine sands, inorganic silt and compacted fills are subject to the additional special requirements in section 723.3.

723.11 LOADING INTERACTION: Wherever bearing strata are subject to interaction from other loadings or strata reactions, such conditions shall be incorporated in the evaluation of the design bearing capacity of the support strata.

723.12 BEARING CAPACITY FOR LIGHT WEIGHT STRUCTURES: Light weight structures and accessory structures such as garages and sheds may be founded on normally unacceptable bearing strata, providing such material is certified by a qualified registered professional engineer or architect as being satisfactory for the intended use.

723.13 PROTECTION OF BEARING STRATA: Bearing strata which may be adversely affected by conditions within the structure, such as evaporation and shrinkage due to excess heat, shall be adequately protected.

723.2 BEARING VALUES: The maximum pressure on soils under foundations shall not exceed values specified in table 7-4, except when determined in accordance with the provisions of section 725.0 or when modified by specific sections of this article.

TABLE 7-4 PRESUMPTIVE BEARING CAPACITY OF FOUNDATION MATERIALS

CLASS OF MATERIAL**	TONS PER SQUARE FOOT*
1. Massive crystalline bedrock including granite, diorite, gneiss, trap rock, and dolomite (hard limestone)	60
2. Foliated rock including limestone, schist and slate in sound condition	40
3. Sedimentary rock including hard shales, sandstones, and thoroughly cemented conglomerates	20
4. Soft or broken bedrock (excluding shale) and soft limestone	20
5. Compacted, partially cemented gravels, and sand and hardpan overlying rock	10
6. Gravel, well-graded sand and gravel mixtures	6
7. Loose gravel, compact coarse sand	4
8. Loose coarse sand and sand and gravel mixtures and compact fine sand (confined)	2

TABLE 7-4 (cont.)

9.	Loose medium sand (confined)	1
10.	Loose fine sand	(+) (+)
11.	Hard clay	4
12.	Medium stiff clay, stiff varved silt	2 (t)
13.	Soft clay, soft broken shale	1 (t)
14.	Soft inorganic silt, preloaded material, shattered shale, or any natural deposit of unusual character not provided for herein	(+) (+)
15.	Disturbed bed varved silt	0
16.	Compacted granular fill	+ (2-5+)

* 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.

t 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 strenth 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 725.0 and 726.0.

** The allowable bearing pressure may be increased by one-third (1/3).

723.21 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 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 Puddingstone).

b) GRANULAR MATERIALS

GRAVEL: a mixture of mineral grains at least seventy (70) percent (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) percent (by weight) of which passes a No. 4 mesh sieve and which contains not more than fifteen (15) percent (by weight) passing a No. 200 mesh sieve.

COARSE SAND: a sand at least fifty (50) percent (by weight) of which is retained on a No. 20 mesh sieve.

MEDIUM SAND: a sand at least fifty (50) percent (by weight) of which passes a No. 20 mesh sieve and at least fifty (50) percent (by weight) is retained on a No. 60 mesh sieve.

FINE SAND: a sand at least fifty (50) percent (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) percent and seventy (70) percent (by weight) passing a No. 4 mesh sieve, between ten (10) and forty (40) percent (by weight) passing a No. 20 mesh sieve, and containing not more than eight (8) percent (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) percent (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) wheel 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 compacting 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 725.0. A copy of all these records and test data shall be filed with the building official.

e) PRELOADED MATERIALS

1) The building official may allow the use of certain otherwise unsatisfacoty 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) percent 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.

723.3 LIQUEFACTION: The earthquake liquefaction potential of saturated medium and fine sands shall be evaluated on the basis of figures 7-7 and 7-8. If the standard penetration resistances, N, in all strata of medium and fine sand lie above the applicable curve in figure 7-7, the sands at the site shall not be considered subject to liquefaction. If strata not meeting the above criterion exist, but if the total thickness of these non-complying strata and the depth to the top of the uppermost of the non-complying stratum meet the requirements in figure 7-8 the site shall also be satisfactory from the standpoint of liquefaction. For pressure-injected footings, the ten (10) foot thickness of soil immediately below the bottom of the driven shaft shall not be considered subject to liquefaction.

Compacted granular fills shall not be considered subject to liquefaction provided they are systematically compacted to at least ninety-three (93) percent of maximum dry density as determined in accordance with laboratory test designation ASTM D1557, or a relative density of at least sixty (60) percent in the case of granular soil having less than ten (10) percent by weight passing the No. 200 sieve.

For sites not meeting the above criteria, and for sites involving saturated inorganic non-plastic silts, studies by a qualified registered professional engineer shall be made to determine that the structure loads can be safety supported. Such studies might include:

a) detailed investigations to establish that the soils at the site are actually not subect to liquefaction during the design earthquake as specified in section 718.7.

b) providing foundations that will not fail if liquefaction occurs.

c) replacing or densifying the liquefaction susceptible soils such that liquefaction will not occur.

723.4 CLASS A AND CLASS B SOILS: For purposes of determining earthquake forces as specified in sections 718.4 and 718.7 Class A soil includes the following classes from Table 7-4: massive igneous rocks and conglomerate; slate, shale in sound conditions, glacial till; gravel or well-graded sand and gravel, if dense to very dense; coarse sand, if dense to very dense; medium sand, if dense to very dense; fine sand, if dense to very dense; medium and hard clay; and compacted granular fill provided that fill soils are systematically compacted throughout under the continuous inspection by a qualified registered professional engineer.

SECTION 724.0 SUBSURFACE EXPLORATIONS

724.1 WHERE REQUIRED: Borings, tests, drill holes, core borings or any combination shall be required for all structures except the following unless specifically required by the building official;

a) one and two-family dwellings and their accessory buildings.

b) structures less than 35,000 cubic feet in gross volume.

The borings or tests shall be adequate in number of depth and so located to accurately define the nature of any subsurface material necessary for the support of the structure.

When it is proposed to support the structure directly on bedrock, the building official shall require rock cores or core borings to be made into the rock, or shall require other evidence satisfactory to prove that the structure shall be adequately founded on bedrock.

724.2 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 725.0 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 qualified registered professional engineer.

725.1 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 qualified registered professional engineer who shall have a fully-qualified representative on the site during all test operations.

725.2 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) percent.

725.21 AREA: For bearing materials of classes 1 to 5 inclusive, the load area shall be not less than one (1) square foot and for other classes, not less than four (4) square feet.

725.3 LOADING PROCEDURE: The application of the test load shall be in steps equal to not more than one-half (½) the contemplated design load, to at least twice the contemplated design load, except as provided in section 725.7. 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 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.

725.4 MEASUREMENTS: Observation of vertical movement shall be made so that the data will accurately define the progress of vertical displacement during the test.

725.5 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.

725.6 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.

725.7 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 (1½) 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 (½) inch, the maximum design load shall be the load allowed in this part for the type of pile or one-half (½) 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.

725.8 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; and 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; and 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.

725.9 SETTLEMENT ANALYSIS: Whenever a structure is to be supported by medium or soft clay (materials of classes 11 and 12) or other materials which may be subject to settlement or consolidation, the settlements of the structure and of neighboring structures due to consolidation shall be given careful consideration, particularly if the subsurface material or the loading is subject to extensive variation. The building official may require a settlement analysis to be made by a qualified registered professional engineer in case the live and dead loads of the structure, as specified in this article, 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 layer.

725.91 SETTLEMENT ANALYSIS COMPUTATIONS: The settlement analysis will be based on a computation of the new 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 shall be determined by a qualified registered professional engineer and approved by the building official.

SECTION 726.0 ALLOWABLE FOUNDATION PRESSURE

The maximum allowable pressures on foundation materials shall be in accordance with section 723.0 and as modified herein.

726.1 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.

726.2 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) percent for each foot of additional depth, but shall not exceed three (3) times the tabulated values.

726.3 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) percent for each foot of depth of the loaded area below the minimum required in section 727 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.

726.4 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 (½) the tabulated bearing pressures.

726.5 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.

726.6 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 by a registered professional engineer and appropriate remedial measures taken, satisfactory to the building official.

SECTION 727.0 SPREAD FOUNDATIONS

Except when erected upon sound bedrock or when protected from frost, foundation walls, piers and other permanent supports of all buildings and structures shall extend a minimum of four (4) feet below finished grade; except as provided in section 727.21. Spread footings of adequate size shall be provided when necessary to properly distribute the load within the allowable bearing pressure of the soil.

727.1 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.

727.2 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.

727.21 GRADE BEAMS: Grade beams of all structures may extend not more than two (2) feet below the 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 nor more than five (5) percent (by weight) passing a No. 200 mesh sieve.

727.22 ISOLATED FOOTINGS: Footings on granular soil of classes 5 to 16 inclusive in table 7-4 shall be so located that the line drawn between the lower edges of adjoining footings shall not have a steeper slope than thirty (30) degrees with the vertical, unless the material supporting the higher footing is braced or retained or otherwise laterally supported in an approved manner.

SECTION 728.0 FOOTING DESIGN

728.1 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 820 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.

728.2 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).

728.3 EARTHQUAKE LOADS: Special provision shall be made in the foundation design to comply with the provisions of section 718.

728.4 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 disturbances of the soil.

728.5 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 729.0 TIMBER FOOTINGS (DELETED)

SECTION 730.0 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 731.0 UNREINFORCED CONCRETE FOOTINGS

731.1 CONCRETE STRENGTH: Concrete in unreinforced foundation footings shall be so proportioned as to develop an ultimate compressive strength of not less than two thousand (2,000) pounds per square inch at twenty-eight (28) days.

731.2 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.

731.3 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.

731.4 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 732.0 MASONRY UNIT FOOTINGS

732.1 DIMENSIONS: Masonry unit footings shall be laid in type M or S mortar complying with section 816 and the depth shall be not less

than twice the projection beyond the wall, pier or column; and the width shall be not less than eight (8) inches wider than the wall supported thereon.

732.2 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 733.0 REINFORCED CONCRETE FOOTINGS

733.1 DESIGN: Reinforced concrete foundations shall comply with section 842 and the applicable reference standards therein listed for the design of reinforced concrete.

733.2 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 cutoff.

733.3 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 734.0 FLOATING FOUNDATIONS

The design of floating foundations shall include a settlement analysis in accordance with the provisions of section 725.9.

SECTION 735.0 PILE FOUNDATIONS

735.1 SITE INVESTIGATION: In addition to the provisions of section 724.0, 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 736.0 shall be taken to prevent corrosion or other destructive action from deleterious conditions.

735.2 SPACING: The minimum center-to-center spacing of piles shall be not less than twice the average diameter 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 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.

735.3 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.

735.4 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.

735.5 MINIMUM DIMENSIONS: Piles of uniform cross section shall have a minimum outside nominal dimension of ten (10) inches except as provided in section 739.2. Tapered concrete piles shall have a minimum butt diameter at cutoff of twelve (12) inches and a diameter of not less than eight (8) inches measured one (1) foot above the tip.

735.6 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) percent of the strength of pile section in whatever state of stress.

735.7 JETTING: Jetted piles shall be driven to the required load resistance as determined by the application of the approved pile driving formula in section 737.21, after the flow of jet water has stopped.

735.8 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.

735.9 PILE HEAVE: Adequate provision shall be made to observe pile heave, and where heaving of one-half (1/2) inch or more occurs, corrective measures shall be taken to ensure that the pile is adequate for its design use.

735.10 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 cutoff. A copy of these records shall be filed in the office of the building official.

SECTION 736.0 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.

736.1 PRESERVATIVE TREATMENTS: The preservative treatment of timber piles shall comply with the provisions of section 738.0 and the reference standards of this article.

736.2 STEEL AND STEEL-CONCRETE PILES: At locations where steel and steel-concrete piles will be in contact with any material which is corrosive to the steel, one of the following procedures shall be used for protection, or any other method which will satisfy the requirements of the building official:

a) remove all objectionable material.

b) effectively protect the steel surface from pile cutoff grade to a grade fifteen (15) feet below the bottom of the objectionable material 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) providing an excess thickness of one-eighth (1/8) inch beyond design requirements on all exposed surfaces.

SECTION 737.0 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 723 and 726, but in no case shall the load exceed the capacity of the pile designed in accordance with the provisions of section 737.1 and the requirements of article 8 for the construction materials involved.

737.1 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 746.

737.2 DETERMINATION OF ALLOWABLE LOAD: In the absence of capacities based on load tests, except for the type of piles covered in sections 740.2 and 742.0, the load on a single pile shall not exceed the higher of the two (2) values determined in accordance with sections 737.2 and 737.22, nor the maximum loads on piles as provided in section 737.23.

737.21 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:

$$R = 2E/(S + C)$$

where

R = allowable pile load in pounds
E = energy per blow in foot pounds
S = penetration of last blow or average penetration of last few blows experienced in inches
C = Constant equal to 1.0 for drop hammer and 0.1 for steam or air hammer.

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 737.21a, based on load tests or past experience under similar conditions.

c) The value of "s" must be determined with the hammer operating at one hundred (100) percent of the rated number of blows per minute for which the hammer is designed.

d) Any driving resistance developed in strata overlying the bearing material shall be discounted.

e) If the driving of the pile has been interruped 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.

f) 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.

737.22 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.

737.23 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.

737.3 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.

737.4 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 principles 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.

737.41 PILE LOAD LIMITATION: 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 723.0.

737.42 LIQUEFACTION DURING EARTHQUAKE: The requirements of section 723.3 shall be considered in the design of pile foundations. If pile tips lie above soil which does not meet the criteria in figures 7-7 and 7-8, special studies shall be made by a qualified registered professional engineer or architect to ensure safety during the design earthquake specified in section 718.7.

SECTION 738.0 TIMBER PILES

738.1 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.

738.2 QUALITY REQUIREMENTS: The quality of all round timber piles shall at least conform to class A and B, round timber piles listed in the reference standards of this article.

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.

738.3 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 through 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 through 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 cutoff, with these measurements being taken under the bark.

c) all piles shall be driven in one (1) piece except as provided in section 744.0 for composite piles.

738.4 CUTOFF: The tops of all timber piles shall be cut off in a horizontal plane; and if not treated by an approved preservative process, the cutoff 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.

738.5 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.

738.51 TREATMENT: Creosoted wood piles of southern yellow pine, Douglas fir, red oak or Norway pine shall be creosoted under pressure in accordance with the reference standards of this article 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 cutoff shall be given three (3) coats of hot creosote, followed by a coat of coal-tar pitch; and the cutoff shall be made in sound wood and be encased not less than three (3) inches in the concrete pile cap.

738.52 CERTIFICATION: Before any treated piles are driven, the building official shall be furnished with certification by a licensed testing laboratory, certifying that 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.

738.6 MAXIMUM LOAD ON WOOD PILES: The load on a wood pile shall not exceed the allowable load specified in section 737. 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. The maximum load on a timber pile shall not exceed thirty-five (35) tons.

738.7 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 739.0 PRECAST CONCRETE PILES

739.1 CONCRETE STRENGTH: No precast concrete pile shall be driven before the concrete has attained a compressive strength of not less than four thousand (4,000) 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.

739.2 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. The minimum lateral dimension of a precast concrete pile shall be ten (10) inches.

739.3 LIMITATION OF LOAD: The load on a precast concrete pile shall not exceed the allowable load specified in section 737 nor twenty-five (25) percent 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) percent of the effective prestress in the concrete after losses shall be deducted from twenty-

five (25) percent of the twenty-eight (28) day strength or twelve hundred (1200) pounds, whichever is less, in computing the maximum pile load.

739.4 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.

739.5 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.

739.6 SPLICES: One splice shall be permitted in precast concrete piles.

SECTION 740.0 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 a 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.

740.1 POURED CONCRETE PILES

740.11 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.

740.12 LOADING: The load on poured-concrete piles shall not exceed the allowable load specified in 737 nor twenty-five (25) percent of the twenty-eight (28) day strength of the concrete, but not exceeding eleven hundred (1100) 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.

740.13 INSTALLATION: Immediately before filling with concrete, the inside of the casing shall be thoroughly cleaned to the bottom and subjected to a visual examination. The casing shall be subject to the following limitations:

a) the diameter shall not vary more than twenty (20) percent from the specified value;

b) the point of the casing shall not deviate more than ten (10) percent of the length of the pile from the design alignment; and

c) the casing shall not deviate by more than four (4) percent of the length of the casing from the straight line connecting the mid-points of the ends of the casing. Any other condition which may affect the design performance shall be duly noted and evaluated subject to the requirements of the building official. 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.

740.2 COMPACTED CONCRETE PILES

740.21 LOADING: The load on compacted concrete piles shall be limited by the provisions of section 737.41 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 twenty (120) tons.

740.22 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) percent 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 (4,000) 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 six (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 (1100) 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.

740.23 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 1/2) feet.

SECTION 741.0 CONCRETE-FILLED PIPE PILES

741.1 INSTALLATION: Immediately before filling with concrete, the inside of the casing shall be thorough cleaned to the bottom and subjected to a visual inspection. The casing shall be subject to the following limitations:

a) the diameter shall not vary more than twenty (20) percent from the specified value;

b) the point of the casing shall not deviate more than ten (10) percent of the length of the pile from the design alignment; and

c) the casing shall not deviate by more than six (6) percent of the length of the casing from the straight line connecting the mid-points of the ends of the casing. Any other condition which may affect the design performance shall be duly noted and evaluated subject to the requirements of the building official. 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, provided the pipe is proven to be free of other material.

741.2 STEEL PIPE: All steel pipe shall conform to the applicable standards listed in the reference standards of this article 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.

741.3 DESIGN: The load on concrete-filled pipe piles shall not exceed the allowable load determined in accordance with section 737.0, nor a load computed on the basis of stress in concrete at twenty-five (25) percent 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 (9,000) 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.

741.4 MINIMUM THICKNESS: The minimum wall thickness of all load-bearing pipe, tubes and shells shall be one-tenth (1/10) inches. When required by soil conditions, allowance shall be made for corrosion as specified in section 736.

741.5 SPLICES: All splices of the steel section shall be welded to one hundred (100) percent of the strength of the pipe and otherwise shall comply with section 735.6 and shall be designed to insure true

alignment of the pipe and uniform transmission of load from one (1) pipe length to another.

SECTION 742.0 CONCRETE-FILLED PIPE WITH STEEL CORE (DRILLED-IN-CAISSONS)

742.1 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.

742.2 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) percent of the strength of the pipe.

742.3 CONCRETE FILL: The concrete fill of caissons shall be controlled concrete with a minimum compressive strength of four thousand (4,000) 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 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.

742.4 ROCK SOCKET: A socket, approximately 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 qualified registered professional engineer.

742.5 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.

742.6 DRIVING PRECAUTIONS: No drilled caissons shall be driven more than two (2) percent of the length out of plumb.

742.7 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.

742.8 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 743.0 STRUCTURAL STEEL PILES

743.1 STEEL: Steel sections may be of any type of steel permitted by the provisions of the reference standards of this article.

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) percent of the depth of the section. No section shall have a nominal thickness of metal less than four-tenths (4/10) 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 (5/10) 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.

743.2 SPLICES: If piles are spliced, the splice shall develop one hundred (100) percent of the strength of the section.

743.3 PROTECTION: Structural steel piles shall be protected under the conditions specified in section 736 or due allowance shall be made for corrosion as therein specified.

743.4 ALLOWABLE LOAD: The load on such piles shall not exceed the allowable load determined in accordance with section 737, nor a load based on stress of eleven thousand (11,000) pounds per square inch on the cross-section.

SECTION 744.0 COMPOSITE PILES

744.1 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 740.13 shall apply to the entire length of a pipe-shell composite pile.

744.2 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) percent 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.

744.3 SPLICES: Splices between concrete sections and steel or wood sections shall be designed to prevent separation of the sections both before and after the concrete portion has set, and to insure the alignment and transmission of the total pile load. Splices shall be designed to resist uplift due to upheaval during driving of adjacent piles and shall develop the full compressive strength and not less than fifty (50) percent of the strength in tension and bending of the weaker section.

744.4 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 745.0 SPECIAL PILES AND CAISSONS

Types of piles or caissons not specifically covered by the provisions of this Code may be permitted subject to the approval of the building official, provided sufficient test data, design and construction information are filed by a qualified registered professional engineer certifying that the pile or caisson installation is adequate to fulfill the design requirements.

SECTION 746.0 LATERAL SUPPORT

746.1 SURROUNDING MATERIALS: Any soil other than water or fluid soil including strata of soil not meeting the criterion in figure 7-7, shall be deemed to afford sufficient lateral support to permit the

design of any type of pile as a short column. When piles are driven through soil which will be removed subsequent at the completion of the foundation, the resistance offered by such material shall not be considered to contribute to the lateral supporting capacity.

746.2 COLUMN ACTION: The portion of a pile or pier that is not laterally supported shall be designed as a column in accordance with section 842 and taking into consideration the conditions of end fixity.

SECTION 747.0 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.

747.1 MANNER OF CONSTRUCTION: The manner of construction shall be by non-displacement methods and shall permit inspection of the bearing material in place.

747.2 BASE ENLARGEMENT: The bases of foundation piers may be enlarged by spread footings, pedestals or belled bottoms.

747.21 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 section 841 or 842.

747.3 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) percent of the twenty-eight (28) day strength of the concrete nor eleven hundred (1100) pounds per square inch.

747.31 When the center of the 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 of its diameter, it shall be reinforced as provided in section 842. The restraining effect of the surrounding soil may be taken into account.

747.4 PLACEMENT: With approval of the building official, concrete may be placed through still water by means of a properly operated tremie or pumped concrete.

747.5 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.

SECTION 748.0 DESIGN REQUIREMENTS FOR FLOODPLAINS AND COASTAL HIGH HAZARD AREAS

748.1 STRUCTURAL REQUIREMENTS: Where a structure is located in an area designated by the authority having jurisdiction as a floodplain area or coastal high hazard area, such a structure shall be designed to retain its structural integrity and stability for the anticipated flood conditions and to minimize flood damage. Any such structure, including one and two-family dwellings, shall have plans submitted by a registered professional engineer or architect showing only those provisions necessary in the construction of the structure to meet the following performance requirements:

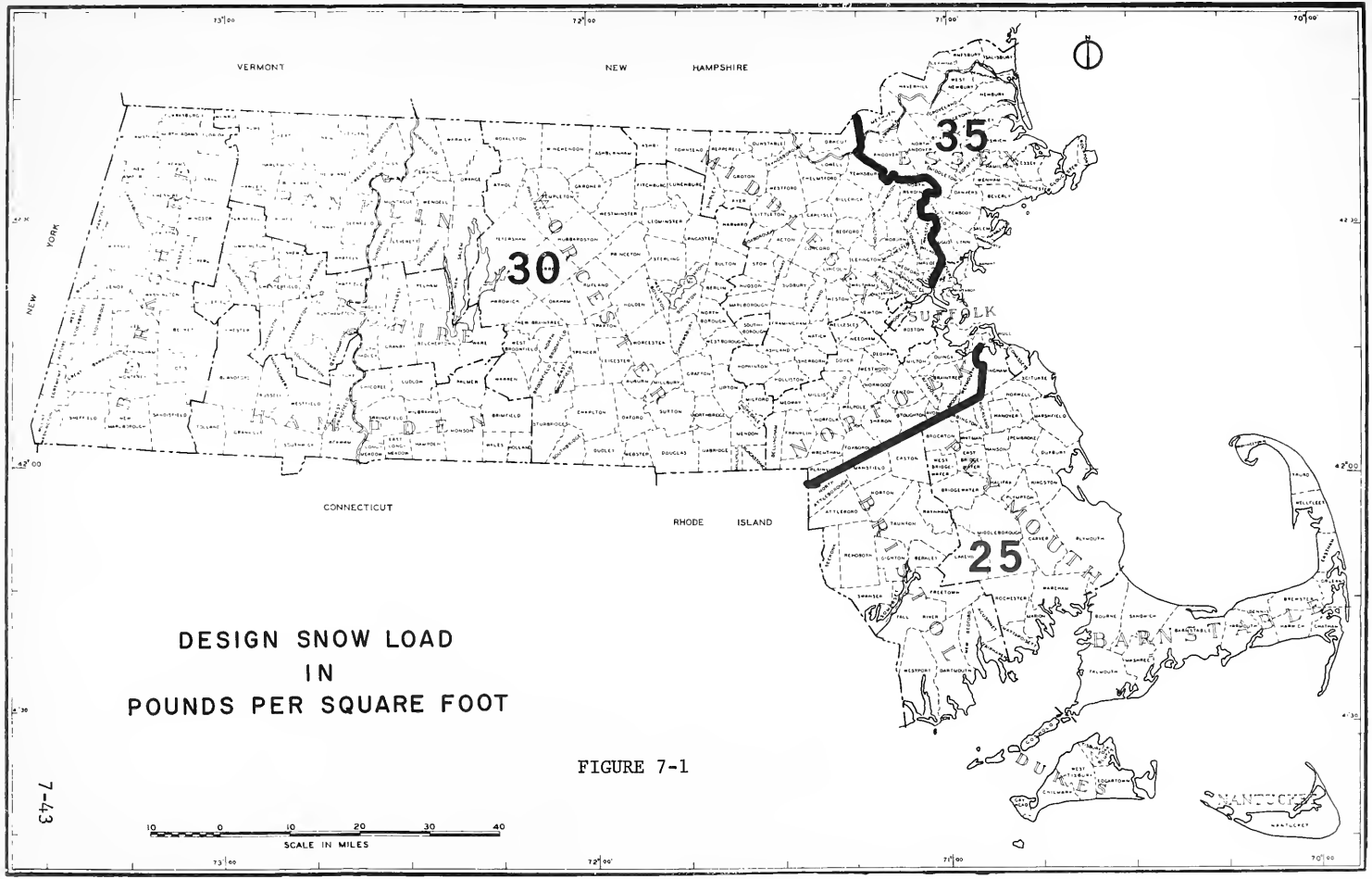
a) structures shall be anchored to prevent movement or collapse.

b) approved flood resistant materials and equipment shall be used.

c) coastal high hazard area structures must be anchored to piles and have space below lowest floor free of construction.

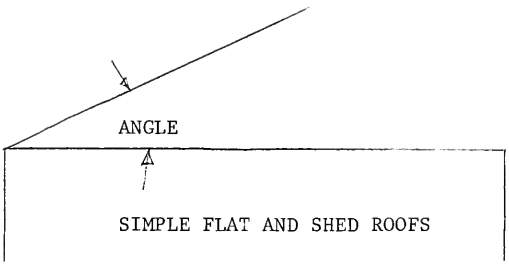
d) non-residential structures built with any occupiable space below the level designated by the authority having jurisdiction as the one hundred (100) year flood level, shall be designed to be floodproof.

748.2 ELEVATION OF STRUCTURES IN FLOODPLAINS: The building official shall maintain for public inspection and furnish upon request a record of elevations in relation to mean sea level, of the lowest floor (including cellar as defined in the Basic Code) of all new or substantially altered structures located in the special flood hazard areas. Where the lowest floor is below grade on one or more sides, the elevation of the floor immediately above shall also be provided.



DESIGN SNOW LOAD
IN
POUNDS PER SQUARE FOOT

FIGURE 7-1

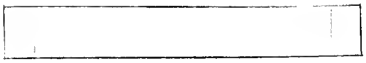


ANGLE	SLOPE	DESIGN SNOW LOAD (lbs/ft^2)		
MAP SNOW LOAD (lbs/ft^2)		25	30	35
0-20	FLAT TO 4/12	25	30	35
20-30	4/12 TO 7/12	25	30	35
30-40	7/12 TO 10/12	20	24	28
40-50	10/12 TO 14/12	15	18	21
50-60	14/12 TO 20/12	10	12	14
60-70	20/12 TO 33/12	5	6	7
70-90	33/12 TO VERTICAL	0	0	0

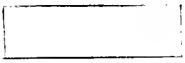
FIGURE 7-2a

DESIGN SNOW LOADS

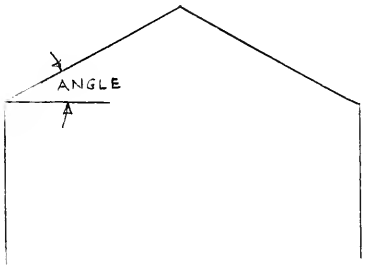
CASE I



CASE II



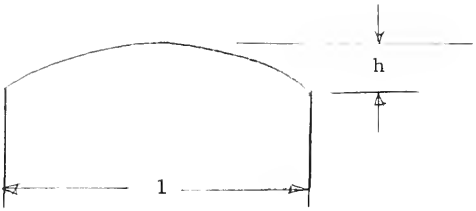
FOR ANGLES > 20°
USE CASES I & II



SIMPLE GABLE AND HIP ROOFS

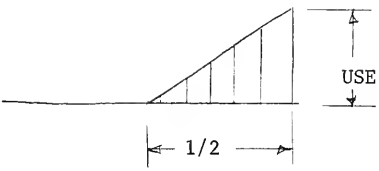
ANGLE	SLOPE	CASE I			CASE II		
MAP SNOW LOAD (lbs/ft²)		25	30	35	25	30	35
		DESIGN SNOW LOAD (lbs/ft²)					
0 - 20	FLAT to 4/12	25	30	35	N/A	N/A	N/A
20 -30	4/12 to 7/12	25	30	35	25	30	35
30 - 40	7/12 to 10/12	20	24	28	25	30	35
40 - 50	10/12 to 14/12	15	18	21	20	23	26
50 - 60	14/12 to 20/12	10	12	14	12	15	18
60 - 70	20/12 to 33/12	5	6	7	8	11	14
70 - 90	33/12 to vertical	0	0	0	0	0	0

FIGURE 7-2b



SIMPLE ARCH AND CURVED ROOFS

CASE I  USE MAP SNOW LOAD

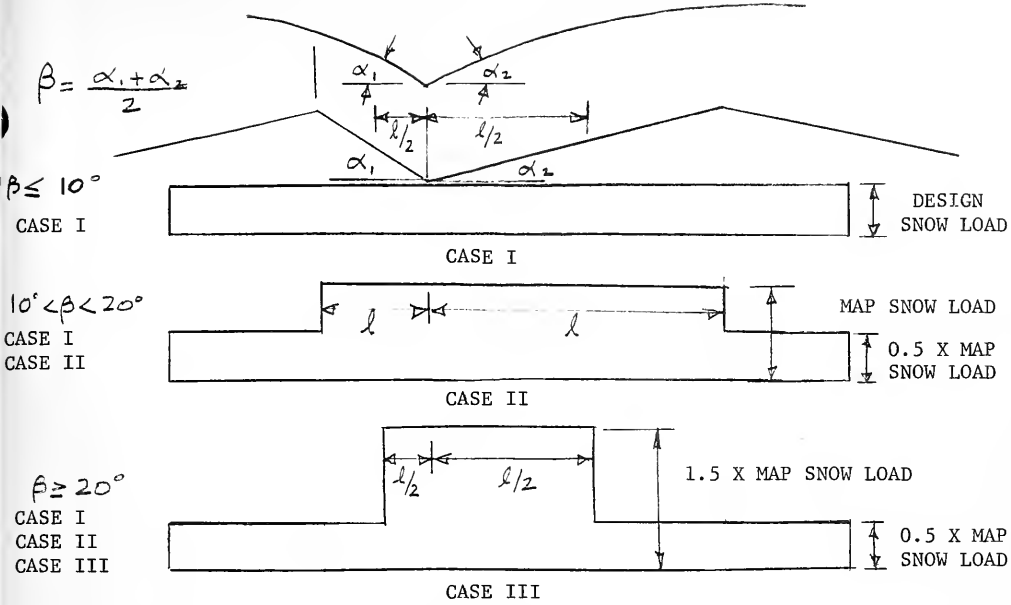
CASE II 

2 X MAP SNOW LOAD

FOR $\frac{h}{\ell} \leq \frac{1}{10}$ USE CASE I ONLY

FOR $\frac{h}{\ell} > \frac{1}{10}$ USE CASE I AND II

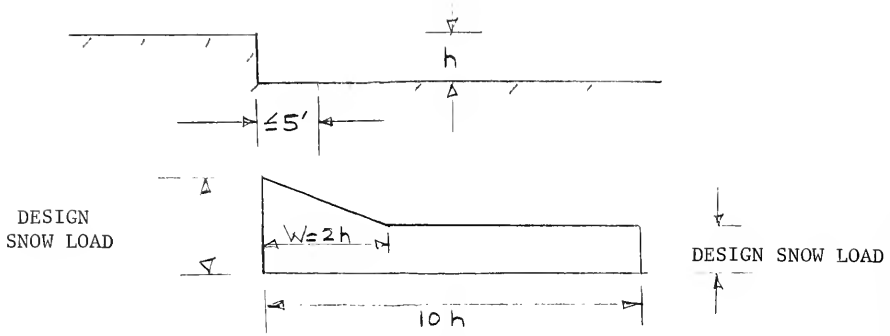
FIGURE 7-2c



VALLEY AREAS OF TWO-SPAN
AND MULTIPLE SERIES SLOPED OR CURVED ROOFS

ANGLE	SLOPE	CASE I		
MAP SNOW LOAD (lbs/ft^2)		25	30	35
		DESIGN SNOW LOAD (lbs/ft^2)		
0 to 10	FLAT to 2/12	25	30	35
10 to 20	2/12 to 4.5/12	25	30	35
20 to 30	4.5/12 to 7/12	25	30	35
30 to 40	7/12 to 10/12	25	30	35
40 to 50	10/12 to 14/12	20	24	28
50 to 60	14/12 to 20/12	10	12	14
60 to 70	20/12 to 33/12	5	6	7
70 to 90	33/12 to vertical	0	0	0

FIGURE 7-3a



LOWER LEVEL OF MULTI-LEVEL ROOFS
(WHEN UPPER ROOF IS PART OF SAME BUILDING OR
ON AN ADJACENT BUILDING NOT MORE THAN 5 FEET AWAY)

MAP SNOW LOADS (lbs/ft^2)	25	30	35	
H IN FEET	DESIGN SNOW LOAD (lbs/ft^2)			W IN FEET
0 - 1.5	25	30	35	10
1.5 - 2.0	30	30	35	10
2.0 - 2.5	38	38	38	10
2.5 - 3.0	45	45	45	10
3.0 - 3.5	53	53	53	10
3.5 - 4.0	60	60	60	10
4.0 - 4.5	70	70	70	10
4.5 - 5.0	75	75	75	10
5.0 - 6.0	75	90	90	W = 2h
6.0 - 15.0	75	90	105	W = 2h
15.0	75	90	105	30

FIGURE 7-3b

Design for:

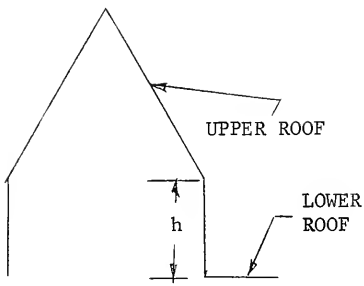
1. UPPER ROOF LOAD AS REQUIRED FOR LOADS APPLICABLE TO SINGLE-LEVEL ROOFS

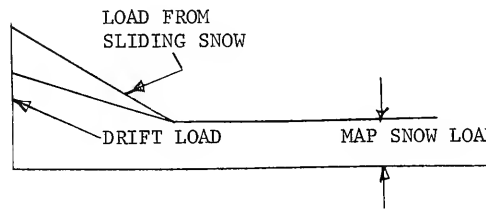
   PLUS

2. LOWER ROOF LOAD AS REQUIRED FOR LOADS APPLICABLE TO MULTI-LEVEL ROOFS

   PLUS

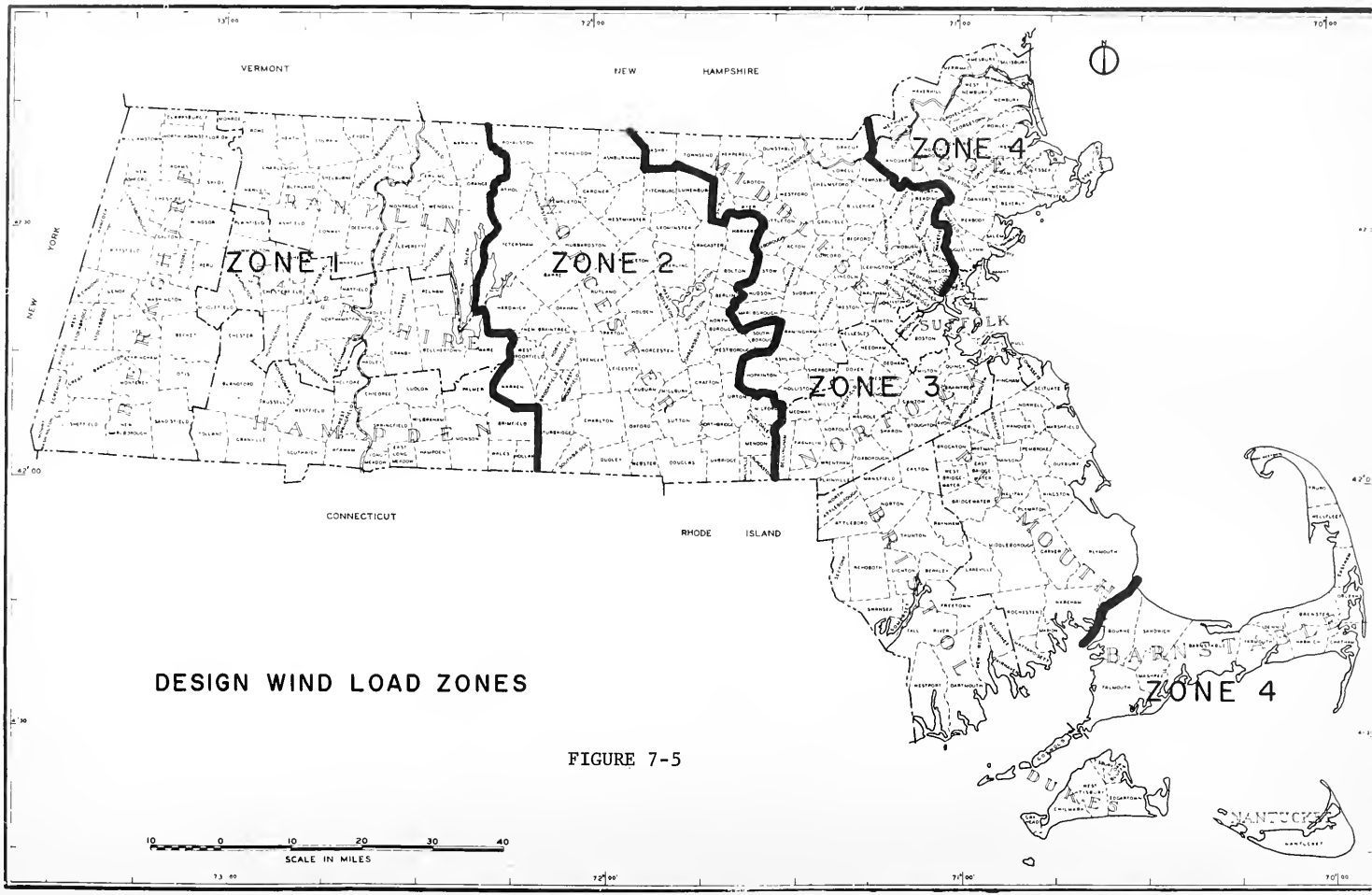
3. 50% OF UPPER ROOF LOAD CONSIDERED AS LOADED ONTO LOWER ROOF DUE TO SLIDING





ROOFS SUBJECT TO SNOW LOAD FROM SLIDING

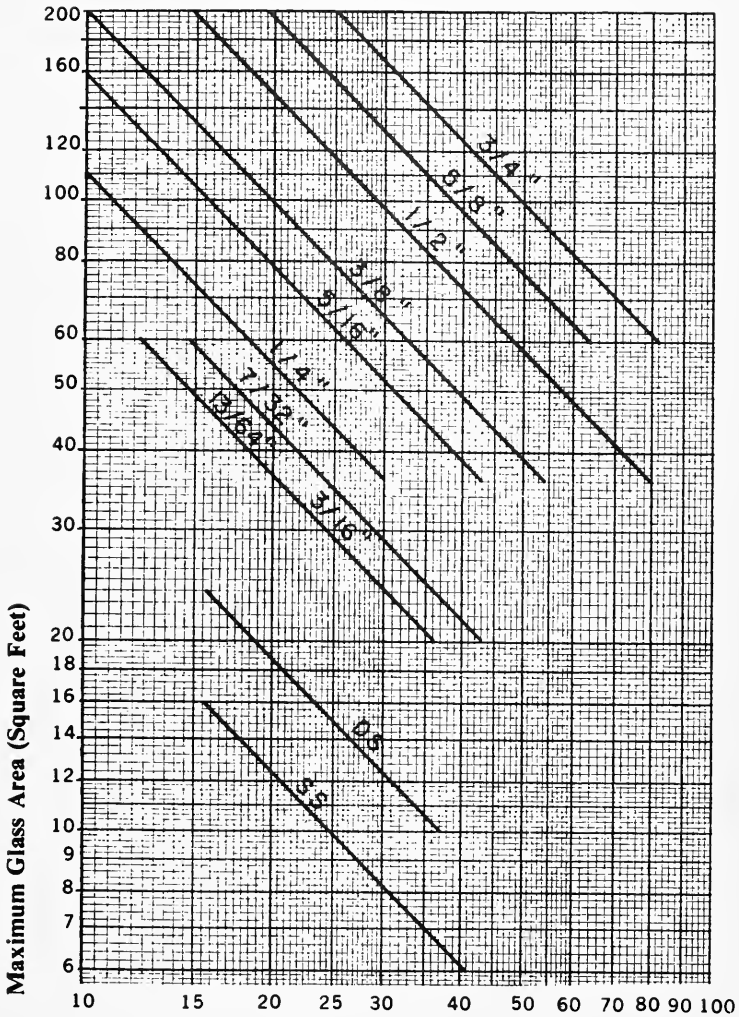
FIGURE 7-4



DESIGN WIND LOAD ZONES

FIGURE 7-5

Required Nominal Thickness of Glass



This chart is based on minimum thicknesses allowed in Federal Specification DD-G-451b

Design Factor - 2.5

FIGURE 7-6

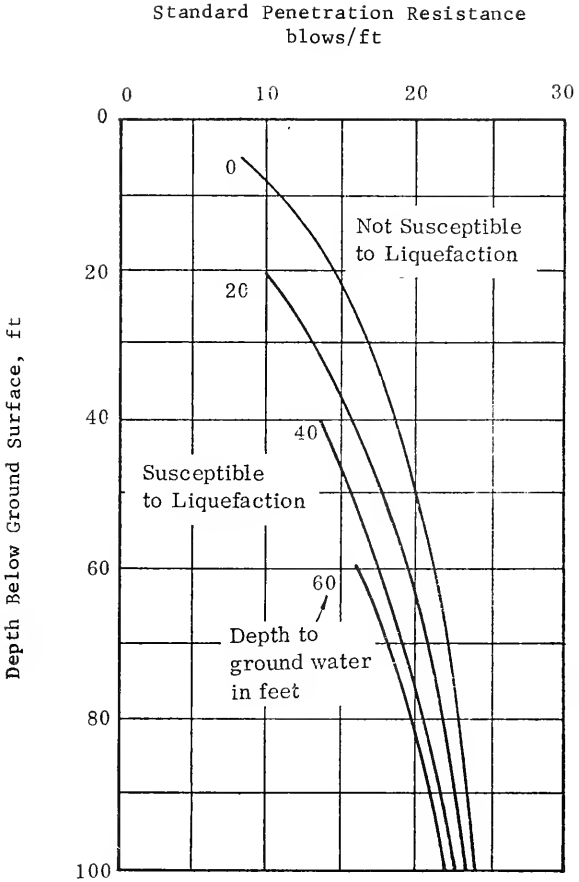


FIGURE 7-7

Penetration Resistance Requirements for
Medium and Fine Sands Subjected to Earthquakes for
Safety Against Liquefaction

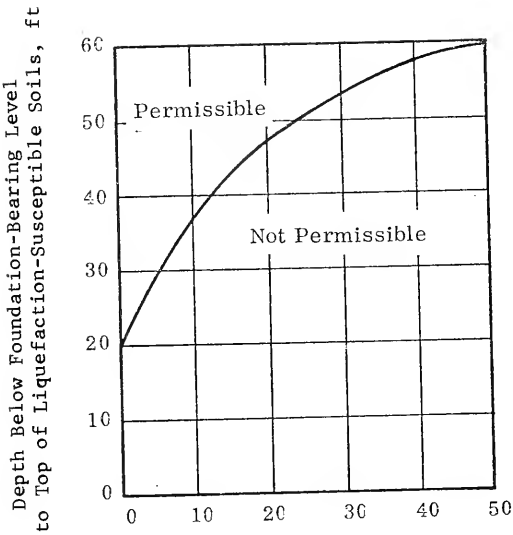


FIGURE 7-8

Permissible thicknesses and depths of soils that are susceptible to liquefaction.

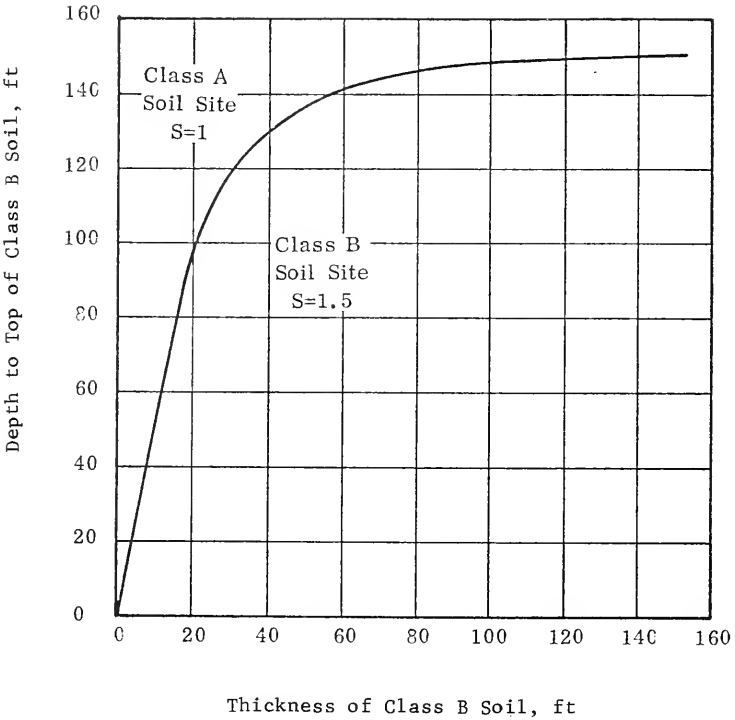


FIGURE 7-9

Determination of Soil Factor S

Reference Standards - Article 7

AASHO		1965	Standard Specifications for Highway 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	1971	Specification for Welded and Seamless Steel Pipe Piles
ASTM	D25	1970	Standard Specification for Round Timber Piles
AWPA	C1	1972	Standard for the Preservation Treatment of all Timber Products by Pressure Processes
AWPA	C3	1972	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
ANSI	A58.1	1972	Building Code Requirements for Minimum Design Loads in Buildings and Other Structures

MATERIAL AND TESTS

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 be subject to the approval of the State Building Code Commission and shall follow those requirements of accepted engineering practice and material and test standards as specified in the reference standards of this article as approved by the State Building Code Commission.

800.1 ACCEPTED ENGINEERING PRACTICE: The quality, use and installation of all materials and devices, and the methods of building construction shall be controlled by the standards of accepted engineering practice as approved by the State Building Code Commission and listed in the references of this article.

800.2 MATERIAL AND TESTS: All materials, devices, methods of construction, and tests shall be subject to the approval and control of the State Building Code Commission for use in the Commonwealth of Massachusetts.

800.3 USED MATERIALS: The use of all second-hand materials which meet the minimum requirements of the Basic Code for new materials shall be permitted.

800.4 CONTROL OF CONSTRUCTION MATERIALS: The use of construction materials in all structures covered by section 128.0, and all personnel and laboratories involved in the control, inspection and testing of such structures shall be subject to the rules and regulations of the State Building Code Commission administered through their provisions and under their direction by the Construction Materials Safety Board.

800.41 CONSTRUCTION MATERIALS SAFETY BOARD: The Board will review applications for registration for licensing of individuals and laboratories responsible for inspection, control and testing of construction material, and report to the State Building Code Commission their recommendations. The Board will collect information and review cases where disciplinary action against an existing license, whether an individual, laboratory or firm, has been proposed and make recommendations to the State Building Code Commission. The Commission will issue applications, receive payment of registration and licensing fees, and maintain records for the efficient dispatch of the duties of the Board. The Board shall submit to the Commission reports from time to time as requested by the Commission, but at least annually.

800.42 TESTING AND EVALUATION GROUP: The State Building Code Commission shall establish and maintain a Testing and Evaluation Group, who will have the responsibility of administering and directing, under the supervision of the Commission, the testing and controls for evaluating individual applicants and laboratories wishing to become registered and licensed as required under section 128.9.

SECTION 801.0 DEFINITIONS

ARCHITECTURAL TERRA COTTA: plain or ornamental hard-burned plastic clay units, larger in size than brick, with glazed or unglazed ceramic finish.

ASHLAR FACING: facing of solid rectangular units larger in size than brick of 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.

BRICK: a solid masonry unit of clay or shale, usually formed into a rectangular prism while plastic and burned or fired in a kiln.

BUTTRESS: a projecting part of a masonry wall built integrally therewith to furnish lateral stability which is supported on proper foundations.

CALCIUM-SILICATE BRICK (sand lime brick): a building unit made of sand and lime.

CERAMIC SURFACE UNIT: (see tile).

CLAY MASONRY UNIT: a building unit larger in size than a brick composed of burned clay, shale, fireclay or mixtures thereof.

COLD-FORMED STEEL CONSTRUCTION: that type of construction made up entirely, or in part, of steel structural members cold-formed to shape from sheet or strip steel such as roof deck, floor and wall panels, studs, floor joists, roof joists and other structural elements.

CONCRETE: a mixture of cement, aggregates and water, of such proportions and manipulation as to meet specific requirements.

CONCRETE BRICK: a solid masonry unit having a shape approximating a rectangular prism and composed of inert aggregate particles embedded in a hardened cementitious matrix.

CONCRETE MASONRY UNIT: a building or unit or block larger in size than twelve (12) by four (4) by four (4) inches made of cement and suitable aggregates.

FLOOR FILL: the fill between the structural floor arch or slab and the finished flooring:

FLOOR FILLING: the type of short-span floor construction in fireproof and fireresistive buildings installed between structural steel framing to serve as a combination structural floor slab or arch and fireproof protection of the framing.

FLOOR FINISH: the finish placed on top of the floor arch, slab or other structural floor element.

HOLLOW BRICK: a masonry unit of clay or shale whose net cross-sectional area in any plane parallel to the bearing surface is not less than sixty (60) percent or more than seventy-five (75) percent of its gross cross-sectional area measured in the same plane.

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) percent of its gross cross-sectional area measured in the same plane.

MASONRY: a built-up construction or combination of building units or materials of clay, shale, concrete, glass, gypsum, stone or other approved units bonded together with mortar; or monolithic concrete. Reinforced concrete is not classed as masonry.

MORTAR: a plastic mixture of approved cementitious materials, fine aggregates and water used to bond masonry or other structural units.

NOMINAL DIMENSIONS.

-LUMBER: a dimension that may vary from actual dimensions as provided in American Lumber Standard listed in the references standards of this article.

-MASONRY: a dimension that may vary from actual masonry dimensions by the thickness of a mortar joint but not to exceed one-half (½) inch.

PRESERVATIVE TREATED WOOD: wood treated by a recognized pressure impregnation process to increase its durability.

REINFORCED CONCRETE: concrete in which reinforcement other than that provided for shrinkage or temperature changes is combined in such manner that the two materials act together in resisting forces.

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.

SOLID MASONRY: masonry consisting of solid masonry units laid contiguously with the joints between the units filled with mortar, or consisting of plain concrete.

SOLID MASONRY UNIT: a masonry unit whose net cross-sectional area in every plane parallel to the bearing surface is seventy-five (75) percent or more of its gross cross-sectional area measured in the same plane.

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.

STRUCTURAL CLAY TILE: a hollow masonry unit composed of burned clay, shale, fireclay or mixtures thereof and having parallel cells.

STRUCTURAL STEEL MEMBER: any primary or secondary member of a building or structure consisting of a rolled steel structural shape other than formed steel, light gage steel or steel joist members.

TILE: a ceramic surface unit, usually relatively thin in relation to facial area, made from clay or a mixture of clay and other ceramic materials, called the body of the tile, having either "glazed" or "unglazed" face and fired above red heat in the course of manufacture to a temperature sufficiently high to produce specific physical properties and characteristics.

WALL: (see also sections 201.0 and 901.0.)

-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 forming the back-up and the other facing elements.

-FACED WALL: a wall in which the masonry facing and backing are so bonded as to exert common action under load.

-HOLLOW WALL: a wall built of masonry 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 with masonry units.

-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.

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 and ordinary materials as defined in sections 721.1 and 722.2. The design and construction shall be based on the assumptions, limitations and methods of stress determination of recognized design procedures.

SECTION 803.0 TESTS

All structural units and assemblies shall be tested as approved by the State Building Code Commission and in accordance with those approved standards listed in the references of this article.

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 the Basic Code, or to such other tests as approved by the State Building Code Commission, that simulate the loads and conditions of application that the completed structure will be subjected to in normal use.

803.11 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 the reference standards of this article.

803.2 DURABILITY AND ENDURANCE TESTS: Whenever specific conditions in a particular case warrant, and such information is otherwise unavailable, the building official may require a specific material to be subject to sustained and repetitive loading to determine its resistance to fatigue, and to tests for durability and weather resistance.

803.3 MAINTENANCE TEST: When reasonable doubt exists as to the quality of approved materials, or excessive variation exists in the quality or standards of materials, the building official may require verification of quality standards before approving further use. The building official may also submit such approved materials to the State Building Code Commission for review of approval.

803.4 PROOF TESTING: Whenever there is sufficient evidence that the stability or structural safety of a completed building or structure or part thereof will not meet approved engineering or other standards cited in this code, the building official may require a load test of the building unit or portions of the structure in question under the supervision of a qualified registered professional engineer or architect. Such existing structure or part thereof shall be subjected to a superimposed load equal to two (2) times the design live load, or to a load causing a stress equal to eighty (80) percent of the yield point in the most highly stressed element. 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 the 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.

803.5 TESTS OF SERVICE EQUIPMENT AND DEVICES: Tests of service equipment and devices are covered in the sections appropriate to their use.

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 section 903 and 904 and the applicable standards listed in appendices G and H.

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 as approved by the State Building Code Commission according to the reference standards of this article. All test specimens and constructions shall be truly representative of the materials, workmanship and details to be normally applied in practice. When structural or fireresistive properties of the material are dependent upon adequate curing, the age of the specimen shall be not less than seven (7) nor more than twenty-eight (28) days, unless otherwise approved by the State Building Code Commission.

803.9 CONDUCT OF LOAD TESTS: Load tests, when required, shall be performed under the supervision of a qualified registered professional engineer or architect. A thorough analysis of the conditions of loading shall be made to ensure that the results reflect an accurate evaluation of the existing stresses.

SECTION 804.0 CONDITIONS OF ACCEPTANCE

When the strength or deflection of a member or assembly cannot be accurately determined by analysis, its evaluation may be based on the results of physical tests as established in these provisions. This section shall apply only to members and assemblies which have not been incorporated into a structure. In-place construction shall be evaluated by the provisions 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 hairline 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 of 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, creep, and relaxation.

804.3 WALL AND PARTITION ASSEMBLIES: Bearing wall and partition assemblies shall sustain the load test both with and without window framing.

804.4 CONCENTRATED LOAD TESTS: When not capable of design all floor constructions in the use classification groups specified in table 7-2 shall be subjected to the concentrated loads therein prescribed when such loading exceeds in stress effect the uniformly distributed load specified for such uses in table 7-1;

804.5 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 APPROVAL: All materials devices, methods of construction and tests shall be subject to the approval and control of the State Building Code Commission for use in the Commonwealth of Massachusetts.

805.2 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

806.1 IDENTIFICATION: The materials which are recognized as being acceptable as masonry for the purposes of this Code are 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 designated to be used as masonry not so included by this article, shall be subject to approval and classification by the State Building Code Commission.

806.2 NOMINAL DIMENSIONS: Dimensions and thickness specified in the Basic Code 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 approval of the building official 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 of the appropriate grade specified in the reference standards of this article. 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

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 the reference standards of this article.

808.2 FLOOR TILE: Structural clay floor tile shall be classified for physical quality as grade FT1 or grade FT2 and shall conform to the reference standards of this article.

808.21 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 the reference standards of this article.

808.31 FIRERESISTANCE: Structural clay tile in fire resistive construction shall be of grade NB or better, and shall conform to the requirements of Table 2-5.

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 the reference standards of this article.

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) percent of combustible matter.

810.1 HOLLOW LOAD BEARING UNITS: Hollow load bearing concrete units shall conform to the reference standards of this article 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.

810.2 HOLLOW NON-LOAD BEARING UNITS: Hollow non-load bearing concrete units shall conform to the reference standards of this article and may be used in non-load bearing interior partitions and non-load bearing exterior walls where effectively protected from the weather.

810.3 SOLID LOAD BEARING UNITS: Solid load bearing units shall conform to the reference standards of this article 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.

810.4 CONCRETE BRICK: Concrete brick shall conform to the reference standards of this article 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.

810.5 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.

810.6 CONCRETE FLOOR TILE

810.61 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.

810.62 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-load bearing construction in the interior of buildings and for the protection of columns, elevator shafts, etc., against fire shall conform to the reference standards of this article.

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

Solid or hollow approved structural glass blocks shall not be used in fire walls, party walls or fire-division walls, or for load-bearing construction. All mortar-bearing surfaces of the block shall be precoated or prepared to insure adhesion between mortar and glass.

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 and shall meet the strength and durability requirements of accepted engineering practice. All units shall be formed to engage securely with and anchor to the structural frame or masonry wall, and shall conform to the reference standards of this article.

SECTION 814.0 NATURAL STONE

Natural stone for masonry shall be sound and free from loose or friable inclusions; and shall meet the strength, fireresistance, durability and impact resistance for the intended use in accordance with accepted engineering practice.

SECTION 815.0 CAST STONE

All approved cast stone shall be fabricated of concrete or other approved materials of required strength, durability and fireresistance for the intended use and shall conform to the reference standards of this article.

SECTION 816.0 MORTAR FOR MASONRY

816.1 MATERIALS: All Portland, natural and masonry cements, quicklime and hydrated lime for use in masonry mortar and concrete shall meet the minimum strength and durability requirements of the standards listed in the references of this article.

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 acid, alkalis, oils, saline, organic and

other deleterious substances in accordance with accepted engineering practice. Masonry mortars shall have a flow after suction of not less than seventy (70) percent and shall conform to the reference standards of this article.

MORTAR PROPORTIONS (Parts By Volume)

Mortar Type	Portland Cement	Masonry Cement	Hydrated Lime or Lime Putty Min.	Hydrated Lime or Lime Putty Max.	Damp Loose Aggregate
M	1	-	-	¼	
	1	1	-	-	
S	1	-	¼	½	
	½	1	-	-	
N	1	-	½	1¼	not less than 2¼ and not more than 3 times the sum of the volumes of the cements and limes used.
	-	1	-	-	
O	-	1	-	-	
	1	-	1¼	2½	

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, N or O
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
Glass block masonry	S or N
Nonloadbearing partitions and fireproofing	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

816.4 SPECIAL MORTARS: other special masonry mortars in place of the mortar types listed in section 816.2 may be approved 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 (¼) 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 the reference standards of this article.

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 the reference standards of this article.

816.61 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 the reference standards of this article.

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 the reference standards of this article.

SECTION 817.0 CONCRETE AGGREGATES

817.1 AGGREGATE QUALITY: Concrete aggregates shall conform to the reference standards of this article for organic impurities, soundness, mortar strength, durability, weather resistance, fire resistance, and wearing qualities.

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 wall conducted in accordance with standard fire test specifications applicable to such test. Protective coverings of 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 table 2-5.

817.21 GRADE 1 CONCRETE: Grade 1 concrete shall mean concrete made with aggregates such as blast-furnace slag, burned clays, and calcareous, igneous, and most silicate crushed stones and gravels and shales, as well as any other aggregates performing as required by the Basic Code for the appropriate construction when tested in accordance with standard methods of fire tests of building construction and materials listed in the reference standards of article 9.

817.22 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 the Basic Code for the appropriate construction when tested in accordance with standard methods of fire tests of building construction and materials listed in the reference standards of article 9.

817.3 SIZE OF AGGREGATES: Fine aggregates shall conform to the reference standards of this article and shall be well-graded from fine to coarse. Coarse aggregates shall not exceed one-fifth (1/5) of the narrowest dimensions between sides of the form nor three-quarters (3/4) of the minimum clear spacing between reinforcing bars and shall conform to the reference standards of this article.

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 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 section 842 for reinforced concrete and to the applicable standards listed in the reference standards of this article.

818.2 TRANSPORTATION: Ready-mixed 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 (1½) hours after the mixing of cement and water.

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 permissible slump shall be specified. The cement factor and water cement ratio shall conform to the provisions of the reference standards of this article.

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 the reference standards of this article.

819.2 MANUFACTURERS' 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 the reference standards of this article.

819.3 TYPES OF GLUE: Structural glues shall be classified as dry use and wet use in conformance with the reference standards of this article.

SECTION 820.0 INTERIOR LATHING AND PLASTERING

All interior lathing and plastering shall conform to the standards of accepted engineering practice for lathing, furring and accessories and gypsum and Portland cement plastering listed in the reference standards of this article except as may otherwise be provided in this article for specific materials.

820.1 INSTALLATION

820.11 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.

820.12 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 standards of this article 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	1¼	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 paper-backed wire fabric may be used of not less than No. 14 U.S. gage galvanized wire with stiffening ribs not more than five (5) inches on centers to which is attached a double layer of fibrous waterproof backing. The mesh opening shall not exceed two by two (2x2) inches.

821.5 BACK PLASTERED CONSTRUCTION; In back-plastered construction, when spacing of studs exceeds sixteen (16) inches, approved horizontol 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 roughened, hacked or bush-hammered to provide bond, or 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.

821.71 FROM FREEZING: At all times during application and for a period of not less than forty-eight (48) hours after application of each coat, provision shall be made to keep stucco work above fifty (50) degrees F.

821.72 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.

821.73 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 the reference standards of this article.

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 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 the reference standards of this article and the manufacturers' specifications.

822.3 GYPSUM PLASTER: All gypsum plaster shall comply with the reference standards of this article.

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 the reference standards of this article.

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 in the reference standards of this article.

823.2 GYPSUM LATH: Except when greater thickness is required for fireresistance under the provisions of article 9, or as herein specified, gypsum lath used for plastering shall be not less than three-eighths (3/8) inches thick and shall comply with the reference standards of this article.

823.3 PERFORATED GYPSUM LATH: Where required to provide specified time-temperature performance, perforated gypsum lath shall be not less than three-eighths (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 fireresistance ratings.

823.4 METAL LATH: The dimensions and sizes of expanded, ribbed and sheet metal lath shall comply with the reference standards of this article; and shall be fabricated from not less than No. 30 U.S. gage steel sheets. It shall be manufactured from copperbearing 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 the reference standards of this article; 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 (2½) 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-sixteenths (5/16) inches thick and shall comply with all the requirements of accepted engineering practice. 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 the reference standards listed in this article.

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 the reference standards of this article.

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 combustible veneer anchored to the base without intervening air spaces.

824.5 DRY WALL CONSTRUCTION: Where fireresistance ratings are required, provisions 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 the reference standards of this article 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 in conformance with the reference standards of this article.

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 (1½) 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 the reference standards of this article, provided it is continuous over two (2) or more spans and laid with face grain perpendicular to the supports.

825.31 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.

825.32 The allowable span for plywood combination subfloor underlayment shall conform to the reference standards of this article.

SECTION 826.0 WALLBOARDS AND SHEATHING

826.1 SHEATHING: Sheathing of particleboard, gypsum, processed fiber and other approved materials shall conform to the reference standards of this article. When used in frame construction, they shall meet requirements of section 855.1 and 855.2. When required to meet fireresistance ratings, the assembled construction shall comply with table 2-5 for structural elements and article 9 for trim and finishes.

826.2 WALLBOARDS: Wall board of particleboard, gypsum, processed fiber and other approved materials shall conform to the reference standards of this article. When required to meet fireresistance ratings, the assembled construction shall comply with table 2-5 for structured elements and article 9 for trim and finishes.

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. Workmanship, design, fabrication, transportation and erection shall conform to accepted engineering practice as defined by the reference standards of this article.

827.1 PLANS: Design plans drawn to appropriate scale 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) pounds per square inch 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 qualified registered professional engineers and shall be supervised by qualified registered professional engineers and qualified technicians licensed and registered by the State Building Code Commission. Welds shall be made by welders, tackers, and welding operators who are licensed and registered by the State Building Code Commission to perform the type of work required, as prescribed in the reference standards of this article.

827.5 PAINTING: All painting shall comply with the specifications for design, fabrication and erection of structural steel for buildings listed in the reference standards of this article.

SECTION 828.0 FORMED STEEL CONSTRUCTION

828.1 DESIGN: The design of all light gage and formed steel members and assembled wall, floor and roof panels, used alone or in combination with other structural members, or with component materials, shall be based on allowable unit stresses and maximum deflections in conformance with the reference standards of this article.

828.2 SECONDARY STRUCTURAL SYSTEM: 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.

828.3 PROTECTION.

828.31 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 acceptable shop coat of paint, enamel, or other approved protection.

828.32 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 acceptable protection.

828.33 SIDING: Exposed siding or sheathing shall be fabricated of approved corrosion-resistive steel or otherwise protected at the ground level for sufficient height above grade as determined by the depth of average snowfall in the locality, but in no case for a height of less than eight (8) inches.

828.34 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.

828.4 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 sections 803 and 804. 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) percent 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 conform with the reference standards of this article.

829.1 DESIGN.

829.11 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 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.

829.12 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 formed steel construction; or the joist 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.

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 standards, steel joist construction of the required fireresistance may be used in all buildings within the height limits of table 2-6.

829.4 TESTS: When not subject to accepted engineering analysis as regulated by the standard for steel joist construction, 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 reference standards of this article.

830.1 IDENTIFICATION: All reinforcing bars shall be rolled with raised symbols or letters impressed on the metal identifying the manufacturing mill. 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 (¼) 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, the building official shall approve tension stresses in bending and compression stresses in vertical column reinforcement not more than forty (40) percent of the minimum yield point, and in conformity with the reference standards of this article. Such stresses shall be not more than thirty-thousand (30,000) pounds per square inch except when pre-stressed reinforcement is used.

830.3 COLUMN REINFORCEMENT

830.31 STRUCTURAL STEEL SECTIONS: The allowable unit stress on structural steel column sections shall conform with the provisions of the reference standards of this article.

830.32 CAST IRON SECTIONS: All cast iron used as reinforcement in combination with concrete shall be of pit-cast water pipe grade complying with the reference standards of this article; and the allowable unit stress shall be not more than ten thousand (10,000) pounds per square inch.

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 the reference standards of this article. 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 procedures.

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 reference standards of this article.

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.

832.4 THICKNESS OF METAL: The minimum thickness of cast iron shall be not less than herein specified:

832.41 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.

832.42 BASES AND BRACKETS: In bases and flanges, the metal shall be not less than one (1) inch thick reinforced with fillets and brackets;

832.43 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) percent shall be prohibited. Where required by the building official, three-eighth (3/8) inch round inspection holes shall be drilled in the section to expose the thickness of metal for inspection purposes.

SECTION 833.0 SPECIAL STEELS

833.1 IDENTIFICATION: Silicon, nickel and other corrosion-resistive alloy and high strength steels with minimum yield points in excess of thirty-six thousand (36,000) used in the design and construction of buildings and structures shall conform to the standards of accepted engineering practice. 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: Design and fabrication methods shall conform to the requirements of the approved rules.

SECTION 834.0 LIGHT WEIGHT METAL ALLOYS

Aluminum and other approved light weight metals and alloys shall be used for structural purposes in buildings and structures in accordance with the reference standards of this article.

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 within working stresses prescribed in the Basic Code and the reference standards of this article.

835.2 Wetting of Brick: Brick (clay or shale) shall be wetted when laid unless their gain in weight resulting from partial immersion flatwise in one-eighth (1/8) inch of water for one (1) minute is less than twenty-five thousandths (0.025) ounce per square inch of immersed area.

835.3 PRECAUTIONS AGAINST FREEZING: All masonry shall be protected against freezing for not less than forty-eight (48) hours after installation; and shall not be constructed below twenty-eight (28) degrees F. on rising temperatures or below thirty-six (36) degrees F. on falling temperatures, without temporary heated enclosures or without heating materials or other precautions necessary to prevent freezing. No frozen materials shall be used nor shall frozen masonry be built upon.

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.

SECTION 836.0 BONDING OF WALLS

Walls of solid, composite and hollow masonry and cavity and other hollow walls shall be bonded in accordance with accepted engineering practice.

836.1 RUBBLE STONE WALLS: All stones in rubble masonry shall be laid on their natural bed and the walls shall be bonded with not less than one (1) through bond stone for each nine (9) superficial square feet of area.

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 INTERSECTION WALLS AND PARTITIONS: Masonry walls and partitions shall be securely anchored or bonded at points where they intersect by one (1) of the following methods:

a) walls may be bonded by laying at least fifty (50) percent of the units at the intersection in true masonry bond with alternate units having a bearing of not less than three (3) inches upon the unit below, or they may be anchored with not less than three-sixteenths (3/16) inch corrosion-resistant metal wire ties or joint reinforcement at vertical intervals not to exceed two (2) feet, or by other equivalent approved anchorage.

b) where walls are carried up separately the intersection shall be toothed or blocked with eight (8) inch maximum offsets and shall be provided with approved metal anchors at vertical intervals of not more than four (4) feet or, when approved, blocking may be eliminated and rigid steel anchors shall be provided, spaced not more than two (2) feet apart vertically.

c) interior nonloadbearing walls may be bonded or anchored as required by 1 or 2 above or they may be anchored at their intersection, at vertical intervals of not more than two (2) feet, with at least twenty-two (22) gage corrosion-resistant corrugated metal ties seven-eights (7/8) inch in width, or other equivalent approved method of anchorage.

836.4 ERECTING PRECAUTIONS: Where hollow walls decrease in thickness, a course of solid masonry or of concrete-filled units, or a continuous bearing plate shall be interposed between the thicker and thinner sections. No wall shall be built up more than twenty-five (25) feet in advance of other walls of the same building or structure unless supported independently at each floor; and all walls shall be temporarily braced during erection.

SECTION 837.0 LATERAL BRACING OF WALLS

All masonry walls shall be laterally supported by horizontal bracing of floor and roof framing or vertical bracing of columns, buttresses or crosswalls at vertical or horizontal intervals. All masonry walls shall be subject to the provisions of the reference standards of this article. Where applicable, masonry walls shall be subject to control as specified in Section 128.0. All such structures shall ensure that provision is made to transfer wind pressures and other lateral forces to the foundation.

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; except that eight (8) inch walls where permitted in residential buildings and the apron under window openings may be chased not more than four (4) inches in depth. 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 stress analysis and such calculations shall be submitted by a qualified registered professional engineer or architect.

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; and such aprons in eight (8) inch walls may be chased not more than four (4) inches in depth when waterproofed. 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.

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 fire-protective 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 (½) 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 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 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.

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.

840.11 JOIST BEARING: Solid construction for support under joists shall be at least two and one-quarter (2¼) inches in height, and joists supported on such construction shall extend into the masonry at least three (3) inches.

840.12 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.

840.2 CLOSURE TILE: All open cells in tiles or blocks at wall ends and at openings shall be filled solidly with concrete for a length of not less than twelve (12) inches, or reversed closure tile shall be used.

SECTION 841.0 PLAIN CONCRETE

Plain concrete is concrete cast in place and not required to be reinforced for structural purposes except with respect to shrinkage and temperature. Such concrete shall be subject to the reference standards of this article and, where applicable, subject to control by section 128.0.

841.1 LIMITATIONS: Plain concrete in loadbearing masonry or where exposed to soil or where used for fireresistive 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.

SECTION 842.0 REINFORCED CONCRETE

842.1 Concrete materials, design, construction, inspection and testing involved in structures and parts thereof included in the categories of section 128.1 shall be subject to the control provisions of section 128.0 and shall conform to the reference standards of this article. In addition, any other structures or parts thereof, required by the building official to be subject to section 128.0 shall be subject to the same control as outlined in that section.

842.2 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.

SECTION 843.0 STRUCTURAL CINDER CONCRETE

843.1 AGGREGATES: Approved cinder aggregates where permitted for use in structural and fireproofing concretes shall consist of clean, well burned cinders, containing a maximum of thirty-five (35) percent of unburned carbon and not more than one and one-half (1½) percent of sulphur nor more than a total of five (5) percent of volatile materials.

843.2 CINDER CONCRETE PROPORTIONS: Structural cinder concrete shall be mixed in the proportions of one (1) part Portland cement and not more than seven (7) parts of fine and coarse aggregate measures separately with a compressive strength of not less than eight hundred (800) pounds per square inch at twenty-eight (28) days' age.

SECTION 844.0 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 the reference standards of this article or in accordance with the approved rules for stone and light weight aggregate concrete and other approved fireresistive floor filling.

SECTION 845.0 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.

845.1 DESIGN: The safe supporting capacity of concrete-filled pipe columns shall be computed in accordance with good engineering practice or determined by test. Where computed, the calculations and design shall be submitted by a qualified registered professional engineer or architect with his seal and signature. Where determined by test, such testing shall be done by an approved licensed registered facility.

845.11 CONCRETE: The concrete shall be designed in accordance with the reference standards of this article and shall be placed to ensure complete filling without voids.

845.2 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. Welding of brackets without mechanical anchorage shall be prohibited. 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.

845.3 REINFORCEMENT: To increase the safe load supporting capacity of concrete-filled pipe 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 in the section, but not nearer than one (1) inch to the exterior steel shell. All strucutral shapes used as reinforcement shall be milled to insure bearing on cap and base plates.

845.4 FIRERESISTIVE PROTECTION; Pipe columns shall be of such size or so protected as to develop the required fireresistance ratings specified in table 2-5. When an outer steel shell is used to enclose the fireproof covering, it shall not be included in the calculations for strength of the column section.

SECTION 846.0 PNEUMATIC CONCRETE

Construction methods for mortar or concrete deposited pneumatically (shotcrete) shall conform to the reference standards of this article. Such mortar or concrete deposited pneumatically shall be applied only with the approval of the building official and shall be protected and cured to prevent the temperature falling below fifty (50) degrees F. or from 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) nor more than four (4) inches either way, with a gross area of not less than two-tenths (0.2) percent of the cross-sectional area of the mortar layer.

846.1 GENERAL REQUIREMENTS: Pneumatically placed concrete shall consist of a mixture of fine aggregate and cement pneumatically applied by suitable mechanism, and to which water is added immediately prior to discharge from the applicator. Except as specified in the following sections, pneumatically placed concrete shall conform to the requirements of the Basic Code for reinforced concrete.

846.11 PROPORTIONS: The proportion of cement to aggregate, in loose dry volume, shall not be less than one (1) to four and one-half (4½).

846.12 WATER: The water content at the time of discharge, including moisture in the aggregate, shall not exceed three and one-half (3½) gallons per sack of cement.

846.13 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) percent moisture.

846.2 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. Rebound may be reused if it conforms to the requirements for aggregate, provided the amount of rebound material used shall not exceed twenty-five (25) percent of the total aggregate in any batch.

846.3 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 addtional material adjacent to previously applied work, these sloping edges shall be cleaned and wetted.

846.4 DAMAGE: Any pneumatically placed concrete which subsides after placement shall be removed.

SECTION 847.0 MINIMUM CONCRETE DIMENSIONS

The protection of reinforced concrete structural elements in buildings of fireproof (types 1-A and 1-B) construction shall be adequate to meet the fire and strength tests of the Basic Code; but in no case less than the minimum dimensions established by the standards of accepted engineering practice. Any floor finish not placed monolithically with floor slabs, shall not be included in the calculations for structural strength, unless calculations submitted by a registered professional engineer or architect are submitted to justify incorporation of the floor finish as part of the structural element.

SECTION 848.0 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 wood aggregates and gypsum shall be pre-mixed at the mill, requiring only the addition of water at the job or site. The manufacture, design and construction shall comply with the requirements of the standards of accepted engineering practice listed in the reference standards of this article.

848.1 LIMITATIONS OF USE: 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.

SECTION 849.0 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 the standards of accepted engineering practice listed in the reference standards of this article. Reinforced brickwork shall be used only when design specifications are submitted by a registered professional engineer or architect and, where applicable, shall be subject to the control of section 128.0.

849.1 DESIGN: The formulae and assumptions used in the design or reinforced masonry shall be those contained in the reference standards of this article.

SECTION 850.0 REINFORCED HOLLOW BLOCK CONSTRUCTION

Walls constructed of hollow block or other hollow unit masonry and reinforced with steel rods grouted solidly into the cells shall be designed and constructed in accordance with reference standards of this article; and plans and specifications shall be submitted by a registered professional engineer or architect. When applicable, the control of section 128.0 shall apply.

SECTION 851.0 LUMBER AND TIMBER CONSTRUCTION

851.1 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 listed in the reference standards of this article. All lumber used for load supporting purposes shall be

identified by the grade mark of a lumber grading inspection agency approved by the State Building Code Commission. Grading practices and the identification shall be in accordance with rules published by an agency approved by the Commission. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by an approved lumber grading or inspection agency may be accepted by the building official for precut, remanufactured, or rough sawn lumber; also for sizes larger than three (3) inches nominal thickness.

851.2 MINIMUM DIMENSIONS.

851.21 SIZES OF STRUCTURAL MEMBERS: All lumber sizes specified in the Basic 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).

851.22 STRUCTURAL POSTS: All isolated structural posts shall have a minimum dimension of four (4) inches.

851.3 FABRICATION.

851.31 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 accepted engineering practice. Bolted connections shall be snugged up tightly without crushing wood fibers under the washers. All nailed connections shall meet the minimum requirements of the reference standards of this article.

851.32 CAMBERING: Trusses and long span girders shall be designed with sufficient camber or other provision shall be made to compensate for excessive deflection.

851.33 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.

851.4 TRIMMER AND HEADER BEAMS: When determined necessary by stress analysis, trimmer and header beams shall be hung in approved metal or other approved noncombustible stirrups or hangers, unless supported on a masonry wall or girder. All such beams shall be spiked together.

851.5 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.

851.6 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 852.0 HEAVY TIMBER TYPE CONSTRUCTION

852.1 WOOD: All structural wood members sawn or glued laminated used in heavy timber type construction shall be stress-grade timbers identified as to grade strength by approved manufacturing, testing, or inspection agencies or bureaus. All structural timber members shall have the minimum dimensions specified in section 217.1 for type 3-A construction.

852.2 OTHER STRUCTURAL MATERIALS: Structural steel or reinforced concrete members may be substitued for timber in any part of the structural frame, protected to develop the required fireresistance specified in table 2-5, 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.

852.3 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 be timber splice plates affixed to the columns by means of metal connectors housed within the contact faces, or by other approved methods. Girder or trusses supporting columns shall have at least three-quarter (3/4) hour fireresistance.

852.4 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 (½) inch to walls to provide an expansion joint, but the joint shall be covered at top or bottom to avoid flue action.

852.5 BEAMS AND GIRDERS.

852.51 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 (½) 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 fireresistance 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.

852.52 COLUMN CONNECTIONS: 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.

SECTION 853.0 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 the reference standards of this article.

853.1 WOOD-STUD FRAME.

853.11 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.

853.12 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.

853.13 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. Bracing may be omitted when diagonal wood sheathing or plywood panels are used, or other sheathing specified in section 853.2 is applied vertically in panels of not less than four (4) feet by eight (8) feet in area with approved nailing complying with the reference standards of this article. Ledger or ribbon boards used in support joists shall be not less than one (1) by four (4) inches in size, cut into and securely nailed to each stud.

853.14 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.

853.15 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.

853.16 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.

853.2 WALL SHEATHING: Except as provided in section 853.3 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	5/8 inch
Particleboard	3/8 inch
Plywood	5/16 inch
Gypsum sheathing	1/2 inch
Fiber boards	1/2 inch

853.21 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.

853.3 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 roof, 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)	1/2 inch
Wood siding (with sheathing)	3/8 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
Aluminum Cement boards	1/8 inch
Aluminum clapboard siding	.024 inch
Formed steel siding	29 gage
Hardboard siding	1/4 inch

853.31 MASONRY VENEERS: See section 860.0.

853.32 METAL VENEERS: See section 860.0.

853.33 HEIGHT OF VENEERS: See section 860.0.

853.34 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 the nailing schedule in the reference standards of this article, 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 (½) inch nominal thickness with approved corrosion-resistive annular grooved nails when the installation is in accordance with the approved manufacturer's standards.

853.4 FOUNDATION ANCHORAGE: When required to resist wind uplift, walls sills shall be anchored to the foundation walls or piers at corners and at intermediate intervals of not more than eight (8) feet with one-half (½) inch bolts. The bolts shall be imbedded in the masonry foundation to a depth of not less than eight (8) inches in placed concrete, and not less than fifteen (15) inches in unit masonry. Sill plates shall be at least equivalent to a two (2) by six (6) inch member.

853.5 AT-GRADE PROTECTION.

853.51 WOOD FRAMING: All exterior wood framework of buildings whether structural or non load-bearing shall be supported on approved foundation walls at least eight (8) inches above the finished grade.

853.52 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.

853.6 FLOORS.

853.61 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.

Midspan bridging is not required for floor, attic or roof framing in one- and two-family dwellings (use group L-3) and multi-family dwellings (use group L-2) except when the joist depth exceeds twelve (12) inches nominal and/or when the minimum uniformly distributed live load exceeds forty (40) pounds per square foot.

853.62 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.

853.7 ROOFS.

853.71 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.

853.72 WOOD SHINGLES: Wood shingles and handsplit shakes complying with the reference standards of this article may be used for roof covering where permitted in section 928.3, and may be installed on tight decking or on spaced roof boards.

853.8 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 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) pound felt or paper shall be attached to the sheathing with flashing wherever necessary to prevent moisture penetration behind the veneer.

853.9 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 854.0 STRESS SKIN PANELS

854.1 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 load-bearing members shall be permitted for use in floors, roofs, walls, partitions and ceilings when designed in accordance with the reference standards of this article or meeting the test requirements of sections 803, 804, and 805.

854.2 SPLICES: Splices and connections between panels shall be weathertight and of sufficient strength to resist two and one-half ($2\frac{1}{2}$) 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.

854.3 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 accepted engineering analysis confirmed by the tests prescribed in sections 803 and 804.

SECTION 855.0 STRUCTURAL GLUED LAMINATED TIMBER AND BUILT-UP WOOD CONSTRUCTION

Buildings and structures may be designed and erected of glued laminated structural members or of composite members of plywood and dimension lumber.

855.1 STRUCTURAL GLUED LAMINATED TIMBER: Structural glued laminated timber elements shall be manufactured in conformity with the provisions of the reference standards of this article.

855.2 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.

855.21 GLUING SURFACES: In glued lumber constructions, the surfaces to be glued shall be clean, plane and sound to provide a controlled glue line. The surfaces shall be free of wax, grease, oil or any other release agents to ensure full strength bonding.

BUILDING ENCLOSURES, WALLS AND
WALL THICKNESS

SECTION 856.0 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 of frame, masonry or other approved construction. Such walls shall be constructed to afford the fireresistance specified in table 2-5 and as required in the Basic Code for location, use and type of construction.

856.1 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.

856.2 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.

856.3 GLASS PANELS.

856.31 CONDITIONS OF USE: Glass, where used in exterior walls and for doors shall be subject to the provisions of this section. Glass subject to the requirements of human impact shall be identified by a permanent marking on each piece of glass so used.

856.32 SUPPORT FOR GLASS PANELS: Glass shall be firmly held in place, and the supports designed to resist any wind or impact load to which it may be subject. Where unusual conditions of support exist, they shall be designed and specified by a registered professional engineer or architect.

856.33 GLASS REQUIREMENTS: Unless otherwise stated herein, glass shall meet the requirements of the reference standards of this article for the applicable type, size, thickness and quality.

856.34 THICKNESS OF GLASS: Thicknesses of glass panels shall be chosen as provided in section 803.11.

856.35 DEFLECTION OF SUPPORT: The deflection of members supporting glass panels under the design wind load shall not exceed L/175 where L is the span of the supporting member. In no case shall such deflection exceed three-quarters (3/4) inch.

856.36 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 subject to the approval of the building official.

856.37 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, or in similar locations wherein one or more of the following criteria apply, shall meet the requirements set forth in table 8-1, 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.

SECTION 857.0 PROTECTION OF WALL OPENINGS

857.1 FIRE-PROTECTED OPENINGS: Openings in exterior walls when required to be fire-protected shall comply with the provisions of article 9.

TABLE 8-1
REQUIREMENTS FOR GLASS PANELS SUBJECT TO IMPACT LOADS

Glass Type	Individual Opening Area	Requirements
Regular plate, sheet or rolled (annealed)	Over 6 square feet	Not less than 3/16 inch thick. Must be protected by a push-bar or protective grille firmly attached on each exposed side, if not divided by a muntin.
Regular plate, sheet or rolled (annealed) surface sandblasted, etched, or otherwise depreciated	Over 6 square feet	Not less than 7/32 inch thick. Must be protected by a push-bar or protective grille attached on each exposed side.
Regular plate, sheet or rolled (annealed) obscure	Over 6 square feet	Not less than 3/16 inch thick. Must be protected by a push-bar or grille firmly attached on each exposed side.
Laminated	Over 6 square feet	Not less than 1/4 inch thick. Shall pass impact test requirements of reference standard RS 8-75.
Full-tempered	Over 6 square feet	Shall pass impact test requirements of reference standard RS 8-
Wired	Over 6 square feet	Not less than 7/32 inch thick. Shall pass impact test requiremen 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.

857.2 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.

857.3 STRUCTURAL STRENGTH.

857.31 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 factored wind load.

857.32 SASH OR FRAMES: The glass, or other approved glazing material shall be of adequate thickness or shall be provided with steel frames or otherwise reinforced to resist the wind loads specified in article 7 blowing both inwardly and outwardly.

SECTION 858.0 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.

858.1 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 seventy (70) feet shall be provided with access panels spaced not more than fifty (50) feet apart in each story.

858.2 SINGLE-STORY BUILDINGS: In one (1) story buildings not more than seventy (70) 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 twenty-five (125) feet apart in all exterior walls of the building required to have thirty (30) foot wide open space adjacent thereto (see sections

858.3 CONSTRUCTION OF ACCESS PANELS: Construction 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.

858.4 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.

858.5 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 859.0 STRUCTURAL GLASS BLOCK WALLS

859.1 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.

859.2 JOINT MATERIALS: Glass blocks shall be laid up in type S or N mortar with approved galvanized or other noncorrosive 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 (½) 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.

859.3 WIND AND EARTHQUAKE LOADS: Exterior wall panels shall be held in place in the wall opening to resist both the internal and external pressures due to wind and earthquake loads specified in sections 713.0 and 719.0.

859.4 INTERIOR WALL PANELS: Structural glass blocks shall not be used in fire walls or party walls or for load-bearing construction. Such blocks 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 fireresistive.

859.5 FIRERESISTANCE 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 fireresistance, provided approval of the building official is secured after satisfactory time-temperature performance under the prescribed test procedure of article 9.

859.6 ACCESS PANELS: Access panels shall be provided in exterior glass block walls for the fire department use to comply with section 858.0

SECTION 860.0 WALL FACINGS AND VENEERS

860.1 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 the Basic Code for the specific material.

860.2 VENEER THICKNESS: No materials used for nonbearing veneers on masonry walls shall have less than the following thickness:

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)	28 U.S. Gage

Masonry or other approved noncombustible materials used as facing on bearing walls or partitions shall not be considered to have structural value and shall be excluded in the determination of required wall thickness.

860.3 MASONRY VENEERS: Veneers of unit masonry shall be attached to the wood frame with at least twenty-two (22) gage corrosion-resistive, corrugated metal ties not less than seven-eighths (7/8) inch in width at vertical intervals of not more than sixteen (16) inches and horizontal intervals of not more than thirty-two (32) inches.

860.4 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.

860.5 HEIGHT OF VENEERS: The height and length of veneer areas shall be unlimited, except as required to control expansion and contraction. When attached to wood frame structures as provided in section 860.3, the veneer shall be supported on footings or foundation walls.

860.6 VENEER OR 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 in an approved manner.

SECTION 861.0 STRUCTURAL GLASS VENEERS

861.1 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.

861.2 CONSTRUCTION.

861.21 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 noncombustible furring spaced not more than twelve (12) inches on centers.

861.22 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.

861.3 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 masonry wall with expansion or toggle bolts.

861.4 EXPANSION JOINTS: Expansion joints shall be provided at ends and intermediate sections caulked with an approved waterproofing compound as required by the approved rules. Where necessary for watertightness, exposed edges shall be protected with corrosion-resistive metal or other approved noncombustible flashing.

861.5 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 masonry wall, free from contact with glass.

SECTION 862.0 THIN STONE AND TILE VENEERS

862.1 SIZE OF UNITS: In localities subject to frost and freezing temperatures, tile and terra cotta units shall be frost-proof 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) percent in area.

862.2 CONSTRUCTION: One (1) inch thick marble, granite, terra cotta, and similar materials; or ceramic tile facing one-quarter (¼) to one (1) inch in thickness shall be set in accordance with the applicable standards listed in the reference section of this article.

SECTION 863.0 METAL VENEERS

863.1 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.

863.2 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.

863.3 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.

863.4 GROUNDING METAL VENEERS: Grounding of metal veneers on all buildings shall comply with the requirements of the Massachusetts State Electrical Code.

SECTION 864.0 PLASTIC VENEERS

Veneers of approved weather-resisting non-combustible plastics shall be erected and anchored on a foundation coat, waterproofed or otherwise protected from moisture adsorption and sealed with a coat of mastic or other approved waterproof coating in accordance with the approved rules.

SECTION 865.0 THICKNESS OF SOLID MASONRY WALLS

All masonry walls shall be of a thickness conforming to the reference standards of this article and subject to the maximum stresses, combined or direct as provided in this Code or in the reference standards.

SECTION 866.0 THICKNESS OF PANEL WALLS

866.1 SOLID PANEL WALLS: Panel, apron or spandrel walls as defined in the Basic Code 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 table 2-5, and are constructed of approved noncombustible weather-resisting materials of adequate strength to resist the wind loads specified in sections 713 and 714.

866.2 HOLLOW PANEL WALLS: Unless constructed of the materials and thickness specified by the accepted engineering standards 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 table 2-5 for exposure on both faces.

866.3 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.

866.4 ANCHORAGE: All panel walls shall be anchored to the structural frame to insure adequate lateral support and resistance to wind and to earthquake forces where subject to seismic disturbances.

SECTION 867.0 THICKNESS OF PARAPET WALLS

All masonry exterior walls shall be constructed with parapet walls extending not less than two (2) feet above the roof, except 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; and except as required for fire walls in section 907 or as herein specifically provided.

867.1 MINIMUM THICKNESS AND HEIGHT: Parapet walls shall be of 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.

867.2 PARTY WALLS WITH FLAT ROOFS: Parapet walls erected between two (2) structures in residential use groups, with flat roofs not more than forty (40) feet in height, need not extend more than six (6) inches above the roof.

867.3 PARTY WALLS WITH PITCHED ROOFS: Party walls in buildings and structures in residential use groups, the roofs of which slope at an angle of thirty (30) degrees or more from the horizontal, may stop at the level of the top of the roof boards, provided no combustible material passes through the wall, and the junction of roof and walls is completely weatherproofed and firestopped.

867.4 COPING: The top of all parapet walls exposed to the weather shall be coped with approved noncombustible and weather-resisting materials.

SECTION 868.0 FOUNDATION WALLS

868.1 DESIGN: Foundation walls shall be designed to resist frost action and to support safely all vertical and lateral loads as provided in article 7 and shall extend to a minimum depth of four (4) feet below grade. The maximum stresses due to combined load shall be within the

868.1 DESIGN: Foundation walls shall be designed to resist frost action and to support safely all vertical and lateral loads as provided in article 7 and shall extend to a minimum depth of four (4) feet below grade. The maximum stresses due to combined load shall be within the values specified for the materials used in the construction. Unless properly reinforced, tensile stresses shall not exceed those permitted in plain masonry.

868.2 MINIMUM THICKNESS: The thickness of foundation wall 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 shall 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;

868.21 REINFORCED CONCRETE: When reinforced concrete is required to resist all stresses, foundation walls shall be not less than eight (8) inches thick.

868.22 HOLLOW AND SOLID MASONRY AND MASS CONCRETE: The thickness of masonry foundation walls shall not be less than shown in the following table for the type of foundation and superstructure construction used. The combined height of eight (8) inch foundation wall and the wall supported shall not exceed thirty-five (35) feet.

THICKNESS OF FOUNDATION WALLS

Foundation Wall Construction		Maximum Depth Below Grade (feet) Note 1.2		
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

Note 1. Depth below grade may be increased up to those shown in parentheses where such increase is warranted by soil conditions and local experience and is required by the building official.

Note 2. Where height of unbalanced fill (height of finish grade above basement floor or inside grade) exceeds seven (7) feet, foundation wall thickness shall be determined by structural analysis as required in section 869.1.

868.23 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;

868.24 RUBBLE STONE: Foundation walls of rough or random rubble stone shall be not less than sixteen (16) inches thick;

868.25 BONDING: All foundation walls shall be bonded as required for superstructure walls in section 836.

868.3 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.

868.4 CORBELS ON EIGHT INCH WALLS: Where an eight (8) inch wall is corbeled, the top corbel course shall be a full header course of headers 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 (½) the depth of the unit nor one-third (1/3) its width at right angles to the face which is offset.

868.5 LATERAL STABILITY: Foundation walls of buildings and structures which serve as retaining walls shall conform to the applicable requirements of section 869 or shall be strengthened with buttresses or additional wall thickness to resist lateral soil and hydrostatic pressure when subjected thereto.

SECTION 869.0 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 piling or other approved materials within the allowable stresses of accepted engineering practice.

869.1 DESIGN: Retaining walls shall be designed 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 foundation pressure and water uplift. Retaining walls meeting the requirements of section 128.1 shall be subject to control as provided in section 128.0.

869.2 HYDROSTATIC PRESSURE: Unless drainage is provided, the hydrostatic head of water pressure shall be assumed equal to the height of the wall.

869.3 COPING: All masonry retaining walls other than reinforced concrete walls shall be protected with an approved coping.

SECTION 870.0 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.

SECTION 871.0 WATERPROOFING

The exterior structural elements of all buildings herein specified shall be waterproofed in accordance with the approved rules.

871.1 STEEL FRAME: Exterior steel columns and girders before embedment in masonry of the required fireresistance specified in table 2-5 shall be protected from moisture by approved waterproofing material, a parging coat of cement mortar or by a minimum of eight (8) inches of weather-tight masonry.

871.2 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.

871.3 FOUNDATIONS: Exterior wall below grade and the cellar floors of all buildings for institutional and residential uses (use groups H and I) enclosing habitable or occupiable rooms or spaces below grade shall be made watertight, and when necessary shall be reinforced to withstand water pressure as prescribed in sections 710 and 869. The basement walls of buildings in the residential use groups and the walls of all habitable and occupiable rooms and spaces below grade shall be protected with not less than one-coat application of approved waterproofing paint, or a one-half (½) inch parging coat of Portland cement mortar or other approved dampproof covering.

871.4 TYPES OF WATERPROOFING: The processes and methods used to render building, structures or parts thereof watertight as herein required shall comply with accepted engineering practice covering types of waterproofing.

SECTION 872.0 RATPROOFING

All buildings and strucutres 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.

872.1 GRADE PROTECTION.

872.11 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 building.

872.12 HEIGHT OF APRON: The apron shall extend sufficiently above grade to provide for the average snow fall in the locality, 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 727. 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.

872.2 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.

872.3 OPENING PROTECTION.

872.31 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 (½) inch mesh openings.

872.32 SLAB OPENINGS: Access opening in grade floor slabs shall be protected with concrete, masonry, metal or other corrosion-resistive noncombustible covers of adequate strength to support the floor loads.

872.33 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 873.0 PROTECTION AGAINST DECAY AND TERMITES

The expression "approval" as used in the following statements means approval in accordance with the procedure established by the Basic Code.

873.1 WHERE CONDITIONS ARE FAVORABLE TO DECAY.

873.11 WOOD IN CONTACT WITH THE GROUND: All wood in contact with the ground and supporting permanent structures shall be approved treated wood.

873.12 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.

873.2 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 or treated wood. Ventilation shall be provided as required in section 508.0.

873.3 SILLS: All sills which rest on concrete or masonry exterior walls and are less than six (6) inches from exposed earth shall be of approved durable or treated wood.

873.31 SLEEPERS AND SILLS: Sleepers and sills on a concrete or masonry slab which is in direct contact with earth shall be of approved durable or treated wood.

873.32 POSTS OR COLUMNS: Posts or columns in cellars shall be supported by piers projecting at least two (2) inches above the finish floor and separated therefrom by an approved impervious barrier except when approved durable or treated wood is used. Posts or columns used in damp locations below grade shall be of approved durable or treated wood.

873.33 WALL POCKETS: Ends of wood girders entering masonry or concrete walls shall be provided with a one-half (½) inch air space on top, sides and end unless approved durable or treated wood is used.

873.34 CLEARANCE BETWEEN WOOD SIDING: Clearance between wood siding and earth on the exterior of a building shall be not less than six (6) inches.

873.4 WOOD USED IN A RETAINING WALL: Wood used in a retaining wall shall be approved durable or treated wood except as follows:

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) a retaining wall of durable wood 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.

873.5 WHERE APPROVED DURABLE OR TREATED WOODS ARE REQUIRED: Where approved durable or treated woods are required in this Code, the building official may require identification by an approved mark or certificate of inspection.

873.6 PRESSURE TREATMENT: Where pressure treatment of wood members is required by the Basic Code, preservatives and methods of treatment shall conform to the standards for pressure treatment and preserving of lumber listed in the reference standards of this article.

SECTION 874.0 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.

874.1 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.

874.2 GIRDER SEPARATION IN HEAVY TIMBER CONSTRUCTION (type 3-A): Wood girders framing into walls shall have at least (8) inches of masonry 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.

874.3 FLUES AND CHIMNEYS: Combustible framing shall be trimmed not less than two (2) inches away from all flues, chimneys and fireplaces, and six (6) inches away from flue openings.

874.4 FIREPLACES: Hearths of noncombustible construction and fireboards, mantels and other combustible trim shall comply with section 1012 governing fireplace construction.

874.5 CONCEALED ROOF SPACES: Concealed roof spaces enclosed by combustible ceiling and roof construction shall be subdivided into areas of not more than three thousand (3000) square feet as provided in section 316.

874.6 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.

874.7 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.

874.8 COMBUSTIBLE TRIM AND FINISH: The space behind combustible trim and finish where permitted under the Basic 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.

874.9 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; 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 noncombusitble means; and in all other locations that would permit the free travel of flame.

SECTION 875.0 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.

875.1 INSTALLATION IN TYPE 1 AND TYPE 2 CONSTRUCTION: Such materials when exposed as installed in building of fireproof or noncombustible (types 1 or 2) construction shall qualify as noncombustible materials when tested in accordance with section 904.

875.2 INSTALLATION IN TYPE 3 AND TYPE 4 CONSTRUCTION: Such materials, when exposed as installed in attic spaces in buildings of ordinary or frame (types 3 or 4) construction may be of noncombustible or approved combustible material when tested in accordance with section 904.

875.3 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 (1½) inches from the unexpected surface of ceiling or sidewall interior finish, or when installed in completely enclosed wall, ceiling joist or rafter spaces, fire-stopped as required in section 874.0 are not required to have a flameresistance rating.

Reference Standards - Article 8 Part A

ACI	318	1971	Building Code Requirements for Reinforced Concrete
AITC	103-65	1965	Standard for Structural Glued-Laminated Timber
ANSI	A 42.1	1964	Specifications for Gypsum Plastering
ANSI	A 42.2	1971	Specifications for Portland Cement Stucco
ANSI	A 42.3	1971	Specifications for Portland Cement Plastering
ANSI	A 42.4	1967	Specifications for Interior Lathing and Furring
ANSI	A 42.5	1960	Standard Specifications for Lime-Cement Stucco
ANSI	A 97.1	1965	Specifcations for Gypsum Wallboard Finishes
ANSI	A 108.5	1967	Tile, Ceramic, Installed in Dry-Set Portland Cement Mortar
ANSI	A 118.1	1972	Standard Specifications for Dry-Set Portland Cement Mortar
ANSI	A 118.3	1969	Standard Specifications for Epoxy, Chemical Resistant, Water Cleanable Tile-Setting and Grouting
ANSI	Z 97.1	1972	United States Standard Performance Specifications and Methods of Test for Transparent Safety Glazing Material Used in Buildings
ASTM	C 5	1968	Specifications for Quicklime for Structural Purposes
ASTM	C 6	1968	Specifications for Normal Finishing Hydrated Lime
ASTM	C 10	1970a	Specifications for Natural Cement
ASTM	C 22	1950	Specifications for Gypsum
ASTM	C 28	1968	Specifications for Gypsum Plasters
ASTM	C 33	1971a	Specifications for Concrete Aggregates
ASTM	C 34	1970	Specifications for Structural Clay Load Bearing Wall Tiles
ASTM	C 35	1970	Specifications for Inorganic Aggregates for Use in Gypsum Plaster

ASTM	C 36	1970,1973	Specifications for Gypsum Wallboard
ASTM	C 37	1969	Specifications for Gypsum Lath
ASTM	C 52	1972	Specifications for Gypsum Partition Tile or Block
ASTM	C 55	1971	Specifications for Concrete Building Brick
ASTM	C 56	1971	Specifications for Structural Clay Non-Load Bearing Tile
ASTM	C 57	1957	Specifications for Structural Clay Floor Tile
ASTM	C 61	1964	Specifications for Keene's Cement
ASTM	C 62	1969	Specifications for Building Brick (Solid Masonry Units Made From Clay or Shale)
ASTM	C 73	1972	Specifications for Sand-lime Building Brick
ASTM	C 79	1967	Specifications for Gypsum Sheathing Board
ASTM	C 90	1970	Specifications for Hollow Load Bearing Concrete Masonry Units
ASTM	C 91	1971	Specifications for Masonry Cement
ASTM	C 94	1971,1972	Specifications for Ready-Mixed Concrete
ASTM	C 126	1971	Specifications for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM	C 129	1971	Specifications for Hollow Non-Load Bearing Concrete Masonry Units
ASTM	C 144	1970	Specifications for Aggregate for Masonry Mortar
ASTM	C 145	1971	Specifications for Solid Load Bearing Concrete Masonry Units
ASTM	C 150	1972	Specifications for Portland Cement
ASTM	C 206	1968	Specifications for Special Finishing Hydrated Lime
ASTM	C 207	1968	Specifications for Hydrated Lime for Masonry Purposes

ASTM	C 208	1966	Specifications for Structural Insulating Board Made From Vegetable Fibers
ASTM	C 216	1971	Specifications for Brick, Facing (Solid Masonry Units Made From Clay of Shale)
ASTM	C 270	1971	Specifications for Mortar for Unit Masonry (Tentative)
ASTM	C 330	1969	Specifications for Lightweight Aggregates for Structural Concrete (Tentative)
ASTM	C 331	1969	Specifications for Lightweight Aggregates for Concrete Masonry Units (Tentative)
ASTM	C 332	1966	Specifications for Lightweight Aggregates for Insulating Concrete
ASTM	C 476	1971	Specifications for Mortar and Grout for Reinforced Masonry
ASTM	C 595	1968	Specifications for Blended Hydraulic Cements
ASTM	C 652	1970	Specifications for Hollow Brick (Solid Masonry Units Made from Clay or Shale)
Federal Specification	DD-G-00451b D.F. 2.5		Glass Thickness Specifications
USDC	CS 181	1952	Adhesive-Water Resistant Organic, for Installation of Clay Tile
U.S. Product Standard	PS-1		Specifications for Plywood
Vermiculite Institute		1963	Standard Specifications for Vermiculite Plastering

1.0 GLASS DESIGN CRITERIA - The required nominal thickness of glass shall be determined from the chart within this reference standard. The modified design wind load to be used for entering the chart shall be determined by dividing the appropriate general design wind load of section 713.0 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:

2.0 GLASS TYPE	RELATIVE RESISTANCE
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

Reference Standards - Article 8 Part B

ACI	318	1971	Building Code Requirements for Reinforced Concrete
ACI	506	1966	Recommended Practice for Shotcreting
ACI	525	1963	Minimum Requirements for Thin-Section Precast Concrete Construction
AISC		1969	Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings
AISI		1968	Specification for the Design of Cold-Formed Steel Structural Members
AITC	PS 56-73	1973	Structural Glued-Laminated Lumber
AITC	200-73	1973	Inspection Manual
AA		1969	Aluminum Construction Manual
APA		1967	Design and Fabrication of Flat Plywood Stressed Skin Panels
ASTM	A 27	1971	Specifications for Mild-To-Medium Strength Carbon-Steel Castings for General Application
ASTM	A 48	1971	Specifications for Gray Iron Castings
ASTM	A 148	1971	Specifications for High-Strength Steel Castings for Structural Purposes
ASTM	A 377	1966	Specifications for Cast Iron Pressure Pipe
ASTM	C 31	1966	Making and Curing Concrete Compression and Flexure Test Specimens in the Field
ASTM	C 143	1966	Test for Slump of Portland Cement Concrete
ASTM	C 172	1968	Sampling Fresh Concrete
ASTM	D 2277	1972	Specifications for Fiberboard Nail-Base Sheathing (Tentative)
AWS	D1.0-69	1969	Code for Welding in Building Construction
NCMA		1971	Specification for the Design and Construction of Load Bearing Concrete Masonry. Where conflict arises between this reference standard and the Basic Code, the more stringent requirements of the two shall apply.

NFoPA		1970	Maximum Spans for Joists and Rafters in Residential Construction
NFoPA		1970	Wood Structural Design Data
NFoPA		1973	National Design Specification for Stress-Grade Lumber and its Fastenings.
BIA		1969	Structural Clay Products Institute Recommended Building Code Requirements for Engineered Brick Masonry. Where conflict arises between this reference standard and the Basic Code, the more stringent requirements of the two shall apply.
SJI-AISC		1972	Standard Specifications and Load Tables for Open Web Steel Joists, J-Series and H-Series
SJI-AISC		1972	Standard Specifications and Load Tables for Long-Span Steel Joists, LJ-Series and LH-Series
ANSI	A59.1	1954	Specifications for Reinforced Gypsum Concrete
USDC	CS 31	1952	Wood Shingles (Red Cedar, Tidewater, Red Cypress and California Redwood)

ACI	525	1963	Minimum Requirements for Thin-Section Precast Concrete Construction
AWPA	C 1	1972	Standard for the Preservative Treatment of all Timber Products by Pressure Processes
AWPA	C 2	1972	Standard for the Preservative Treatment of Lumber, Timbers, Bridge Ties and Mine Ties by Pressure Processes
AWPA	C 3	1972	Standard for the Preservative Treatment of Piles by Pressure Processes
AWPA	C 4	1972	Standard for Preservative Treatment of Poles by Pressure Processes
AWPA	C 9	1972	Standard for the Preservative Treatment of Plywood by Pressure Processes
AWPA	M 2	1962	Standard Instructions for the Inspection of Preservative Treatment of Wood
AWPA	M 4	1962	Standard for the Case of Pressure-Treated Wood Products
ANSI	A 94.1	1961	Specifications for Interior Marble
ANSI	A 94.2	1961	Specifications for Thin Exterior Marble Veneer (Two Inches and Less in Thickness)
ANSI	A 94.3	1961	Specifications for Thin Exterior Marble in Curtain or Panel Walls
ANSI	A 108.1	1967	Specifications for (Including Requirements of Related Divisions) Installation of Glazed Ceramic Wall Tile in Cement Mortars
ANSI	A 108.2	1967	Specifications for (Including Requirements of Related Divisions) Installation of Ceramic Mosaic Tile in Cement Mortars
ANSI	A 108.3	1967	Specifications (Including Requirements of Related Divisions) for Installation of Quarry Tile and Pavers in Cement Mortars
ANSI	A 108.5	1967	Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar

Recommended Nailing Schedule

Building Element	Nail Size and type	Number and location
Stud to sole plate	8d common	4 Toe-nail
Stud to cap plate	16d common	2 Toe-nail
Double studs	10d common	12"o.c. Direct
Corner studs	16d common	24"o.c. Direct
Sole plate to joist or blocking	16d common	16"o.c.
Double cap plate	16d common	16"o.c. Direct
Cap plate laps	16d common	2 Direct
Ribbon strip - 6" or less ...	10d common	2 each Direct bearing
Ribbon strip - 6" or more ...	10d common	3 each Direct bearing
Roof rafter to plate	8d common	3 Toe-nail
Roof rafter to ridge	16d common	2 Toe-nail
Jack rafter to hip	10d common	3 Toe-nail
Floor joists to studs	10d common	5 Direct or
(No ceiling joists)	10d common	3 Direct
Floor joists to studs ..... (With ceiling joists)	10d common	2 Direct
Floor joists to sill or girder	8d common	3 Toe-nail
Ledger strip	16d common	3 each Direct joist
Ceiling joists to plate	16d common	3 Toe-nail
Ceiling joists to parallel rafters	16d common	3 Direct
Ceiling joists (laps over partition)	16d common	3 Direct
Collar beam	10d common	3 Direct
Bridging to joists	8d common	2 each Direct end
Diagonal brace (to stud and plate)	8d common	2 each Direct bearing
Tail beams to headers	20d common	1 each End
(When nailing permitted)		4 sq. ft. floor area
Header beams to trimmers	20d common	1 each End
(When nailing permitted)		8 sq. ft. floor area
1" roof decking ..... (6" or less in width)	8d common	2 each Direct rafter
1" roof decking ..... (over 6" in width)	8d common	3 each Direct rafter
1" sub-flooring (6" or less)..	8d common	2 each Direct joist
1" sub-flooring (8" or more)..	8d common	3 each Direct joist
2" sub-flooring	16d common	2 each Direct joist
1" wall sheathing (8" or less in width)	8d common	2 each Direct stud
Plywood roof and wall sheathing	6d common	6"o.c. Direct edges and
(1/2 or less		12"o.c. intermediate
(5/8" or greater)	8d common	6"o.c. Direct edges and 12"o.c. intermediate

Recommended Nailing Schedule

Building Element	Nail Size and type	Number and location
(5/16", 3/8" or 1/2")...	16 ga. galvanized wire staples, 3/8" minimum crown; length of 1" plus plywood thickness	4"o.c. edges and 8"o.c. intermediate
(5/8")	Same as immediately above	2-1/2"o.c. edges and 5"o.c. intermediate
Plywood subflooring:		
(1/2")	6d common or 6d annular oredges spiral thread	6"o.c. Direct and 10"o.c. intermediate
(5/8", 3/4")	8d common or 6d annular or spiral thread	6"o.c. Direct edges and 10"o.c. intermediate
(1", 1-1/8")	10d common or 8d ring shank or 8d annular or spiral thread	6"o.c. Direct edges and 6"o.c. intermediate
(1/2")	16 ga. galvanized wire staples	4"o.c. edges and 7"o.c. intermediate
(5/8")	3/8" minimum crown, 1-5/8" length	2-1/2"o.c. edges and 4"o.c. intermediate
Built up girders and beams ..	20d common	32"o.c. Direct
Continuous header to stud ...	8d common	4 Toenail
Continuous header-two pieces.	16d common	16"o.c. Direct
1/2" Fiberboard sheathing ...	1-1/2" galvanized roofing nail or 6d common nail or 16 gage staple, 1-1/8" long with minimum crown of 7/16"	3"o.c. exterior edge 6"o.c. intermediate
25/32" Fiberboard sheathing..	1-3/4" galvanized roofing nail or 8d common nail or 16 gage staple, 1-1/2" long with minimum crown of 7/16"	3"o.c. exterior edge, 6"o.c. intermediate
Gypsum sheathing	12 gage 1-1/4" large head corrosion-resistive	4"o.c. on edge, 8"o.c. intermediate
Shingles-wood	No. 14 B&S corrosion-resistive	2 each bearing
Weather boarding	8d corrosion-	2 each bearing

PLYWOOD ROOF SHEATHING
DOUGLAS FIR, WESTERN LARCH, SOUTHERN PINE
AND
GROUP 1 SHEATHING GRADES WESTERN SOFTWOOD PLYWOOD

Panel Identification Index (2) (roof span "/floor span")	Roof				Floor
	Maximum Span (Inches)		Load (psf)		
	Edges Blocked(3)	Edges Unblocked	Total Load	Live Load	Maximum Span(5) (Inches)
12/0	12	12	130	100	0
16/0	16	16	75	55	0
20/0	20	20	55	45	0
24/0	24(6)	24	60	45	0
30/12	30	26	55	40	12(7)
32/16	32	28	50(4)	40	16(8)
36/16	36	30	50(4)	35(4)	16(8)
42/20	42	32	45(4)	35(4)	20(8)
48/24	48	36	40(4)	40	24

1. 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.

2. Identification index appears on all panels in the construction grades listed in footnote (1).

3. Edges may be blocked with lumber or other approved type of edge support.

4. For roof live load of forty (40) psf or total load of fifty-five (55) psf, decrease spans by thirteen (13) percent or use panel with next greater identification index.

5. Plywood edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless one-fourth (1/4) inch minimum thickness underlayment is installed, or finish floor is twenty-five thirty-seconds (25/32) inch wood strip. Allowable uniform load based on deflection of one three-sixtieth (1/360) of span is one hundred (100) psf.

6. 1/2 inch Structural I, when continuous over one (1) 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 twenty-four (24) inches on center, and the live load does not exceed thirty (30) pounds per square foot. For other grades, a thickness of five-eighths (5/8) is required.

7. May be sixteen (16) inches, if twenty-five thirty-seconds (25/32) inch wood strip flooring is installed at right angles to joists.

8. May be twenty-four (24) inches if twenty-five thirty-seconds (25/32) inch wood strip flooring is installed at right angles to joists.

PLYWOOD COMBINATION SUBFLOOR-UNDERLAYMENT

ALLOWABLE SPAN FOR PLYWOOD COMBINATION SUBFLOOR-UNDERLAYMENT (1)

Plywood Continuous over Two (2) or More Spans and Face Grain Perpendicular to Supports

Species Groups	Maximum Spacing of Joists (Inches)		
	16	20	24
1	1/2	5/8	3/4
2,3	5/8	3/4	7/8
4	3/4	7/8	1

1 - 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 1/360 of span is 100 psf. Plywood edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless one-fourth (1/4) inch minimum thickness underlayment is installed, or finish floor is twenty-five thirty-seconds (25/32) inch wood strip. If wood strips are perpendicular to supports, thicknesses shown for sixteen (16) inch and twenty (20) inch spans may be used on twenty-four (24) inch span.

ARTICLE 9

FIRERESISTIVE CONSTRUCTION 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 building, and provide for the installation of safeguards against the spread of fire within buildings and between buildings.

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 the Basic 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 as follows:

900.21 COMBUSTIBLE COMPONENTS: Combustible aggregates may be incorporated in concrete mixtures approved for fireresistive construction as provided in section 811 and 848 for gypsum concrete, in section 843 for cinder concrete and any other approved component material or admixture may be used in assemblies that meet the fireresistive test requirements of the Basic 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.

900.22 FILLER UNITS: When not included in strength calculations, filler units that contain component combustible materials may be used in all fireresistive 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 fireresistive construction and shall be classified in accordance with the degree of fireresistance required in article 2 and in tables 2-5 and 2-6.

SECTION 901.0 DEFINITIONS

AUTOMATIC FIRE DOOR: a fire door or other opening protective so constructed and arranged so that if open, it shall close when subjected to:

a) a predetermined temperature, or
b) a predetermined rate of temperature rise, or
c) smoke or other products of combustion.

COMBUSTIBLE FIRE DAMPER: a damper arranged to seal off air flow automatically through part of an air duct system, so as to restrict the passage of heat. The fire damper may also be used as a smoke damper if the location lends itself to the dual purpose.

COMBUSTIBLE (MATERIAL): a combustible (material) is a material which cannot be classified as noncombustible in accordance with that definition.

CONFLAGRATION HAZARD: the fire risk involved in the spread of fire by exterior exposure to and from adjoining buildings and structures.

FIRE DAMPER: a damper arranged to seal off air flow automatically through part of an air duct system, so as to restrict the passage of heat. The fire damper may also be used as a smoke damper if location lends itself to the dual purpose.

FIRE DIVISION: the interior means of separation of one part of a floor area from another part together with fireresistive floor construction to form a complete barrier between adjoining or superimposed floor areas in the same building or structure.

FIRE DOOR: a door and its assembly, so constructed and assembled in place as to give protection against the passage of fire.

FIRE DOOR ASSEMBLY: the assembly of a fire door and its accessories, including all hardware and closing devices and their anchors; and the door frame, when required, and its anchors.

FIRE GRADING: the posted fire hazard classification of a building or structure in hours or fractions of an hour as established for its use group and occupancy in table 9-1.

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

-MODERATE: all uses 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 uses 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 PARTITION: a partition which subdivides a story of a building to provide an area of refuge or to restrict the spread 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 provision of safeguards in construction and of exit facilities; and the installation of fire alarm, fire-detecting and fire-extinguishing service equipment to reduce the fire risk and the conflagration hazard.

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 resist fire exposure as determined by fire tests conducted in compliance with recognized standards.

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 CONSTRUCTION: fabricated units or assemblies of units of construction which have a fireresistance rating of not less than one-third (1/3) hour.

FIRERETARDANT LUMBER: wood so treated by a recognized impregnation process as to reduce its combustibility.

FIRE SAFETY: the measure of protection of a building or structure against interior and exposure fire hazards through fireresistive construction and the provision of safe exitways and fire-detecting and extinguishing equipment.

FIRE SEPARATION (EXTERIOR FIRE EXPOSURE): the distance in feet measured from any other building on the site, or from an interior lot line, or from the opposite side of a street or other public space to the building.

FIRE WALL: a wall having adequate fireresistance and structural stability under fire conditions to accomplish the purpose of completely subdividing a building or of completely separating adjoining buildings to resist the spread of fire.

FIRE WINDOW: a window constructed and glazed to give protection against the passage of fire.

FLAMERESISTANCE: the property of materials or combinations of component materials which resists the spread of flame as determined by the flameresistance tests specified in the Basic 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 recognized standards.

NONCOMBUSTIBLE: (INCOMBUSTIBLE) This is a general, relative term. Its precise meaning is defined in the Basic Code for specific applications.

PARTY WALL: a fire wall, used or adapted for joint service between two buildings, which may fall on an interior lot line or which may be used to separate adjoining one and/or two-family dwellings on the same lot.

SELF-CLOSING: a fire door or other opening protective which is normally closed and equipped with an approved device to insure closing after having been opened for use.

SHAFT: a vertical opening or passage through two or more floors of a building or through floors and roof.

-COVERED: an interior enclosed space extending through one (1) or more stories of a building, connecting a series of two (2) or more openings in successive floors, or floors and roof, and covered at the top.

-OPEN: an exterior, enclosed space extending through one or more stories of a building, enclosed with walls of the required weather and fireresistance for exterior walls, and open to the sky at the top.

STANDARD FIRE TEST: the standard controlled furnace test formulated under the procedure of the American Society for Testing Materials and designated ASTM E119 as listed in the reference standards of this article.

SECTION 902.0 FIRE HAZARD CLASSIFICATION

The degree of fire hazard of buildings and structures for each specific use group as defined by the fire grading in Table 9-1 shall determine the requirements for fire walls, fire divisions and the segregation of mixed uses as prescribed in section 213 and all structural members supporting such elements, unless otherwise provided in this Code.

902.1 UNCLASSIFIED USES: The building official shall determine the fire hazard classification of a building or structure designed for a use not specifically provided in table 9-1 in accordance with the fire characteristics and potential fire hazard of the use group which it most nearly resembles; or its designation shall be fixed by the approved rules.

SECTION 903.0 FIRERESISTANCE TESTS

All fire tests of building materials and construction shall be conducted in accordance with the standard fire test procedure; except that the hosestream test therein prescribed for one (1) hour construction shall be required for all assemblies and constructions approved for a fireresistance rating of three-quarter (3/4) hours.

TABLE 9-1 - FIRE GRADING OF USE GROUPS

Class	Use Group	Fire grading in hours
A	High hazard	4
B-1	Storage - Moderate hazard	3
B-2	Storage - Low hazard	2
C	Mercantile	3
D	Industrial	3
E	Business	2
F-1	Assembly - Theatres	3
F-2	Assembly - Night Clubs	3
F-3	Assembly - Recreation centers, lecture halls, terminals, restaurants	2
F-4	Assembly - Churches, schools	1½
H-1	Institutional - Restrained occupants	3
H-2	Institutional - Incapacitated occupants	2
L-1	Residential - Hotels	2
L-2	Residential - Multi-family dwellings	1½
L-3	Residential - 1 and 2 family dwellings	3/4

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 table 2-5. All floor and ceiling assemblies shall extend to and be tight against the exterior wall. Approved firestopping providing equivalent fireresistance shall be used to close off any separation between the floor and exterior wall.

903.2 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.

903.3 ROOF COVERINGS.

903.31 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.

903.32 TEST PROCEDURE: The tests shall be conducted to determine ability to resist ignition, duration of flaming and susceptibility to fire spread.

903.4 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 or tested in accordance with reference standard of this article.

903.41 CLASS A ROOFINGS shall be effective against severe fire exposure and shall be permitted for use on fireproof (type 1), noncombustible (type 2) and heavy timber mill (type 3-A) buildings and structures;

903.42 CLASS B ROOFINGS shall be effective against moderate fire exposure and shall be permitted as the minimum for use on fireproof (type 1) buildings and structures;

904.43 CLASS C ROOFINGS shall be effective against light fire exposure and shall be permitted as the minimum for use on noncombustible (type 2), masonry enclosed (type 3) and protected frame (type 4-A) buildings and structures;

903.44 NON-RATED ROOFINGS 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 4-B) construction.

903.5 OPENING PROTECTIVES.

903.51 STRUCTURAL INTEGRITY: Opening protectives, including frames, self-closing devices, and hardware, shall be classfied as to fire-protection rating and shall be installed, maintained and operated in accordance with the provisions of the reference standards of this article. All opening protectives shall bear the identification of an approved testing laboratory or agency certifying to the performance rating thereof.

903.52 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.

903.53 LABELED FIRE DOORS: Opening protective assemblies including the frames, hardware and operation which comply with the standards and accepted practice, including shop inspection, of approved testing authorities shall be deemed to meet the requirements of the Basic Code for their recommended and approved locations and use as listed in section 917.

903.54 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.

903.55 LABELED FIRE WINDOWS AND SHUTTERS: Fire window assemblies and shutters which comply with Section 918 and the standards and accepted practice of approved testing agencies shall be deemed to meet the requirements for their recommended and required locations under the Basic Code.

903.56 LABELED FIRE DAMPERS: Only fire dampers which have been tested, listed and labeled by an approved testing agency shall be deemed to meet the requirement of this Code for the recommended locations and use as listed in section 1810.1.

903.6 COMBUSTIBILITY TESTS: Where the behavior of materials under exposure to fire is specified in the Basic Code the characteristics of materials shall be determined by the following tests and criteria:

903.61 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 the reference standards of this article 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 1, with a surfacing not more than one-eighth (1/8) inch thick which has a flamespread rating not greater than fifty (50) when tested in accordance with the method of test for surface burning characteristics of building materials listed in the reference standards of this article.

c) materials other than defined in paragraphs 1 and 2, having a flamespread 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 flamespread rating greater than twenty-five (25) when tested in accordance with the method of test for surface burning characteristics of building materials listed in the reference standards of this article.

903.62 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 the reference standards of this article, 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 accredited authoritative testing agency showing the performance rating thereof.

903.7 FIRERETARDANT TREATED WOOD: Wood that has been pressure-treated with fireretardant chemicals in accordance with the reference standards of this article may be used in type 1 and 2 constructions for nonbearing partitions, structural elements, roof framing and sheathing as indicated by note (h) of table 2-5 provided that the assembly in which such material is used shall produce the required fireresistance when tested in accordance with the reference standards of this article.

903.71 LIMITATIONS: Fireretardant treated wood may not be used where exposed to the weather or in interior spaces where the relative humidity is normally eighty (80) percent 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 exposed surfaces or edges are tightly butted against other material that is noncombustible or that is fireretardant 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) percent of the allowable stresses for untreated lumber of like classification.

SECTION 904.0 FLAMERESISTANCE TESTS

All materials which are required to restrict the spread of flame or to be flameresistant under the provisions of the Basic 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 in the reference standards of this article.

904.1 INTERIOR FINISH MATERIALS: All materials used for interior finish shall be classified within the classifications listed in table 9-2. Interior finish materials shall be tested in accordance with

one of the methods of test for surface burning characteristics of building materials in the reference standards of this article. For class D material, the flame from the test specimen shall not reach the angle frame at any point in five (5) minutes or less when tested under the federal specification.

TABLE 9-2 - FLAME-SPREAD RATING

Class of material	Federal specification test	Surface Burning Characteristics Test (Tunnel test)
I	A	0 to 25
II	B or C	26 to 75
III	D (5 min. limit)	76 to 200
IV	Note a	201 to 500

904.2 INTERIOR HANGINGS AND DECORATIONS: Refer to Chapter 148 of the General Laws of the Commonwealth of Massachusetts for buildings subject to those regulations.

904.21 ACCEPTANCE CRITERIA: Where required to be flameresistive under the provisions of the Basic Code, all materials specified or required for artistic enhancement or use for decorations, draperies, curtains, scenery and hangings shall comply with this section for noncombustible or fireretardant materials; or if treated to be flame-resistant shall not generate smoke or gases more than those given off by untreated wood or paper burning under comparable conditions when tested in the vertical flame test listed in the reference standards of this article.

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 table 2-5 and the height and area limitations of table 2-6 shall be subject to the following exceptions and modifications, and to Massachusetts Department of Public Safety, Board of Fire Prevention Regulations FPR-4.

905.1 PUBLIC GARAGES: All 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.

905.21 HEIGHTS AND AREAS: Heights and areas of open parking structures shall not exceed the limits in the following table:

HEIGHT AND AREA LIMITATION FOR OPEN PARKING STRUCTURES

Type of Construction	Height	Area
1-A, 1-B, 2-A	Unlimited	Unlimited
2-B	100'	Unlimited
2-C	75'	Unlimited

The area of structures wherein more than twenty-five (25) percent 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 installed in accordance with section 308.1 in types 2-B and 2-C construction, the area may be unlimited. The above limits of height permit parking on the roof.

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 fire limits of masonry wall (type 3) construction not more than five thousand (5000) 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 table 2-6. Not more than one motor vehicle may be stored in such buildings unless separately enclosed with 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. Where applicable, conformance with Department of Public Safety, Board of Fire Prevention Regulations FPR-4 and 11 is required.

905.6 RESIDENTIAL BUILDINGS.

905.61 PROTECTED ORDINARY CONSTRUCTION: Multi-family dwellings (use 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 fireresistive construction, the floor area is subdivided by two (2) hour fire walls into fire areas of not more than three thousand (3000) square feet, and the common exitway, public hallways and exitways are enclosed in two (2) hour fireresistive construction.

905.62 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 (1½) hours fireresistive construction.

905.63 RETAIL BUSINESS USE: The first floor of buildings of unprotected noncombustible (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.

905.71 NON-FIREPROOF CONSTRUCTION: In all buildings other than one- and two-family dwellings (use group L-3) and other than fireproof (types 1-A and 1-B) 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 3-A) construction, or shall be equipped with automatic sprinklers; but in no case less than the required fireresistance of the use group and type of construction required by tables 2-5 and 2-6.

905.72 PROTECTED NONCOMBUSTIBLE CONSTRUCTION: In all buildings of one and one-half (1½) hour protected noncombustible (type 2-A) construction, more than four (4) stories or fifty (50) feet in height, in other than residential use groups, the floor above the basement or cellar shall be constructed with a fireresistance of not less than two (2) hours.

905.73 ONE- AND TWO-FAMILY DWELLINGS: One- and two-family dwellings (use group L-3), not more than two (2) stories and attic or thirty-five (35) feet in height, shall be exempt from the requirements of this section.

905.74 BASEMENT 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 stories or rooms below grade unless the floor construction above and below is of not less than one and one-half (1½) hour 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 table 2-5 as regulated by the location and type of construction.

906.1 EXCEPTIONS: The provisions of the Basic 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 table 2-5; and except as otherwise specifically permitted in the Basic Code, the piers, columns and other structural supports within the open portion shall be constructed with the fireresistance required for exterior bearing walls in table 2-5.

906.2 FIRE CANOPIES: All fire canopies required by section 918.51 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.

906.3 PARAPETS. - Parapets shall be provided on all exterior walls of buildings of construction types 3A, 3B, 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 867.0. Exceptions where parapets need not be provided on the exterior walls shall be made for the following buildings:

906.31 One (1) story buildings less than twenty-two (22) feet high; or

906.32 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

906.33 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

906.34 A building whose roof has a class A roof covering, and any overhangs, cornices, or gutters are constructed as required by section 906.32 above.

SECTION 907.0 FIRE WALLS AND PARTY WALLS

Fire walls, party walls and other fire division walls shall be constructed of noncombustible materials or form of construction of the required strength and fireresistance rating specified in table 2-5 for the type of construction but not less than the fire grading of the use group in table 9-1. The construction shall comply with all the structural provisions for bearing and non-bearing 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 867.0; except that in all buildings more than twenty-five (25) feet in height used for moderate hazard storage (use group B-1) and all high hazard uses (use 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 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 (use group B-1) and high hazard (use 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 (use 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 use groups other than one- and two-family dwellings, all party and fire walls shall be not less than two (2) hour fireresistive construction, but in no case less than the equivalent fire grading of the use group as specified in table 9-1.

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.

907.6 HOLLOW FIRE WALLS: When combustible members frame into hollow fire walls or fire walls of hollow units, all hollow spaces shall be solidly filled for the full thickness of the wall and for a distance of not less than four (4) inches above, below and between the structural members, with noncombustible materials approved for firestopping in section 921.

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 FIRE DIVISIONS: Fire walls and other vertical fire divisions shall be continuous between foundation roof, or horizontal fire divisions and through any concealed space in floor or roof construction. Horizontal fire divisions shall be continuous between exterior walls and/or vertical fire divisions.

907.81 When roof construction is combustible on both sides of 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.

907.82 Except as required in 907.83 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.

907.83 When a vertical fire division is required by table 9-1 to have a fireresistance rating of three (3) hours or greater, 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.

907.84 Fire walls and 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.

907.85 Fire walls and fire divisions shall be made smoke-tight at their junction with exterior walls.

907.9 OFFSET FIRE WALLS: If fire walls are offset at intermediate floor levels in fire-protected skeleton frame construction, the offset floor construction and the intermediate wall supports shall be constructed of noncombustible materials with a fireresistance rating not less than that required for the fire wall.

907.10 ONE AND TWO-FAMILY DWELLINGS: The requirements for the means of separation of single-family dwellings or two-family dwellings are as follows:

a) TWO-FAMILY DWELLING: Superimposed dwelling units - when one dwelling unit of a two-family dwelling is located wholly or partly above the other dwelling unit, the two dwelling units shall be completely separated by fire division walls and floor-ceiling assemblies of not less than three-quarter (3/4) hour fireresistive construction.

b) TWO-FAMILY DWELLING: Side by side dwelling units - when adjacent dwelling units of a two-family dwelling are attached by a common wall, said wall shall be a fire division wall having a minimum of three-quarter (3/4) hour fireresistance rating that shall serve to completely separate the dwelling units.

c) MULTIPLE, SINGLE-FAMILY DWELLINGS: Side by side - when multiple, single-family dwellings (use group L-3) are attached by a common wall, said wall shall be a party wall, having a minimum three-quarter (3/4) hour fireresistance rating. Said wall shall extend from the foundation to the underside of the roof sheathing and to the inside of the exterior wall sheathing.

d) MULTIPLE, TWO-FAMILY DWELLINGS: Side by side - when multiple, two-family dwellings (use group L-3) are attached by a common wall, said wall shall be a party wall, having a minimum three-quarter (3/4) hour fireresistance rating. Said wall shall extend from the foundation to the underside of the roof sheathing and to the inside of the exterior wall sheathing.

SECTION 908.0 FIRE WALL OPENINGS

Openings in fire walls 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 OPENING: Except in sprinklered buildings, no opening through a fire wall shall exceed one hundred and twenty (120) square feet in area, and aggregate width of all openings at any floor level shall not exceed twenty-five (25) percent of the length of the wall.

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: Every opening in a fire wall shall be protected on both sides with an approved automatic protective assembly as herein required, or the approved labeled equivalent, except horizontal exit openings.

Heat-actuated hold-open devices used on an automatic fire assembly providing three (3) hour fireresistance rating shall be installed, one on each side of the wall at ceiling height where the ceiling is more than three (3) feet above the opening.

Fire assemblies protecting openings required to have one and one-half (1½), one (1) or three-quarter (3/4) hour fireresistance shall be protected in a similar manner or by a single fusible link incorporated in the closing device.

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 table 2-5; except that partitions constructed of combustible materials to provide the required fireresistance may be accepted for use in exitways of building of types 3 and 4 construction as regulated by table 2-5 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 fire grading defined in table 9-1 for the specific use group.

909.4 OPENINGS.

909.41 SIZE: No other openings shall be permitted in fire partitions except exitway doors, and the aggregate permissible width of such doorways shall not exceed twenty-five (25) percent of the length of the wall, nor shall the maximum area of any individual opening exceed forty-eight (48) square feet.

909.42 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 table 6-6 for buildings not more than three (3) stories in height.

909.5 COMBUSTIBLE STAIR ENCLOSURES.

909.51 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 floors, ceilings and fire doors, separating the exitways from the unprotected areas of the building. Such enclosures shall be firestopped to comply with sections 874.9 and 921.

909.52 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

910.1 CONSTRUCTION: All permanent partitions designated as fireresistive for subdividing purposes other than providing required areas of refuge shall be constructed of noncombustible materials when designed for use in buildings and structures of fireproof or noncombustible (types 1 and 2) construction, except as provided in section 910.4.

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 874.0 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 903.0 and 917.

910.4 EXCEPTIONS.

910.41 NONFIREPROOF 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 fireresistance specified in table 2-5 shall be approved for enclosures of exitways where permitted in table 6-6 and for all nonbearing partitions.

910.43 FIREPROOF CONSTRUCTION: In all buildings and structures or other than institutional (use group H) and residential (use groups L-1 and L-2) of fireproof (type 1) or of protected noncombustible (type 2) constructions, 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 common 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 or fire partitions, fire walls, and fireresistive floors. Larger areas may be subdivided with fireretardant wood or with materials of similar combustible characteristics when complying with section 903.62 but not to exceed fifty (50) percent increase in area.

SECTION 911.0 VERTICAL SHAFTS AND HOISTWAYS

The provisions of this section shall apply to all vertical shaft enclosures, except as provided for stairway enclosures in section 618, flue enclosures in section 1009, incinerator chutes in sections 1014 and 1015 duct shafts in sections 1016 and 1017, and pipe shafts in section 1115.

911.1 OPEN SHAFT ENCLOSURES: 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 of the required fireresistance specified in table 2-5.

911.2 COVERED SHAFT ENCLOSURES: The enclosing walls and the top 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 911.3.

911.3 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 928.

911.4 TOP ENCLOSURE.

911.41 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. Such shafts shall be provided with noncombustible vents for the relief of smoke and gasses in the event of fire, with an area not less than ten (10) percent of the shaft area.

911.42 EXTENDING TO ROOF: All shafts that extend to the roof of the building shall be covered at the top with a thermostatically controlled skylight of not less than twenty-five (25) percent of the area of the shaftway, constructed in accordance with the requirements of section 928. The automatic operation of the skylight 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.

911.43 ALTERNATE SHAFT VENTILATION: The skylight herein required may be replaced by a window of equivalent area in the side of the shaft, provided the sill of such window is not less than two (2) feet above the adjoining roof and is equipped with an automatic vent opening, does not face on an interior lot line or within ten (10) feet thereof, and is not located within twenty (20) feet of an opening in adjacent walls.

911.5 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 fireresistance as the lowest floor through which it passes, but in no case with a fireresistance rating less than that of the shaft enclosure.

911.6 EXISTING SHAFTWAYS: In all existing shaftways of buildings of assembly (use groups F-1, F-2, F-3 and F-4), institutional (use groups H-1 and H-2) and residential (use groups L-1 and L-2) 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,

911.7 SHAFT OPENING: No openings other than necessary for the purpose of the shaftway shall be constructed in shaft enclosures; and all openings shall be protected with approved fire doors or fire shutters complying with the provisions of sections 917, 918, 919.

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 as required for structural members supporting masonry.

912.2 STONE LINTELS: Except when otherwise approved by the building official in controlled material procedure, the use of stone lintels on spans exceeding four (4) feet shall be prohibited unless supplemented by fireproofed structural members or masonry arches of the required strength to support the superimposed wall load.

SECTION 913.0 BEAMS AND GIRDERS

All beams and girders shall be protected with noncombustible materials or assemblies of component materials to afford the fire-resistance specified in table 2-5 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.

913.11 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 firesistance rating shall have any concealed spaces therein firestopped as outlined below:

913.31 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 protectives having the fire protection rating required by table 2-5. Firestopping 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. Firestopping 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 ventialated 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 firestopped in areas of not more than one thousand (1000) square feet with materials meeting the requirements of section 921.

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 building that do not exceed two (2) stories or thirty (30) feet in height, which are required by table 2-5 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 (2½) 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 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) percent 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.

9.3.9 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 table 2-5 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 fireprotected as required by this section and shall be protected agains corrosion by cement parging, waterproofing, or other approved methods complying with section 871.

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 (2½) 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 EMBEDDED MECHANICAL FACILITIES: Plumbing and heating pipes and vent ducts and similar service equipment shall be installed outside of the required protective column covering; except that plumbing pipes, wires, conduits and cables may be embedded in the required fireproof protection when they occupy not more than one-quarter (¼) of the fireproofed surface of a rectangular column face nor more than one-quarter (¼) of the perimeter of a round column.

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 table 2-5 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.

914.61 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.

914.62 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.

914.63 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 strucural member and to each other.

914.64 EXPOSED TIES: When outside tie wires are used, they shall be protected by not less than one-half (½) 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 concrete columns shall be proportioned by test to meet the fireresistive requirements of table 2-5 base 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 Table 2-5 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 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. Trusses that are required to be fire protected, and that support 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 fireresistance 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 316.

915.2 ONE STORY BUILDING: 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 20 FEET HIGH: In multi-story buildings of types of construction in which fire protected coverings of the structural framework are required by table 2-5 and the provisions of the Basic 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 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) constructions, 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 (use group F-4), residential buildings (use groups L-2 and L-3) and buildings of frame (type 4) construction, shall have approved fire windows, shutters, curtains, doors or other approved opening protectives meeting the requirements of the Basic Code 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 (1½) hours.

916.3 INTERIOR LOT LINE EXPOSURE: Opening protectives shall be provided in every permissible wall opening in buildings of high hazard (use group A) within eleven (11) feet of an interior lot line; in buildings of moderate hazard (use group B-1) 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 use group L-2 and L-3.

916.4 FIRST STORY OPENINGS: The required fireresistive opening protectives may be omitted in first story openings facing on a street or other public space not less than thirty (30) feet wide, when not extending more than twenty-five (25) feet above grade.

916.5 NON-AUTOMATIC PROTECTIVES: Required protective assemblies in exterior openings, unless self-closing or provided with approved automatic closing devices, operative from either side, shall be closed at the end of business hours and at all times when not required for light and ventilation under the provisions of article 5.

916.6 COMBUSTIBLE MATERIALS: 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.

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 section 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 building not more than three (3) stories or 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 L-1) and from hospital rooms (occupancy group H-2), to corridors providing access to an exitway may be of noncombustible construction or of one and three-quarter (13/4) inch bonded solid-core wood doors.

Doors in Schoohouse Use Group F-3 and F-4 occupancy except as herein otherwise provided for may be of one and three-quarter (1-3/4) inch solid-core wood doors. Plywood face veneers not more than one twenty-eighth (1/28) inch thick shall be permitted on such doors.

917.2 LABELED PROTECTIVE ASSEMBLIES: Labeled protective assemblies meeting the requirements of section 903.53 and 903.55, and the reference standards of this article, including shop inspection, shall be approved for use in the following typical and special situations:

917.21 TYPICAL SITUATIONS:

- CLASS A DOORS: fire wall openings in accordance with section 908.

- CLASS B DOORS: vertical shafts and openings in fire partitions in accordance with sections 909. and 911.

- CLASS C DOORS: openings in corridor, room and fireresistive par titions in accordance with section 910.

  In all schoolhouse uses other than F-3 and F-4, openings in corridors, rooms and fireresistive partitions shall conform to the requirements of section 910.

- CLASS D DOORS AND WINDOWS: openings in exterior walls in exposing and exposed buildings of high hazard use (use 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 requiredzin accordance with section 624.

917.22 SPECIAL SITUATIONS: Approved labeled opening protective assemblies shall be accepted as complying with the required time-temperature performance ratings specified in the Basic Code including the following special situations:

- CLASS A DOORS: high pressure boiler room walls in accordance with sections 618 and 1113.
  Volatile flammables, film, pyroxylin products and fur storage vaults in accordance with sections 403, 406, and 407.
  Grinding and grain processing rooms in accordance with section 409.

  Paint and flammable storage rooms in accordance with section 410.

  Dry cleaning rooms of high and moderate hazard in accordance with section 411.
  Proscenium walls of theatres in accordance with section 416.
  Transformer room walls in accordance with Massachusetts Electrical Code.

- CLASS B DOORS: motion picture studios in accordance with section 407.

  Dressing rooms in accordance with section 416.
  Show rooms in public garages in accordance with section 413.
  Theatre exits and property rooms in accordance with section 416.
  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 407.
  Paint spray rooms in accordance with section 410.
  Service stations and repair shops in accordance with sections 414 and 415.
  Kitchen and service pantries in places of assembly in accordance with section 417.
  Corridor rooms and all fireresistive partitions in accordance with section 910.

- CLASS D DOORS: attached garages in accordance with sections 412 and 917. Switchboard rooms where required in the Basic Code.

917.3 MULTIPLE DOORS.

917.31 FIRE WALLS: Two (2) doors of one and one-half (1½) hour fireresistance each, installed on opposite sides of the same opening, shall be deemed equivalent in fireresistance to one three (3) hour door.

917.32 FIRE PARTITIONS: Two (2) doors of three-quarter (3/4) hour fireresistance each, installed on opposite sides of same opening shall be deemed equivalent in fireresistance to a one and one-half (1½) hour fire door.

917.4 GLASS PANELS: Wire glass panels shall be permitted in fire doors within the limitations of section 919.

917.5 ALTERNATE CLOSING DEVICES: Except as may be otherwise provided for openings in fire and fire division walls, all fire doors shall be self-closing and shall be closed during occupancy of the building or part thereof; except that the building official may accept the use of rate of rise heat actuated devices meeting the requirements of the approved rules on doors that are normally required to be open for ventilation or other specified purposes when the safety of the occupants is not endangered thereby.

SECTION 918.0 FIRE WINDOWS AND SHUTTERS

918.1 FIRERESISTANCE RATING: Approved assemblies of fire window and fire shutters shall meet the test requirements of sections 903 and 904, or shall be approved labeled assemblies meeting the requirements of section 903.55.

Steel window frame assemblies of one-eights (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 of approved counterbalanced construction that can be readily opened from the outside.

918.5 VERTICAL SEPARATION OF WINDOWS.

918.51 WHERE REQUIRED: In all buildings and structures designed for storage, mercantile, industrial and business uses (use groups A, B, C, D and E), 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.

918.52 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 table 2-5, 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 nonbearing 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: Wired glass in fire doors located in fire walls shall be prohibited, except when serving as horizontal exits, 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 (1½) 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 shall not exceed a total exposed area of one thousand two hundred and ninety-six (1296) square inches; except as provided in section 917.32.

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 opening.....	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

919.5 EXITWAY PROTECTIVES: Unless specifically required in article 4 to be solid in such locations where unusually hazardous conditions prevail, fire doors in elevator and stairway shaft enclosures may be equipped with vision panels which shall be so located as to furnish clear vision of the passageway or appraoch to the elevator or stairway. Such vision panels shall not exceed the size limitations specified for class B doors.

SECTION 920.0 FIRERESISTIVE REQUIREMENTS FOR PLASTER

920.1 THICKNESS OF PLASTER: The required thickness of fireresistive 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 to fiber board, wood, or gypsum lath and from the back of metal lath.

920.2 PLASTER EQUIVALENTS: For fireresistive purposes, one-half (½) inch of unsanded 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 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 (½) 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 316.0, for combustible wall, partition and floor framing in section 874.0 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 1117 and for fire dampers and curtains in section 1810.

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

922.1 FLOORS AND FLOOR COVERINGS: Finish floors and floor coverings shall be exempt from the requirements of this section provided, however, that in any case where the building official finds a floor surface of unusual hazard the floor surface shall be considered a part of the interior finish for the purpose of this code.

TABLE 9-3 - INTERIOR FINISH REQUIREMENTS

	Use Groups	Required Vertical Exitways and Passageways	Corridors Providing Exitway Access	Rooms or Enclosed Spaces (a)
A	High Hazard	I	II	III
B-1	Storage-Moderate Hazard	I	II	III
B-2	Storage-Low Hazard	I	II	III
C	Mercantile Walls			
	Ceilings	I	II	II(e)
D	Industrial	I	II	III
E	Business	I	II	III
F-1	Assembly-Theatres	I	I	II(b)
F-2	Assembly-Night Clubs	I	I	II(b)
F-3	Assembly-Halls, Terminals, Restaurants	I	I, I(e)	II(b)
F-4	Assembly-Churches, Schools	I	I	II(b)
H-1	Institutional-Restrained	I	I	I(c)
H-2	Institutional-Incapacitated	I	II	I(c)
L-1	Residential-Hotels	I	II	III
L-2	Residential-Multi-family Dwellings	I	II	III
L-3	Residential-1 and 2-Family Dwellings	IV(f)	IV(f)	IV

NOTE a. - Requirements for rooms or enclosed spaces are based upon spaces enclosed in partitions of the building or structure, and where fireresistance is required for the structural elements the enclosing partitions shall extend from the floor to the ceiling. Partitions which do not comply with this shall not be considered as enclosing spaces and the rooms or spaces on both sides thereof shall be counted as one. In determining the applicable requirements for rooms or enclosed spaces, the specific use or occupancy thereof shall be the governing factor, regardless of the occupancy group classification of the building or structure. When approved full sprinkler protection is provided, the interior finish of class II or III materials may be used in place of class I or II materials respectively, where required in the table, except in exitways.

NOTE b. - Class III interior finish materials may be used in places of assembly with a capacity of 300 persons or less except for use group F-6.

NOTE c. - Class III interior finish materials may be used in administrative areas. Class II interior finish materials may be used in individual rooms of not over 4 persons capacity. Provisions in Note "a" allowing a change in interior finish classes when sprinkler protection shall not apply.

NOTE d. - Class III interior finish materials may be used for wainscoting of paneling for not more than one thousand (1000) square feet of applied surface area in the grade lobby when applied directly to a noncombustible base or over furring strips applied to a noncombustible base and fire-stopped as required by section 923.

NOTE e. - Class III interior finish materials may be used in mercantile occupancies of 3,000 square feet or less gross area, used for sales purposes on the street floor only. (balcony permitted).

NOTE f. - Class IV finish having a flame spread rating not greater than five hundred (500) is permitted in one- and two-family dwellings, except that material of no greater flame spread than class III finish shall be used in exitways from the upper story of a two-family dwelling.

922.2 CLASSIFICATION OF MATERIALS:

a) The classification of interior finish materials specified in section 922.2 (b) shall be that of the basic material used, without regard to subsequently applied paint or wallpaper. However, the building official shall revise the classification of the basic material when such finishes, in his opinion are of such characteristics or thickness or so applied as to affect materially the flame spread characteristics. This revised classification shall be that corresponding to the rating of the combination of the basic material together with the applied finish.

b) Interior finish materials shall be grouped in classes according to their flame spread and related characteristics as given in table 9-2.

c) Smoke: Notwithstanding the flame spread classification of sections 922.2 (a) and 922.2 (b), any material shown by test to have a life hazard greater than that indicated by the flame spread classification owing to the amount of character of smoke generated, shall be included in the group appropriate to this actual hazard as determined by the enforcing authority.

d) Fire Retardant Paints: (1) In existing buildings, the required flame spread classification of interior surfaces may be secured by applying approved fire retardant paints of solutions to existing interior surfaces having a higher flame spread rating than permitted. "Approved" shall mean a paint or solution tested by Underwriters' Laboratories in accordance with ASTM E-84-61 (NFPA No. 255 dated May, 1961) and rated with flame spread classifications in accordance with the requirements set forth, and applied in accordance with manufacturer's specifications to achieve these ratings. (2) Fire retardant paints or solutions shall be renewed at such intervals as necessary to maintain the necessary fire retardant properties. Durability and serviceability of paint shall meet the washability and leeching standards established by Federal Specification (D.O.D.) TT-P-0026b dated August 24, 1961.

e) Trim and Other Incidental Finish: Interior finish not in excess of ten (10) percent of the aggregate wall and ceiling areas of any room or space may be Class III materials in occupancies where interior finish of lower flame spread rating is required.

f) In mill type construction, heavy timber structural members shall be exempt and no treatment of such heavy timbers members will be permitted that would increase the flame rating of the natural untreated timber.

g) Interior Finish and Trim Requirements by Use Occupancy: Interior finish material shall be used in accordance with requirements for individual classes of occupancy specified in sections 202 thru 213. Wherever the use of any class of interior finish is specified, the use of a higher class shall be permitted; e.g. where Class II is specified, Class I may be used.

h) Automatic Sprinklers: Where a complete standard system of automatic sprinklers is installed, interior finish with flame spread rating one class lower than that specified in table 9-2 may be used; e.g. where Class II is normally specified, an interior finish with flame spread rating not over Class III may be used.

prescribed for the various occupancy groups listed in Table 9-3 when tested in accordance with the requirements of Section 904.

922.4 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 I, II or III 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 I or II materials shall be used for interior trim where interior finish is restricted to Class I material.

Class IV trim having a flamespread rating not greater than five hundred (500) shall be allowed for trim only where Class IV material is permitted for interior finish.

SECTION 923.0 APPLICATION OF INTERIOR FINISH

Where interior finish is regulated by the requirements of the Basic Code, interior finish materials shall be applied or otherwise fastened in such a manner that they will not readily become detached 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.

923.1 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 or other structural elements are required to be fireresistive or to be constructed of noncombustible component materials and interior finish is set out or dropped distances greater than one and three-quarter (1 3/4) inches from the surface of such elements, only material of which both faces qualify as Class I shall be used, unless the finish material is protected on both sides by automatic sprinklers (see note (a) to Table 9-3) or is attached to 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 3A) construction, where permitted, or to furring strips applied to such members or wood decking as provided in section 923.1.

923.4 CLASS II AND III MATERIAL: Interior finish materials, other than Class I 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 the Basic Code for noncombustible classification of material under section 903.61 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 the Basic Code. Where Class III 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 for theatres and similar places of public assembly (Use Groups F-1 and F-2), the use of combustible materials in or on floors of type 1 and type 2 buildings shall be herein specified.

924.1 SLEEPERS, BUCKS AND GROUNDS: Floor sleepers, bucks, nailing blocks and ground 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 DECORATIVE MATERIAL RESTRICTIONS

In places of public assembly, all draperies, hangings and other decorative materials suspended from walls or ceilings shall be noncombustible or flameresistant meeting the requirements of section 904 as herein specified:

925.1 NONCOMBUSTIBLE: The permissible amount of noncombustible decorative hangings shall not be limited.

925.2 FLAMERESISTANT: The permissible amount of flameresistant decorative hangings shall not exceed ten (10) percent of the total wall and ceiling area.

SECTION 926.0 EXTERIOR TRIM RESTRICTIONS

926.1 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 ARCHITECTURAL TRIM.

926.21 CONSTRUCTION REQUIREMENTS: All architectural trim, such as cornices and other exterior architectural elements, attached to the exterior walls of buildings of types 1 and 2 construction shall be constructed of approved noncombustible materials and shall be secured to the wall with metal or other approved noncombustible brackets; except that outside the fire limits, such trim may be of frame construction when the building does not exceed three (3) stories or forty (40) feet in height. Such trim may be of frame construction on all buildings of types 3 and 4 construction.

926.22 LOCATION: When architectural trim, as described in section 926.21, is located along the top of exterior walls, it must be completely backed up by the exterior wall and shall not extend over the top of exterior walls.

926.23 FIRESTOPPING: Continuous exterior architectural trim constructed of combustible materials shall be firestopped as required in section 874.

926.3 COMBUSTIBLE HALF TIMBERING: In buildings of masonry enclosed (type 3) construction that do not exceed three (3) stories or forty (40) feet in height, exterior half-timbering and similar architectural decorations may be constructed of wood or other equivalent combustible materials, provided such trim is backed up solidly with approved noncombustible materials.

926.4 BALCONIES: All balconies attached to or supported by buildings of types 1 and 2 construction shall be constructed of noncombustible materials. Balconies attached to or supported by buildings

of type 3 and 4 construction may be of unproteced noncombustible materials or frame construction. Balconies of frame construction shall afford the fireresistance rating required by table 2-5 for floor construction and the aggregate length shall not exceed fifty (50) percent of the building perimeter on each floor.

926.5 BAY AND ORIEL WINDOWS: All bay and oriel windows attached to or supported by walls other than frame construction shall be of noncombustible construction, framed with brackets of steel, concrete or other approved noncombustible materials, unless specifically exempted by section 303.

926.6 EXISTING COMBUSTIBLE CONSTRUCTION: Any existing cornices or other exterior architectural element constructed of wood or similar combustible materials may be repaired with the same material to the extend of fifty (50) percent of its area in any one year if the public safety is not thereby endangered.

926.7 WOOD VENEERS: Inside the fire limits wood veneers are permitted in accordance with section 303.10.

SECTION 927.0 ROOF STRUCTURES

All construction, other than aerial supports, clothes dryers and similar structures less than twelve (12) feet high, water tanks and cooling towers as hereinafter provided and flag poles, erected above the roof of any part of any building or structure located within the fire limits or of any building or structure more than forty (40) feet in height outside the fire limits shall be constructed of noncombustible materials.

927.1 SCUTTLES.

927.11 SIZE: Unless provided with other approved means of access to the roof, every building and structure more than three (3) stories or 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.

927.12 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 wood covered on top and edges with sheet metal in masonry enclosed (type 3) and protected frame (type-4) buildings.

927.2 SKYLIGHTS.

927.21 SASH AND FRAMES: Skylights which are inclined more than thirty (30) degrees from the vertical hereafter constructed on all buildings and structures except frame (type 4-B) buildings and all skylights on fireproof and noncombustible (types 1 and 2) buildings shall have the sash and frames thereof constructed of metal or other approved noncombustible materials. 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.

927.22 GLASS -- WIRED OR PLAIN: Skylights shall be glazed with wired glass or of approved glass block construction conforming to sections 812 and 859, except that skylights placed over shafts and stair enclosures and skylights used for emergency heat and smoke ventings shall be glazed with plain glass not over one-eighth (1/8) inch thick. No single panel of wired glass in skylights shall exceed seven hundred and twenty (720) square inches in area or forty-eight (48) inches in any dimension. Light transmitting plastic may be used as specified in section 2006.0.

927.23 SCREENS: Plain glass skylights shall be protected by substantial corrosion-resistive metal or other approved noncombustible screens having a mesh not less than three-quarter (3/4) by three-quarter (3/4) inches nor larger than one (1) by one (1) inches, constructed of not lighter than No. 12B and S gage wires. The screen shall be erected at a distance of not less than four (4) nor more than ten (10) inches above all glazed portions of the skylight and shall project on all sides for a distance of not less than the height of the screen above the glass. A similar screen shall be placed below the skylight to afford protection to the occupants of the building. The provisions for wired glass or screen protection shall not apply to glass block skylights or to greenhouse construction.

927.3 PENTHOUSE.

927.31 ADDITIONAL STORY: Penthouses occupying more than one-third (1/3) of the roof area shall be considered a story of the building and the enclosure shall conform to the requirements for exterior walls of the building type as regulated by table 2-5 and article 8.

927.32 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 fireresistance, it may be constructed with a fireresistance rating of not less than one and one-half (1½) hours, covered on the outside with noncombustible, waterproof material and supported on protected steel or reinforced concrete construction.

927.33 DOORS, FRAMES AND SASH: Doors, frames and window sash except where otherwise specifically required to be fireproof or fireresistive under the Basic 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:

927.41 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 fireresistance rating of not less than three-quarter (3/4) hours protected with weather-resistive roof and wall coverings complying with section 928.0.

927.42 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 fireresistance rating covered on the outside with approved roofing materials.

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 fireresistance 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 fireresistance 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) percent of the roof area.

927.7 WATER TANKS.

927.71 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.

927.72 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 the Massachusetts State Plumbing Code.

927.73 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.

927.74 TANK COVER: All unenclosed roof tanks exposed to the weather shall have approved covers sloping toward the outer edges.

927.75 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:

927.81 LOCATED IN FIRE DISTRICTS: Within Fire District Nos. 1 and 2, cooling towers erected on the roofs of buildings shall be constructed of noncombustible materials, except that drip bars may be of wood.

927.82 LOCATED OUTSIDE FIRE DISTRICTS: Outside the fire limits, cooling towers may be constructed of wood or other approved materials of similar combustible characteristics; except that when the base of the tower is more than fifty-five (55) feet above grade and the tower is located on a building, the drip bars only may be fabricated of combustible materials as herein provided.

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 tables 2-5 and 2-6; 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 section 421.0.

SECTION 928.0 ROOF COVERINGS

All approved roof coverings shall be classified as A, B, or C on the basis of their resistance to fire exposure as listed in the reference standards of this article.

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 Fire District Nos. 1 and 2, all roof coverings shall be of asbestos, brick, concrete, metal, slate, tile, prepared asphalt 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 903.4 for class A, B, or C roof coverings or their approved equivalent.

928.3 OUTSIDE FIRE LIMITS: Roof coverings which are classfied as non-rated roofing under section 903.4 and the approved rules including wood shingles and handsplit shakes as specified in section 853.72 shall be deemed to meet the requirements for use on all one- and two-family dwellings of frame (type 4-B) construction, not exceeding two (2) stories or thirty-five (35) feet in height and four thousand (4000) square feet in area when the distance of the building from any other building is not less than twelve (12) feet; and on private garages or airplane hangars and structures for similar accessory uses outside the fire limits and in Fire District No. 2, located on the same lot with a dwelling, not exceeding one (1) story or twenty-five (25) feet in height and twenty-five hundred (2500) square feet in area and with a fire separation of not less than twelve (12) feet; and on storage buildings of moderate or low fire hazard (use groups B-1 and B-2) not exceeding one (1) story or twenty-five (25) feet in height and six thousand (6000) square feet in area when separated not less than twenty (20) feet from any other building.

928.4 ROOF DECKING AND SHEATHING.

928.41 COMBUSTIBLE DECKING: Unless attached directly to noncombustible framework, all roof coverings shall be applied to a closely fitted deck; except as provided in section 853.72 for wood shingles and handsplit shakes.

928.42 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: The use of cork, fiber board and other combustible roof insulation shall be permitted provided it is covered with approved roof coverings directly applied thereto.

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 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 electrical system within the building.

928.61 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.

AIA		1968	Fireresistance Ratings
ASTM	E 84	1970	Standard Method of Test for Surface Burning Characteristics of Building Materials
ASTM	E 108	1970	Standard Methods of Fire Tests of Roof Coverings
ASTM	E 119	1973	Standard Methods of Fire Tests of Building Construction and Materials
ASTM	E 136	1965	Method of Test for Determining Noncombustibility of Elementary Materials
ASTM	E 152	1972	Standard Methods of Fire Tests of Door Assemblies
ASTM	E 163	1965	Standard Methods of Fire Tests of Window Assemblies
AWPA	C 20	1970	Structural Lumber - Fireretardant Treatment by Pressure Processes
AWPA	C 27	1970	Plywood - Fireretardant Treatment by Pressure Processes
NFPA	No. 80	1973	Installation of Fire Doors and Windows
NFPA	No. 701	1969	Standard Methods of Fire Tests for Flame-resistant Textiles and Films
U.S. Federal Test Method Standard	No. 191	1968	Method 5190 Textile Test - Burning Rate of Cloth; 30 degree angle
ULI	Standard Test Method, Subject 723	1960	Test Method for Fire Hazard Classification of Building Materials
ULI	Standard Subject 10 (a)	1965	Tin-Clad Fire Doors and Shutters
ULI	Standard 555	1970	Fire Dampers
Federal Specification	SSA 00118 C	1960	Flameresistance Tests - Acoustical Units, Prefabricated
NFPA	703	1971	Fireretardant Treatment of Building Materials
FMED			Prevention and Spread of Fire Approved Fire Protection Equipment and Building Materials

ARTICLE 10

CHIMNEYS, FLUES AND VENT PIPES

SECTION 1000.0 SCOPE

The provisions of this article shall control the design and constructions of all chimneys and 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 shall be deemed to meet the requirements of this Code.

1000.11 COMMONWEALTH OF MASSACHUSETTS REQUIREMENTS: Gas vents required for appliances or equipment using fuel gases of any kind such as natural gas, manufactured gas, undiluted liquified petroleum gases, liquified 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

CHIMNEY: A primarily vertical enclosure containing one or more passageways. (see section 1005.0).

-FACTORY-BUILT CHIMNEYS: a chimney that is factory-made, listed by an accredited authoritative testing agency, for venting gas appliances, gas incinerators, and solid or liquid fuel burning appliances.

-MASONRY CHIMNEY: a field constructed chimney built in accordance with nationally recognized codes or standards.

-METAL CHIMNEY: a chimney made of metal of adequate thickness, (see section 1009.0) galvanized or painted unless suitably corrosion-resistant, properly welded or riveted and built in accordance with nationally recognized codes or standards.

-CHIMNEY CONNECTOR: a pipe or breaching which connects the heating appliance to the chimney.

DRAFT HOOD: a device placed in and made part of the vent connector from an appliance, or in the appliance itself, which is designed 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 appliances; (3) neutralize the effect of stack action of the chimney flue upon the operations of the appliance.

DRAFT REGULATOR: a device which functions to maintain a desired draft in the appliance by automatically reducing the draft to the desired value.

DUCT: a tube, pipe conduit or continuous enclosed passageway used for conveying of air, gases or vapors.

FLEXIBLE TUBING: a gas conduit other than that formed by a continuous one-piece metal tube.

FORCED AND INDUCED DRAFT FUEL BURNING APPLIANCES: fuel burning appliances listed as exhausting low temperature fuel gases and listed for use with type L venting systems.

GAS VENTS: type B. Listed factory-made gas vents for venting listed or approved appliances, equipped to burn only gas, except those specifically listed for use with chimneys only.

GAS VENTS: type B-W. Listed factory-made gas vents for venting listed or approved gasfired vented recessed heaters.

GAS VENTS: type C. Vents constructed of sheet copper not less than No. 24 U.S. standard gage or galvanized steel of not less than No. 20 U.S. standard gage, or other approved noncombustible corrosion-resistant materials.

GAS VENTS: type L. Low-Temperature, Venting Systems. A venting system consisting of listed factory made piping and fittings for use with fuel burning appliances listed as exhausting low temperature flue gases and approved for use with a type L venting system.

HOOD: a canopy or similar device connected to a duct for the removal of heat, fumes or gases.

METAL CHIMNEY (smokestack) (see chimney)

VENT: a passageway, vertical or nearly so, for removing vent gases to the outer air.

VENT CONNECTOR: (vent connector pipe.) that portion of the vent system which connects the gas appliance to the gas vent or chimney.

VENT SYSTEM: the gas vent or chimney and vent connector, if used, assembled to form a continuous unobstructed passageway from the gas appliance to the outside atmosphere for the purpose of removing vent gases.

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 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 flue gases to the outside atmosphere.

1002.2 ENGINEERED VENT SYSTEM: The requirements specified in the following sections: 1003.0 through 1012.0 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 products of combustion.

1003.1 ACCEPTANCE CRITERIA: The system shall be accepted if the following three (3) conditions are fulfilled:

1) there shall be no continuous spillage at the draft hood when any one or combination of appliances connected to the system is in operation;

2) temperature on adjacent combustible surfaces shall not be raised more than the limits acceptable to approved testing agency; and

3) condensation shall not be developed in a way that would cause deterioration of the vent or drip from joints or bottom end of vent.

1003.11 APPROVED INSTALLATIONS: Factory-built chimneys and gas vents which have been tested and approved by an approved 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.

SECTION 1004.0 KINDS OF CHIMNEYS

CHIMNEYS AS USED IN THIS ARTICLE SHALL BE CLASSIFIED AS:

1) factory-built chimney.
2) masonry chimneys.
3) metal chimneys (smokestacks).

SECTION 1005.0 APPLIANCES REQUIRING CHIMNEYS

All heating appliances shall be connected to chimneys which conform to the provisions of this article. Chimneys shall be used for venting the following types of appliances:

1) incinerators, except as noted in section 1005.1;
2) appliances which may be converted readily to use solid or liquid fuels;
3) combination gas-oil burning appliances;
4) appliances listed for use with chimneys only;
5) oil-fired appliances and equipment except as exempted in section 1011.

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 RAISING EXISTING CHIMNEYS: Whenever a building is hereafter erected, enlarged or increased in height so that a wall along an exterior lot line, or within three (3) feet thereof, extends above the top of an existing chimney or gas vent of an adjoining existing building, the owner of the building so erected, enlarged or increased in height shall carry up at his own expense, with the consent of the adjoining property owner, either independently, or in his own building, all chimneys connected to liquid or solid fuel burning appliances. Gas vents within six (6) feet of any portion of the wall of such adjoining building shall be extended two (2) feet above the roof or parapet of the adjoining building.

1006.2 SIZE OF EXTENDED CHIMNEYS: The construction of an extended chimney shall conform to the requirements of this article for new chimneys, but in no case shall the internal area of such extension be less than that of the existing chimney.

1006.3 NOTICE OF ADJOINING OWNER: It shall be the duty of the owner of the building which is erected, enlarged or increased in height to notify in writing and to secure the consent of the owner of existing chimneys affected, at least ten (10) days before starting such work.

1006.4 EXISTING CHIMNEYS: No existing chimney, except one which does not endanger the fire safety of a building or structure and is acceptable to the building official, shall be continued in use unless it conforms to all requirements of this article for new chimneys.

1006.5 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 or other approved devices shall be provided at the base of all chimneys to enable the passageways to be maintained and cleaned.

SECTION 1007.0 FACTORY-BUILT CHIMNEYS

1007.1 FACTORY-BUILT CHIMNEYS: Factory-built chimneys that have been tested and certified by an approved agency shall be installed in accordance with the clearance and details of their approval and the manufacturer's instructions.

SECTION 1008.0 MASONRY CHIMNEY

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 subsections.

1008.11 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.

1008.12 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.

1008.13 HIGH TEMPERATURE: Chimneys constructed to safely remove products of combustion having temperatures over 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.

1008.21 MASONRY CHIMNEYS: 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 on approved foundations complying with article 7 and shall not be designed to support any direct load other than its own weight.

1008.3 LOW TEMPERATURE CHIMNEYS.

1008.31 SOLID MASONRY: When constructed of solid masonry, the walls shall be not less than eight (8) inches thick, except as herein provided in dwellings and small business buildings.

1008.32 REINFORCED CONCRETE: When constructed of reinforced concrete the walls shall be not less than six (6) inches thick, except as provided for dwellings.

1008.33 DWELLINGS: In residential buildings (use 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.

1008.34 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.

1008.35 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-eighth (5/8) inches.

1008.36 FLUE LINING CONSTRUCTION: Flue linings shall be constructed in advance of the chimney and shall start from a point 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.

1008.41 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.

1008.42 REINFORCED CONCRETE: When constructed of reinforced concrete the walls shall be not less than six (6) inches thick with approved lining.

1008.43 LINING: Medium temperature masonry chimneys shall be lined with not less than four and one-half (4½) 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 wall of double-wall construction shall be of fire brick at least four and one-half (4½) 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.

1008.61 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.

1008.62 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 1008.36.

1008.63 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.

1008.64 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 (½) inch clearance from the chimney walls.

1008.65 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.

1008.66 THICKNESS AND SHAPE: For chimneys larger than one hundred and twenty (120) square inches, except as specified in section 1008.33, 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.

SECTION 1009.0 METAL CHIMNEYS

1009.1 THICKNESS OF METAL.

1009.11 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 (¼) inch thick for larger diameters.

1009.12 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 and 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 OPENING: 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 fireproof (type 1-A) construction at intermediate levels.

1009.5 HIGH TEMPERATURE LINING: When metal or masonry chimneys are used to remove high temperature combustion gases they shall be lined with four and one-half ($4\frac{1}{2}$) inches of fire brick 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 non-combustible construction. No such stack shall be located less than twenty-fou (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 appliance 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 CONNECTOR (SMOKEPIPES)

The chimney connector from every heating appliance, except for vent connectors from gas-fired appliances, shall connect to a chimney conforming to the provision 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 other 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 1017 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.

1010.61 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

1010.62 REDUCED CLEARANCES: The clearances specified herein may be reduced one-half (½) 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 1112. 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 fireresistance 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 which has a rubbish chute identical with the flue.

SECTION 1011.0 VENT SYSTEMS

For the purpose of determining vent requirements, oil-fired appliances shall be classified as "listed" or "unlisted". A listed appliance is one that is shown in a list published by an approved 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.

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) all water heaters;
d) room heaters listed for vented use only as required in section 1011.2;

e) appliances equipped with gas conversion burners;
f) appliances which have draft hoods supplied by the appliance manufacturer;
g) unlisted appliances.

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) other appliances listed for unvented use and not provided with flue collars;
h) specialized equipment of limited input such as laboratory burners or gas lights.

When any or all of the appliances listed in items 5, 6, 7, and 8 above are installed so that the aggregate input rating exceeds thirty (30) B.T.U. 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 appliances does not exceed thirty (30) B.T.U. 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 VENTS.

1011.31 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.

1011.32 VENTILATING HOODS: Ventilating hoods and exhaust systems may be used to vent commercial appliances.

1011.33 CHIMNEYS: Chimneys shall be constructed in accordance with the requirement of article 10.

1011.34 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.

1011.35 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.

1011.4 INSTALLATION REQUIREMENTS.

1011.41 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.

1011.42 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 1008.61, 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.

1011.43 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.

1011.44 TOP ASSEMBLY: Gas vents and factory-built chimneys shall extend above the roof surface and through the flashing and shall terminate in a top or roof assembly with a venting capacity not less than that of the vent. The top shall prevent rain and debris from entering the vent.

1011.45 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 section 1007, 1008 and 1009.

1011.46 OUTSIDE GAS VENTS.

1011.47 MATERIALS: Outside gas vents and chimneys shall not be used in exposed locations except when permitted by the building official. When they are permitted to be used, the material shall possess high insulation qualities or be adequately insulated.

1011.48 CONDENSATE DRAIN: Where local experience with gas vent materials indicates that the condensate may be a problem, a capped tee and drain pipe shall be installed at the base of the riser to drain off condensate.

1011.5 PROHIBITED INSTALLATIONS.

1011.51 PROHIBITED TERMINATION: Natural draft vents extending through outside walls shall not terminate below eaves adjacent to such walls or parapets.

1011.52 UNVENTED ROOM HEATERS PROHIBITED: 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 FIREPLACES

1012.1 CONSTRUCTION: The back and jambs of fireplaces shall be constructed of solid masonry or reinforced concrete not less than eight (8) inches thick, with a lining of fire brick, soapstone, cast iron or other approved noncombustible material not less than two (2) inches thick. Such lining may be omitted when the solid masonry or reinforced concrete is not less than twelve (12) inches thick, or the equivalent insulation is provided integrally in approved heating equipment or firing devices installed in the fireplaces. In one- and two-family dwellings (use group L-3), when approved steel fireplace units which are equipped with an air circulating chamber are installed integrally with the fireplace construction, the back and jambs of the fireplace construction, the back and jambs of the fireplace may be reduced to four (4) inches of approved masonry.

1012.2 HEARTH: Every fireplace shall be constructed with a hearth of brick, stone, tile or other noncombustible material. For fireplaces with an opening of less than six (6) square feet the hearth shall extend not less than sixteen (16) inches in front and not less than eight (8) inches on each side of the fireplace opening. For fireplaces with an opening of six (6) square feet or more the hearth shall extend not less than twenty (20) inches in front and not less than twelve (12) inches on each side of the fireplace opening. Such hearths shall be supported on trimmer arches of brick, stone, tile or concrete not less

than four (4) inches thick, or other equally strong and fireresistive materials. All combustible forms or centering shall be removed after completion of the supporting construction.

1012.3 FIREPLACE DAMPER: Every fireplace shall be equipped with an approved damper.

1012.4 FIREPLACE CLEARANCES.

1012.41 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.

1012.42 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 the twelve (12) inch boundary of the opening shall not project more than one-eighth (1/8) inch from the face of the masonry for each one (1) inch distance from the opening.

1012.5 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 heater which is exempted from vent requirements under the provisions of section 1011.

1012.6 IMITATION FIREPLACES: The depth of an imitation fireplace or recess for heating equipment shall not be 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 fireresistive 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.

SECTION 1013.0 CUPOLA CHIMNEYS

1013.1 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 heavy wire netting or other spark arrester as provided in section 1018.

1013.2 CUPOLA CLEARANCES: No combustible material shall be erected or placed within three (3) feet of any cupola or other high temperature chimney.

SECTION 1014.0 FUEL-FIRED INCINERATOR CHIMNEYS

Chimneys for fuel-fired incinerators shall be constructed of at least four (4) inches of clay or shale brick masonry which is lined with not

less than four and one-half (4½) inches of firebrick for at least forty (40) feet above the roof of the combustion chamber; and beyond the forty (40) foot level shall be enclosed with not less than eight (8) inches of clay or brick masonry.

SECTION 1015.0 MISCELLANEOUS INCINERATOR FLUES

1015.1 FLUE ENCLOSURES: All incinerator flues not provided for in sections 1015 and 1016, including flues for rubbish and waste material incinerators, shall be enclosed with not less than eight (8) inches of clay or shale brick masonry, unless otherwise approved by the building official.

1015.2 CONNECTION TO CHIMNEYS AND STACKS: Nothing in this article shall prohibit the connection of an incinerator by means of an approved breeching to a smokestack or chimney flue which serves a heat appliance; provided the cross-sectional area of such stack or flue is at least four (4) times that of the incinerator breeching and such stack or flue and the connection meet the requirements of this article for incinerator flues.

SECTION 1016.0 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 fireresistance to comply with section 911.

SECTION 1017.0 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.

1017.1 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.

1017.2 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 10-1. 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 10-2.

TABLE 10-1 - METAL DUCT AND VENT CONSTRUCTION, OTHER THAN DWELLINGS

Diameter, or diagonal of rectangular ducts, dimension in inches	Minimum thickness: Galvanized Steel U. S. gage number	Minimum thickness: 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

1017.3 ONE AND TWO-FAMILY DWELLINGS.

1017.31 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 10-2, or other approved noncombustible materials of equal strength and durability.

1017.32 SUPPORTS: All ducts shall be securely supported by metal or other approved noncombustible straps, hangers, lugs and brackets.

TABLE 10-2 - DUCTS FOR DWELLINGS

Diameter, or diagonal of rectangular ducts, dimensions in inches	Minimum thickness and weight: Tin weight per square in pounds	Minimum thickness and weight: Galvanized steel U. S. gage number	Minimum thickness and weight: 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

1017.33 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 1017.4; 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 (¼) inch air-cell asbestos or equivalent.

1017.4 HIGH TEMPERATURE DUCTS.

1017.41 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 (¼) of an inch thick of air-cell asbestos or its equivalent. Approved asbestos cement ducts, not less than one-quarter (¼) 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 1011.

1017.42 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.

1017.5 DUCT LINING: The lining of high temperature ducts shall be of approved noncombustible materials.

1017.6 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.

1017.7 FIRESTOPPING: Whenever the passage of ducts in walls, floors or partitions requires the removal of firestopping, 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.

1017.8 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 1112. 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 1016 for duct shafts.

1017.9 FIRE-CLAY VENTS: Where prohibited for use with gas-fired appliances, fire-clay vents shall have a thickness of not less than one-half (½) inch for an internal diameter of six (6) inches or less and three-quarter (3/4) inch for an internal diameter of more than six (6) inches. The joints shall be made gastight with caulked bell and spigot, sheet metal sleeves or galvanized iron bands of not less than No. 26 U.S. gage, all thoroughly cemented and secured in place with high temperature cement mortar.

SECTION 1018.0 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-quarter (3/4) inches. The total area of spark arrestors shall be not less than four (4) times the flue area.

Reference Standards - Article 10

ASTM	C106	1967	Refractories for Incineraotrs
ASTM	C178	1958	Air Setting Refractory Mortar
ASTM	C270	1971	Mortar for Unit Masonry
ASTM	C279	1954	Chemical-Resistant Masonry Units
ASTM	C315	1972	Clay Flue Linings
ASTM	C401	1968	Castable Refractories
ANSI	A131.1	1971	Factory-Built Chimneys
NFPA	211	1972	Chimneys, Fireplaces and Venting Systems
ULI	103	1964	Factory-Built Chimneys
ULI	641	1965	Testing Standards for Low Temperature Type L Venting Systems
ANSI	A62.4	1947	Sizes of Flue Linings
ANSI	Z21.12	1937	Listing Requirements for Draft Hoods

ARTICLE 11

HEATING EQUIPMENT AND APPLIANCES-MOUNTING, CLEARANCES AND CONNECTIONS

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 the reference standards of this article shall be deemed to conform to the provisions of this code.

1100.11 COMMONWEALTH OF MASSACHUSETTS REGULATIONS: All installations of gas appliances must comply with the Massachusetts Code for Installation of Gas Appliances and Gas Piping established under Chapter 737, Acts of 1960. The construction, installation and operation of oil burning equipment is subject to the provisions of FPR-3, established in accordance with Chapter 148, Section 10 of the M.G.L.A, as amended. The construction, installation, testing and inspection of boilers, air tanks, ammonia compressor valves, and refrigeration and air-conditioning systems of five (5) tons or more capacity are subject to the Rules and Regulations issued by the Board of Boiler Rules under authority of Chapter 146 of the M.G.L.A., as amended.

1100.2 COOPERATING AGENCIES: Nothing herein contained shall be deemed to nullify the provisions of other legal statutes or regulations of the Commonwealth of Massachusetts governing the operation and maintenance of boilers and other heating appliances and equipment.

1100.3 LABELED HEATING AND COOKING APPLIANCES: Approved 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 approved agencies shall be accepted by the building official when installed with the reduced clearance and details of installation therein recommended provided they meet the requirements of this code for fire protection.

1100.4 CLEARANCE FROM COMBUSTIBLE CONSTRUCTION: All heating and cooking appliances shall be installed with adequate clearances from combustible construction or shall be provided with integral insulation of the appliance of fire-protection of the structural members so that continued or intermittent operation shall not raise the temperature on the surface of combustible floors, walls or partitions above two hundred and fifty (250) degrees F.

SECTION 1101.0 DEFINITIONS

BOILER: a heating appliance intended to supply hot water or steam for space and heating, processing or power purposes.

FLOOR FURNACE: a self-contained furnace suspended from the floor of the space which is being heated, with means of observing the flame and lighting the furnace from such space.

LOW PRESSURE BOILER: a steel or cast iron boiler in which the maximum allowable gage working pressure is limited to fifteen (15) pounds per square inch for steam and thirty (30) pounds per square inch for hot water.

HEATING APPLIANCE: any device designed or constructed for the generation of heat from solid, liquid or gaseous fuel or electricity.

HIGH PRESSURE BOILER: a boiler 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.

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.

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.

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.

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 or gas-fired appliance for heating air to be distributed with or without duct systems to the space to be heated.

MECHANICAL WARM AIR FURNACE: a warm air furnace equipped with a fan to circulate the air.

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 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.

SECTION 1103.0 BOILERS AND UNFIRED PRESSURE VESSELS

1103.1 COMMONWEALTH OF MASSACHUSETTS REGULATIONS: All boilers and unfired pressure vessels shall be subject to the provisions of Chapter 146 of the M.G.L.A., as amended.

1104.0 SMOKE ABATEMENT: All furnaces and heating appliances fired with solid or liquid 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, flyash or other materials which are deleterious to the safety or health of the public. Under any circumstances, any combustion device intended for use as specified in this section must conform to the applicable standards of the Commonwealth of Massachusetts relative to control of emissions and air quality standards.

SECTION 1105.0 INDUSTRIAL HEATING APPLIANCE CLASSIFICATION

1105.1 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 horse power, 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 calssified 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

1105.2 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 horse power 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)
	Wood Distilling Furnaces
Galvanizing Furnaces	Wood Gas Retorts

1105.3 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	Cupolas
Blast, Billet and Bloom and Open Hearth Furnaces	Glass Kilns and Furnaces
	Porcelain Baking and Glazing Kilns
Brass Furnaces	Reverberatory Furnaces
Cement, Brick and Tile Kilns	Welding Furnaces
Coal and Water Gas Retorts	Wood Carbonizing Furnaces

SECTION 1106.0 FIRE RESISTANCE REQUIREMENTS FOR HEAT APPLIANCE FOUNDATIONS

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.

1106.1 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 the ashes are removed shall be protected for at least eighteen (18) inches with not less than one-quarter (¼) inch asbestos lumber covered with No. 24 U.S. gage sheet metal, or its approved equivalent.

1106.2 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 fireresistance and shall extend not less than three (3) feet beyond the appliance on all sides. When solid fuel is used, the fireresistive 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.

1106.3 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 fireresistance 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.

SECTION 1107.0 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.

1107.1 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.

1107.2 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 (¼) 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.

1107.3 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-eighths (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.

1107.4 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.

1107.5 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.

1107.6 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 1108.0 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 the reference standards of this article 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:

1108.1 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 (¼) 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;

1108.2 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;

1108.3 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.

1108.4 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.

1108.5 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 1109.0 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:

1109.1 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;

1109.2 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 1107.3;

1109.3 FOUR INCH CLEARANCE: When restuarant 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 1107.4;

1109.4 DOUBLE TILE MOUNTING: When restaurant type appliances are not mounted on legs, the floor under the appliance shall be protected as required in section 1107.5 with a double tile base.

SECTION 1110.0 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:

1110.1 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 corners and the floor;

1110.2 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 material. When solid fuel-fired, the protection shall not extend not less than eighteen (18) inches on sides where ashes are removed.

1110.3 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 1111.0 SIDE AND TOP CLEARANCES

Clearances shall be provided from wood and other combustible construction in walls, ceilings and partitions adjacent to heating appliance and equipment as follows:

1111.1 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;

1111.2 MEDIUM HEAT APPLIANCES: A medium heat appliance shall be installed to provide a clearance from combustible material of not less than three (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;

1111.3 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 are removed.

SECTION 1112.0 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 lessor requirements than herein provided may be installed in accordance with the conditions of such approvals.

1112.1 CLEARANCE VARIATIONS: House heating appliances, domestic type ranges and space heaters may be installed with modified clearances as herein specified from combustible materials:

	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" asbestos cement.	9	6	48	18
Mechanical warm air with 250o F. temperature limit control	6	6	48	18
Domestic ranges and stoves	36	18	36	18
Ranges and stove with fire clay lining	24	18	24	18
Space heaters	36	18	36	18
Water heaters	12	12	12	18

1112.2 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.

1112.3 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 fireresistances specified in table 11-1, or the equivalent protection is secured by an approved arrangement of plates and baffles.

TABLE 11-1 - REDUCED WALL AND CEILING CLEARANCES

Fireresistance of protected construction	Fraction of specifed 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

1112.4 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 1113.0 BOILER ROOMS

1113.1 ENCLOSURES: Except in one and two-family dwellings and as specifically required for industrial furnaces and accessory equipment or for high hazard uses in article 4, all heating boilers 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 pressure boilers and not less than three-quarter (3/4) hours for low pressure boilers.

1113.2 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 411.3 and storage or public garages in section 413.5 shall be separately enclosed with entrance from the outside of the building only; or shall be located in segregated accessory structures with walls, floors and roofs of fireproof or noncombustible construction.

1113.3 BOILER ROOM EXITWAYS: Primary and emergency exitways from all boiler rooms shall be provided to comply with section 616.2.

1113.4 AIR SUPPLY FOR COMBUSTION.

1113.41 SOLID AND LIQUID FUELS: All rooms and spaces in which boilers, furnaces and other 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 one (1) square inch for each five thousand (5000) B.T.U. of input rating or fraction thereof.

1113.42 GAS-FIRED EQUIPMENT: For gas-fired equipment located in enclosed spaces, openings shall be provided near 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 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 (½) inch mesh.

1113.5 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.

1113.6 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 an element of a required means of egress from the building or structure.

1113.7 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 fireresistance, insulated on top with not less than one-quarter (¼) 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.

SECTION 1114.0 ASH PITS AND BINS

1114.1 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.

1114.2 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 fireresistance; except that roofs over ash pits may be constructed of approved noncombustible materials.

1114.3 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 1115.0 STEAM AND HOT WATER PIPES

1115.1 CLEARANCES: Unless otherwise specifically provided in article 4 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 1016. 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 (½) inch.

1115.2 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.

1115.3 FIRESTOPPING: When heating pipes pass through floors and partitions, the open sleeve space shall be filled with noncombustible materials.

1115.4 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.

1115.5 FREEZING TEMPERATURES: All concealed heating pipes located in exterior walls shall be protected against freezing in accordance with the approved rules.

1115.6 EXPANSION AND CONTRACTION: All heating pipes shall be installed to provide for all expansion and contraction movements due to temperature changes.

1115.7 HOT WATER LINE EXCEPTIONS: Hot water lines which are equipped with approved automatic temperature control devices which prevent a temperature of the circulating water in excess of one hundred and seventy (170) degrees F. shall be exempt from the requirements of section 1117.

SECTION 1116.0 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 1117.0 HOT AND COLD AIR DUCTS

1117.1 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 10-1 and 10-2 of section 1017. All vision panels for inspection purposes shall be constructed of wired glass or tightly fitted and secured metal panels.

1117.2 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.

1117.3 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 firestopping 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.

1117.4 INTEGRAL DUCTS AND PLENUMS: When hot air ducts form an integral part of the structure, the duct walls shall be constructed of not less than one-half (½) hour fireresistance except as provided for herein;

1117.41 The attic space, if unoccupiable and of incombustible construction, may be used as supply or return air plenums provided the system is mechanical and all return air registers are provided with automatic incombustible dampers or with rate of rise thermostats and/or smoke detectors in the ceiling space or return air chamber of the mechanical unit that would shut down the unit or insolate (seal off) the space. In no case shall the plenum be continuous over exitway corridors, passageways or stairways.

1117.42 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 section 300-22 of the Commonwealth of Massachusetts Electrical Code.

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.

1117.5 INSULATION: Only noncombustible exterior coverings 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.

1117.6 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 (½) inch of approved noncombustible materials or the exposed construction is protected to afford not less than one-half (½) hour fireresistance.

1117.7 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.

1117.8 AIR FILTERS.

1117.81 CONSTRUCTION: Air filters shall be of a flameresistive 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.

1117.82 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.

1117.9 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 1118.0 WARM AIR HEATING SYSTEMS

1118.1 CLASSIFICATION: Warm air heating systems in one and two-family dwellings shall be classified as follows;

1118.11 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.;

1118.12 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.

1118.2 FURNACE CONTROLS OF LOW TEMPERATURE SYSTEMS.

1118.21 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.

1118.22 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 at the main supply duct reaches a temperature of two hundred (200) degrees F. after the stoker and fan have shut down in normal operation.

1118.3 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.

1118.4 WARM AIR FURNACES.

1118.41 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.

1118.42 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.

1118.5 REGISTERS.

1118.51 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.

1118.52 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.

1118.53 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) per cent 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.

1118.54 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 1119.0 CENTRAL RECIRCULATING SYSTEMS

1119.1 AIR SUPPLY: A central fan heating system of the recirculating type for use in structures with large open areas such as garages and airplane hangers, 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) per cent of the air moved by the fan be taken directly from outside the building.

1119.2 AIR DUCT: Air ducts for fresh air shall be installed without dampers and shall be fully open at all times.

SECTION 1120.0 FLAMMABLE VAPOR SYSTEMS

1120.1 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.

1120.2 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.

1120.3 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 1121.0 UNIT HEATERS

1121.1 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.

1121.2 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.

1121.3 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.

1121.4 FIREPLACE HEATERS: Unit gas-fired heaters, labeled for use in fireplace recesses, shall not be used elsewhere.

1121.5 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 1122.0 FLOOR FURNACES

1122.1 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 fireresistive 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

1122.2 ENCLOSURES: Enclosures of floor furnaces shall be constructed entirely of noncombustible materials with a fireresistance 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 1115.42 and with means of access for purposes of servicing the furnace.

1122.3 FURNACE SUPPORTS: Floor furnaces shall be installed only in floors of noncombustible construction of not less than two (2) hours fireresistance, except as provided for one and two-family dwellings in section 1124.5 with the following clearances:

1122.31 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;

1122.32 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.

1122.33 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.

1122.4 FURNACE CLEARANCES: Floor furnace clearances shall comply with section 1112 and flue and vent clearances with section 1011.

1122.5 ONE AND TWO-FAMILY DWELLINGS: Furnace enclosures may be constructed of noncombustible materials with a fireresistance 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.

1122.6 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 1123.0 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.

1123.1 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.

1123.2 STRUCTURAL INSULATION.

1123.21 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.

1123.22 HEAT INSULATION: Steel or reinforced concrete framing adjacent to a boiler or furnace in industrial plants and subject to temperature in excess of seven hundred and fifty (750) degrees F. shall be protected with fireproofing of not less than four (4) hour fireresistance, or the design stress shall be reduced to provide structual safety.

1123.3 AIR SUPPLY: Sufficient air supply for combustion shall be provided in conformity to section 1115.

1123.4 STATE APPROVAL: Thermal energy utilization units and appurtenances having an energy input capacity of at least one hundred million BTU (100,000,000) 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 M.G.L.A., as amended.

SECTION 1124.0 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 the references of this article.

1124.1 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 authorized agency.

1124.2 CERTIFICATE: The certificate of approval shall state the maximum pressure which may be maintained in the vessel.

1124.3 IDENTIFICATION LABEL: Every approved unfired pressure vessel shall be assigned a serial number for the purpose of identification, which shall be stamped or otherwise permanently and prominently indicated thereon and recorded in the building department.

SECTION 1125.0 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 1109 and 1112 for low heat appliances and as herein provided.

1125.1 VENTILATING HOODS: Unless enclosed and vented in an approved manner, a range, candy kettle, cruller furnace, appliance for the frying of bakery and confectionery products and any similar apparatus generating hot and noxious smoke and gases shall be provided with a ventilating hood and ducts to remove such smoke, gases and vapors directly to the outer air.

1125.2 CONSTRUCTION: Hoods and their ducts shall be constructed of approved noncombustible materials with tight joints and the width and length of the hood shall be not less than that of the appliance served.

1125.21 HEIGHT: The hood shall be installed not more than seven (7) feet above the floor and shall completely cover the appliance served with not less than eighteen (18) inch clearances to combustible material unless the construction is protected as specified in section 1114.3.

1125.22 FLUE CONNECTION: The hood or duct from a restaurant range or similar appliance shall connect directly to an approved masonry flue or metal smokestack complying with article 10. Connections to any other ventilating system shall be prohibited.

1125.3 VENTS: The vent of a floor-mounted restaurant type cooking appliance installed under a hood may discharge into the space under the hood, providing the vent extends through or beyond any grease screen installed in the hood.

1125.4 FILTERS AND SCREENS: The exhaust duct shall be equipped with filters or screens which are readily accessible for removal and cleaning to prevent grease from accumulating in the smoke flue, chimney or smokestack to which it is connected.

SECTION 1126.0 HOT WATER SUPPLY HEATERS

All range boilers, hot water heaters and storage tanks shall be equipped with temperature limit controls and pressure relief valves as herein required and shall conform to the applicable accepted engineering practice standards listed in the reference section of this article.

1126.1 AUTOMATIC HOT WATER SUPPLY: Automatic or remote control ignition equipment on domestic hot water heating devices using liquid fuel shall be installed only in connection with a burner equipped with a safety pilot or other approved device arrange to automatically shut off the fuel supply to the main burners if the pilot flame is extinguished. All 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.

1126.2 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.

1126.3 PRESSURE RELIEF VALVES: The rate of discharge of pressure valves shall limit the pressure to rise to ten (10) per cent of the pressure at which the valve is set to open for any given heat input.

1126.4 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.

1126.5 VACUUM RELIEF VALVES: All copper tanks shall be equipped with approved vacuum relief valves.

1126.6 RELIEF OUTLET WASTES: The size of relief outlet waste valves shall be 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.

1126.7 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 space with a volume of less than three hundred (300) cubic feet unless such space contains adequate provision for ventilation, clearances, and combustion air; nor shall vent pipes designed for use with gas appliances be used with solid or liquid fuel-fired equipment except as provided for alternate flue construction.

SECTION 1127.0 OIL BURNERS

1127.1 REGULATIONS OF THE COMMONWEALTH OF MASSACHUSETTS: Oil burners and related equipment are subject to the Rules and Regulations promulgated in FPR-3, made in accordance with the provisions of Section 10, of Chapter 148 of the M.G.L.A., as amended. Wnvented room heaters are regulated by section 1011.52.

SECTION 1128.0 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.

1128.1 PIPING CLEARANCE: All overhead heating pipes shall have a clearance of not less than two (2) inches from combustible contents of the dryer.

1128.2 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 (¼) inch asbestos mill board or other approved equal insulation.

1128.3 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 1129.0 NON-FUEL-FIRED INCINERATORS

Non-Fuel-Fired Incinerators are prohibited by the regulations published by the Department of Public Health in accordance with Section 142D of Chapter 111 of the M.G.L.A., as amended.

SECTION 1130.0 FUEL-FIRED INCINERATORS

All fuel-fired incinerators shall conform to the requirements of this section.

1130.1 COMBUSTION CHAMBER:

1130.11 NINE SQUARE FEET GRATE AREA: The combustion chamber for incinerators with a capacity of less than two hundred and fifty (250) pounds refuse per hour or grate area not more than nine (9) square feet shall be constructed of eight (8) inches of approved masonry which is lined with four and one-half (4½) inches of fire brick laid in fire clay mortar.

1130.12 OVER NINE SQUARE FEET GRATE AREA: When the capacity exceeds two hundred and fifty (250) pounds of refuse per hour or grate area more than nine (9) square feet, the combustion chamber shall be constructed of eight (8) inches of approved masonry which is lined with nine (9) inches of fire brick laid in fire clay mortar.

1130.13 STEEL ENCLOSURE: The exterior four (4) inches of masonry on the unfired side may be replaced by a steel plate casing not less than three-sixteenth (3/16) inches thick.

1130.2 STRUCTURAL REINFORCEMENT: The walls of the combustion chamber shall be strongly braced and stayed with structural steel shapes, or reinforced concrete or other approved reinforcement.

1130.3 LOCATION: Combustion chambers and waste material bins or containers shall be located in a room or compartment devoted to no other purpose; or they may be located in the same room with the boiler or heating plant. Such room shall be separated from the rest of the building by floors, walls and ceilings of not less than two (2) hours fire-resistance with approved one and one-half (1½) hour fire doors or the approved labeled equivalent in all openings complying with article 9.

1130.4 INCINERATOR SMOKEPIPES.

1130.41 THICKNESS OF METAL: Flue connections and breechings shall be constructed of not less than No. 16 U.S. gage sheet metal when less than twelve (12) inches and No. 12 U.S. gage metal when more than twelve (12) inches in diameter or largest dimension.

1130.42 LINING: When the breeching is between twelve (12) and eighteen (18) inches in diameter, it shall be lined with not less than two and one-half (2½) inches of fire brick; and when it is over eighteen (18) inches in diameter, it shall be lined with not less than four and one-half (4½) inches of fire brick laid in fire clay mortar.

1130.43 COMBINED BREECHINGS: When an incinerator breeching combines with a smokepipe from another appliance, such connection shall also be lined as required for a direct incinerator flue connection; except that when the cross-sectional area of the combined connection is not less than four (4) times the area of the incinerator breeching, the lining may be omitted.

1130.5 CLEARANCE OF INCINERATOR SMOKEPIPES: A flue connection or breeching shall have a clearance on all sides from combustible materials or construction of not less than thirty-six (36) inches, except as provided in section 1114.3.

SECTION 1131.0 MISCELLANEOUS REFUSE INCINERATORS

1131.1 INTEGRAL CONSTRUCTION: When constructed as an integral part of a building, incinerators for the reduction of garbage, refuse or other waste materials shall be installed in accordance with the provisions of section 1134.0.

1131.2 PORTABLE EQUIPMENT: Incinerators that do not form an integral part of the building construction shall comply with the provisions of sections 1105, 1106 and 1123 for low or medium heat industrial furnaces. The chimneys and smokepipes shall comply with the requirements of sections 1005, 1009 and 1010 for low and medium temperature flues and smokestacks.

SECTION 1132.0 REFUSE CHUTES

1132.1 CHUTE DISCHARGE: A refuse chute shall not feed directly to the combustion chamber of an incinerator, but shall discharge into an enclosed room or bin separated from the incinerator room by ceiling and walls of not less than two (2) hours fireresistance, unless otherwise approved by the building official.

1132.2 CHUTE ENCLOSURES: Refuse chutes shall be enclosed with walls of masonry of not less than two (2) hour fireresistance rating for interior chutes and of noncombustible (type 2) construction for exterior chutes. All chutes shall be supported on substantial foundations complying with article 7.

1132.3 CHUTE HEIGHT: An interior refuse chute shall extend not less than four (4) feet above the roof and shall be covered with an approved ventilating skylight complying with section 927.

1132.4 SERVICE COMPARTMENTS: Service openings for chutes shall be located in separate rooms or compartments enclosed in walls, partitions floors and ceilings which have a fireresistance rating of not less than three-quarter (3/4) hours and in which the openings are equipped with fire doors or other approved protectives of not less than three-quarter (3/4) hours fireresistance rating or their approved labeled equivalent.

1132.5 OPENING PROTECTIVES: All openings between refuse rooms, chutes and incinerator rooms shall be protected with one and one-half (1½) hour fire doors or their approved labeled equivalent complying with article 9.

SECTION 1133.0 REFUSE VAULTS

1133.1 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.

1133.2 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 (1½) hour fireresistance rating or the approved labeled equivalent complying with article 9.

1133.3 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 section 1017.

1133.4 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 1134.0 BLOWER AND EXHAUST SYSTEMS

1134.1 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 non-combustible materials as provided in table 11-2 for transporting non-abrasive and abrasive materials and table 11-3 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.

TABLE 11-2 - 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

TABLE 11-3 - 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

1134.2 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.

1134.3 LOCATION OF FAN: The fan for blowing flammable materials or vapors shall comply with the approved rules and shall be located and intalled so as to be readily accessible. No fan for blowing flammables shall be located in a fire wall or fire division wall.

1134.4 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 1135.0 DUST, STOCK AND REFUSE CONVEYOR SYSTEMS

1135.1 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.

1135.2 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.

1135.3 DISCHARGE PIPES: Discharge pipes shall conform to all the requirements for ducts including clearances required for high heat appliances in sections 1017, 1117 and 1812. 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.

1135.4 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.

1135.5 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 entry of sparks.

1135.6 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.

1135.61 SCREENS: When a screen is used in a safety relief vent, it shall be so attached as to permit ready release under emergency pressure.

1135.62 HOODS: The relief vent shall be provided with an approved noncombustible cowl or hood, or with a counterbalanced relief valve or cover arranged to prevent the escape of hazardous materials, gases or liquids.

Reference Standards - Article 11

AMSE		1965, 1966, 1968, 1971	Boiler and Pressure Vessel Code
ASTM	C106	1967	Refractories for Incinerators
ASTM	C401	1960	Castable Refractories
ASTM	C178	1947	Air-Setting Refractory Mortar
ASTM	C612	1967	Mineral Fiber Block and Board Thermal Insulation
ASTM	E84	1970	Method of Test for Surface Burning Characteristics of Building Materials
ASTM	C105	1947	Ground Fire Clay as a Mortar
IIA		1970	Incinerator Standards
NFPA	90B	1973	Standard for the Installation of Residence Type Warm Air Heating Systems
NFPA	91	1973	Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying

FIRE PROTECTION AND FIRE-EXTINGUISHING EQUIPMENT

SECTION 1200.0 SCOPE

The provisions of this article shall control the installation of fire alarms, fire communications systems, and fire-extinguishing service equipment. All electrical equipment and the details of wiring for fire-extinguishing installations shall comply with the provisions of the Commonwealth of Massachusetts State Electrical Code and the applicable standards listed in the reference at the end of this article.

Plans submitted under section 113.5 of this Code relative to this article must have the approval of the various officials having jurisdiction before installation begins.

1200.1 APPROVED DEVICES: The building official shall accept only that equipment and material which has been approved by the State Building Code Commission of the Commonwealth of Massachusetts and said equipment and materials shall be installed to comply with those requirements established for the conditions of their use by the said Commission.

SECTION 1201.0 DEFINITIONS

AUTOMATIC FIRE ALARM SYSTEM: a system which automatically detects a fire condition and actuates a fire alarm signal device.

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 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: an arrangement of piping and sprinklers designed to operate automatically by the heat of fire and to discharge water upon the fire.

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 municipal fire department.

DELUGE SYSTEM: a sprinkler system designed to deliver large quantities of water through open sprinkler heads, in which the water supply is controlled by a valve actuated by a thermostatic device

on a predetermined temperature of rate of temperature rise.

FIRE DRILL: the organized procedure conducted with or without a private fire brigade for vacating the occupants of a building and for operating the first-aid fire appliances and equipment for the extinguishing of fire and safeguarding of life.

HORIZONTAL FIRE LINE: a fire line installed around the interior walls and columns of a building, pier or wharf, with hose outlets located so that every part of the floor area is within reach of at least one fire stream.

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 station will ring all signals throughout the building or at one 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.

NON-AUTOMATIC SPRINKLER SYSTEM: a sprinkler system in which all pipes are maintained dry and which is equipped with a siamese fire department connection.

ONE-SOURCE SPRINKLER SYSTEM: an automatic sprinkler system which is supplied from one of the approved automatic sources of water supply.

PARTIAL SPRINKLER SYSTEM: an automatic sprinkler system consisting of a limited number of automatic sprinkler heads serviced from the building water supplies with one or more fire department siamese connections as required, for use in exitway facilities and isolated hazardous locations when approved by the building official.

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, 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.

STANDPIPE: a wet or dry fire line installed exclusively for the fighting of fire, extending from the lowest to the topmost story of a building or structure with hose outlets at every floor equipped with reducing valves and designed to operate at required working pressures.

STANDPIPE, DRY: a standpipe fire line without permanent or automatic water supply equipped with a siamese connection for use of the fire department.

STANDPIPE, FIRST-AID: an auxiliary vertical or horizontal fire line designed primarily for emergency use by the occupants of the building or by a private fire brigade before the arrival of the municipal fire department.

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.

SUPERVISED SPRINKLER SYSTEM: 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.

TWO-SOURCE SYSTEM: an automatic sprinkler system which is supplied from a combination of any two 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.

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.

SECTION 1202.0 PLANS AND SPECIFICATIONS

Before any standpipe or sprinkler equipment is installed or 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 submitted by a qualified registered professional engineer to 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. Plans and specifications for fire suppression systems as required in this article for high-rise structures

with a height of seventy (70) feet or more above mean grade must be submitted by a registered professional engineer qualified by experience to design and specify the appropriate elements of the fire suppression system.

1202.01 APPROVAL BY OTHER AGENCIES: Approval by other agencies having jurisdiction is required for any change in fire protection and fire extinguishing equipment.

1202.1 STANDPIPE FIRE LINES: Plans for the standpipe installation shall show the 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, locations 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 tests 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, every standpipe fire line shall be tested for static pressure and flow, including the top and bottom outlets in the presence of the fire official authorized to witness such test.

1203.11 PRESSURE TEST: The test shall demonstrate that the system will sustain a hydrostatic pressure of not less than one hundred (100) pounds per square inch at the topmost hose outlet, and not less

than three hundred (300) pounds per square inch at the fire department connection to the risers. In buildings not exceeding three (3) stories nor more than forty (40) feet in height, the test pressures may be reduced to not more than twenty-five (25) percent in excess of the normal operating pressure.

1203.12 TEMPORARY CONSTRUCTION STANDPIPES: The feed mains, risers, interconnections and branch lines of temporary standpipes in structures under erection shall be maintained watertight when work is not being done on the system.

1203.2 SPRINKLER TESTS.

1203.21 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; except that in buildings of not more than three (3) stories nor more than forty (40) feet in height, the test pressure need not be more than fifty (50) pounds per square inch in excess of the normal pressure carried in the system or in excess of the pressure necessary to operate the highest sprinklers in non-automatic systems.

1203.22 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.

1203.23 PRESSURE TANKS: Pressure tanks shall be tested to a pressure of one and one-half (1½) times the working pressure.

1203.3 FIRE ALARM TESTS: Upon completion of a fire alarm system, the installation shall be subject to a test to demonstrate its efficiency of operation. All wiring shall be so installed that when completed the system will be free from short circuits and from grounds other than as provided in article 250 of the Massachusetts State Electrical Code.

SECTION 1204.0 PERIODIC INSPECTIONS AND TESTS

1204.1 INSPECTIONS: Inspections and field tests of fire-extinguishing equipment shall be made by the owner, his authorized representative, or insurance organization and the fire department of the municipality as herein required to enforce the maintenance of all service equipment in operating condition and to familiarize the fire-fighting force with existing conditions in all buildings and structures.

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 fire 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 building or fire official having jurisdiction before any test is made.

SECTION 1205.0 EXISTING BUILDINGS AND FIRE SERVICE EQUIPMENT

1205.1 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:

1205.11 WATER SUPPLY: There shall be a reserve of fifteen hundred (1500) gallons of water in the gravity tank for exclusive use of the standpipe:

1205.12 GRAVITY TANK: The gravity tank shall be fed by direct city water connection at a rate of not less than sixty-five (65) gallons per minute or by booster pump of equal capacity; and the bottom of the tank shall be located not less than twenty (20) feet above the topmost hose outlet;

1205.13 FIRE DEPARTMENT CONNECTION: Existing siamese hose connections shall be maintained in a manner satisfactory to the fire official.

1205.2 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.

1205.21 VOLUNTARY PROTECTION: Existing sprinkler systems not required by the Basic 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.

1205.22 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 fireresistance rating not less than required by table 9-1 and section 908 for fire walls or fire division walls.

1205.23 WATER SUPPLY: The service supply 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 (1½) inches in diameter.

1205.3 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 administrative official.

SECTION 1206.0 WET STANDPIPE REQUIREMENTS

Except as herein required, all buildings and structures hereafter erected, other than one- and two-family dwellings (use group L-3) and all buildings heretofore erected which are not already equipped with two and one-half (2½) inch or larger standpipes, shall comply with the provisions of this article.

1206.1 STANDPIPE REQUIREMENTS.

1206.11 CONDITIONS REQUIRING STANDPIPES: All buildings, except use group L-3, over three (3) stories in height shall require standpipes; and other buildings according to table 12-1 below:

TABLE 12-1 CONDITIONS REQUIRING STANDPIPES

Use Group	Conditions
ALL (Except L-3)	>3 stories
B-1	3 stories or >3,000 ϕ per floor
C	3 stories or >3,000 ϕ per floor
D	3 stories or >3,000 ϕ per floor
E	3 stories or >3,000 ϕ per floor
F	3 stories
F-1, F-2, F-3	>300 occupants
H	3 stories
L-1	3 stories

1206.12 STANDPIPE SIZES: Standpipes shall extend from the lowest portion of the building to a height of five (5) feet above the finished floor of the topmost story and shall have a minimum diameter as follows:

TABLE 12-2

Maximum Building Height			Minimum Standpipe Size
STORIES		FEET	CENTER DIAMETER
3	or	40	2½ inches
4	or	50	2½ inches
5	or	65	4 inches
6	or	75	4 inches
7[1]	or	85	6 inches
8[1]	or	95	6 inches
		95 to 250	6 inches
		over 250	8 inches

[1]At least one (1) standpipe shall extend through the roof and terminate in a two-way, two and one-half (2½) inch hose connection.

1206.2 NUMBER OF STANDPIPE RISERS.

1206.21 BASED ON FLOOR AREA: The number of standpipe risers shall be such that all parts of every floor area can be reached by a thirty (30) foot stream from a nozzle attached to one hundred (100) feet of hose connected to the riser outlet.

1206.22 BASED ON STREET FRONTS: There shall be at least one (1) riser for each street front on which the building or structure faces; except that a corner building need not be considered as facing on more than (1) street.

1206.23 BUILDINGS SEVENTY (70) FEET IN HEIGHT OR OVER: All buildings seventy (70) feet in height or over must have each floor supplied by a minimum of two (2) combination risers.

1206.24 COMBINED USE: The standpipe system risers may also serve as the fire sprinkler system risers in all buildings having both systems whether required or not.

1206.3 LOCATION OF STANDPIPES: Insofar as practicable, standpipes shall be located with outlets within stairway enclosures; but when stairway enclosures are not available, the standpipes shall be located in a common corridor or accessible from an interior or exterior stairway or a smokeproof tower; but in any case, one riser shall be located in the main stairway or smokeproof tower.

1206.4 STANDPIPE PROTECTION: Standpipe fire lines shall be protected from freezing and mechanical and fire damage.

1206.5 STANDPIPE CONSTRUCTION.

1206.51 HEIGHT: Standpipe fire lines shall extend from the lowest to the topmost story of the building or part of building which they serve and shall be installed progressively with the erection of the building.

1206.52 INTERCONNECTIONS: When more than one (1) standpipe is required in a building they shall be interconnected at their bases by pipes of size equal to that of the largest riser so as to permit water from any source to supply all risers. Each riser shall be equipped with the O.S.& Y.valve so as to permit individual risers to be taken out of service if damaged or broken without interrupting the water supply to other risers.

1206.53 HOSE CONNECTIONS: Subject to the provisions of section 1209, standpipes shall be equipped in every story with a two and one-half (2½) inch hose connection and a one and one-half (1½) inch hose connection with valves and threads conforming to the municipal fire department's standard, located not more than five (5) feet above the floor level.

1206.6 HOSE: Except as provided in section 1209, standpipes located inside buildings and structures shall have not less than one hundred (100) feet of one and one-half (1½) inch diameter hose equipped with a one-half (½) inch nozzle and couplings conforming to the municipal fire department's standard at each outlet complying with section 1206.3 and hung in an approved rack or cabinet.

1206.7 FIRE DEPARTMENT CONNECTION.

1206.71 LOCATION: Every standpipe fire line shall be equipped with an approved siamese fire department inlet connection constructed of approved corrosion-resistive metal, located on a street front of the building not less than two (2) feet nor more than four (4) feet above grade.

1206.72 PROJECTION: When located two (2) feet or more above grade, the fire department connection shall not project beyond the street lot line or legal building line.

1206.73 STANDPIPE FEEDER: The pipe connecting the siamese to the standpipe shall be at least four (4) inches in diameter, but not less than the size of the interconnecting feed lines. When the automatic supply is from a city main or a yard hydrant system, a two and one-half (2½) inch valved and threaded hose outlet shall be provided to enable the system to be drained.

1206.74 HOSE THREADS: All hose threads in the fire department connection shall be uniform with that used by the municipal fire department.

1206.75 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 1208.3 and 1212.8.

SECTION 1207.0 STANDPIPE WATER SUPPLIES

The source of water supply to standpipes shall be adequate to maintain a flow of two hundred (200) gallons per minute with not less than fifty (50) pounds per square inch pressure at the topmost outlet of the building or structure and shall conform to the minimum requirements of this section.

1207.1 PUBLIC WATER STANDPIPE SUPPLY: When supplied by a street main, the acceptable flow shall be not less than five hundred (500) gallons per minute from a hydrant within two hundred (200) feet of the building under the minimum pressures herein specified.

1207.2 GRAVITY TANK STANDPIPE SUPPLY: When supplied by a gravity tank, the tank shall be so located that the bottom shall be not less than twenty-five (25) feet above the topmost outlet. The tank shall

have a capacity of not less than five thousand (5000) gallons; and if jointly used for house supply and sprinkler systems it shall be arranged to provide a reserve supply of not less than five thousand (5000) gallons at all times for the standpipe fire line and such additional capacity to provide for yard hydrants when required.

1207.3 PRESSURE TANK STANDPIPE SUPPLY: When supplied by a pressure tank, the tank shall be located in the top story or on the roof of the building or structure and shall have an air pressure and water capacity to supply not less than forty-five hundred (4500) gallons and such additional capacity to provide for yard hydrants when required.

1207.4 FIRE PUMP STANDPIPE SUPPLY: When supplied by an automatic fire pump, the combined pump capacity shall be not less than five hundred (500) gallons per minute for a four (4) inch standpipe; seven hundred and fifty (750) gallons per minute for a six (6) inch standpipe or for two (2) four (4) inch standpipes; and not less than one thousand (1000) gallons per minute for an eight (8) inch standpipe, or for two (2) six (6) inch standpipes. When pumps are not supplied from the street main, the source shall furnish sufficient water for full operation of the standpipe for not less than one (1) hour.

SECTION 1208.0 DRY STANDPIPE FIRE LINES

When in the opinion of a qualified registered professional engineer or architect, the fire hazard involved in the use of the building type of construction does not warrant a constant, automatic water supply to insure fire safety, the building official may accept a dry standpipe fire line in buildings not more than seventy (70) feet in height. One riser shall be provided for each ten thousand (10,000) square feet of fire area or fraction thereof.

1208.1 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 fire official may accept a smaller size when deemed adequate by him.

1208.2 FIRE DEPARTMENT CONNECTION FOR DRY STANDPIPES: Siamese fire department connections shall be provided as herein specified; two-way connection on two and one-half (2½) 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.

1208.3 IDENTIFICATION OF FIRE DEPARTMENT CONNECTION: Fire department connections shall be suitably marked with raised letters at least one (1) inch in height reading "TO DRY STANDPIPE."

SECTION 1209.0 FIRST-AID STANDPIPE FIRE LINES

First-aid standpipe fire lines for use of the occupants of a building or of the trained fire brigade shall comply with the provisions of this section. Such systems can be combined with the main standpipe fire lines by direct connection to the standpipe riser as provided in section 1206.52.

1209.1 SIZE OF FIRST-AID STANDPIPES: The minimum size of first-aid standpipe fire lines shall be one and one-half (1½) inches in buildings which are not more than six (6) stories nor more than seventy (70) feet in height.

1209.2 NUMBER OF FIRST-AID RISERS: The number and location of risers shall be such that all parts of every floor area requiring protection can be reached within twenty (20) feet by a three-eighths (3/8) inch nozzle attached to not more than seventy-five (75) feet of one and one-half (1½) inch hose connected to the standpipe outlet mounted on a rack or in a cabinet at each outlet.

1209.3 FIRST-AID WATER SUPPLY: The water supply for first-aid protection shall be sufficient to service two (2) hose streams for a period of thirty (30) minutes with a flow of seventy (70) gallons per minute at the topmost outlet at a minimum pressure of fifteen (15) pounds per square inch.

1209.4 HIGH HAZARD BUILDINGS: First-aid standpipes shall be provided in storage buildings of moderate fire hazard (use group B-1) and in mercantile (use group C), industrial (use group D), and business (use group E) buildings, in which flammable materials, products or other hazardous conditions are present and which are more than thirty (30) feet or two (2) stories in height and with more than three thousand (3000) square feet of undivided floor area; except that such buildings shall be exempt from this provision when equipped with an approved two-source automatic sprinkler system with supervisory service.

1209.5 INSTITUTIONAL BUILDINGS: First-aid standpipes shall be provided in hospitals, asylums, places of detention and other institutional buildings (use groups H-1 and H-2) and hotels, boarding houses and dormitories (use group L-1) with sleeping accommodations for more than twenty-five (25) persons and which are more than thirty (30) feet or two (2) stories in height.

1209.6 ASSEMBLY BUILDINGS: First-aid standpipes shall be provided in theatres and night clubs (use groups F-1 and F-2); and in assembly halls, lecture halls and recreation centers (use group F-3) with an occupancy load of more than three hundred (300) as required in article 4.

SECTION 1210.0 HORIZONTAL FIRE LINES

In one-story buildings of moderate or high fire hazard more than seven thousand five hundred (7500) square feet in area and on wharves and

piers as provided in section 1211 which are not equipped with an approved automatic sprinkler system, there shall be provided a horizontal fire line complying with the requirements of this section.

1210.1 CONSTRUCTION OF HORIZONTAL FIRE LINES.

1210.11 SIZE: The horizontal fire line shall be constructed of two and one-half (2½) inch pipe supported on the interior walls of the building or attached to interior columns or girders of noncombustible construction.

1210.12 WATER SUPPLY: Adequate water supply shall be provided to service not less than two (2) hose connections, but in no case less than a two (2) inch service tap connected to a public water supply main.

1210.13 HOSE: Approved hose valves, hose and nozzles shall be provided at intervals not exceeding one hundred and twenty-five (125) feet.

1210.2 EXEMPTION FROM FIREPROOF CONSTRUCTION: When the area of buildings of types 2, 3, and 4 construction which are not more than two (2) stories or thirty (30) feet in height, designed for use as a storage garage, or for industrial uses which are not deemed unusually hazardous by the building official, but in which a considerable amount of combustible contents are stored or processed, does not exceed the tabular limits by more than fifty (50) percent, a sprinkler system, approved by the building and fire officials may be accepted in lieu of fireproof construction.

SECTION 1211.0 PIER AND WHARF PROTECTION

1211.1 FIRE AREA OF PIERS: All piers and wharves shall be subdivided to 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.

1211.2 FIRE PROTECTION OF PIERS: When not protected with an approved two-source automatic sprinkler system, both substructure and superstructure shall be equipped with an approved standpipe fire line complying with the provisions of this article.

SECTION 1212.0 AUTOMATIC SPRINKLER SYSTEMS

The requirements of this section shall apply to sprinkler equipment specified by the provisions of the Basic Code. All such systems shall be designed, constructed and maintained in accordance with the accepted engineering standards listed in the reference standards of this article and within the limitations of the approved devices of recognized testing agencies.

1212.1 BUILDINGS REQUIRING SPRINKLERS: Approved automatic sprinkler systems shall be provided in all buildings herein specified or as required for special uses and occupancies in article 4.

1212.11 FIRE SUPPRESSION SYSTEMS IN HIGH-RISE BUILDINGS: All buildings and structures which are seventy (70) feet in height or more above grade, and those which fall within the categories listed in table 12-3, shall require a fire suppression system in accordance with the provisions of section 1212.112.

1212.111 FIRE SUPPRESSION SYSTEMS IN HIGH-RISE BUILDINGS: All buildings and structures which are seventy (70) feet in height, or more, above grade, will require a fire suppression system in accordance with the provisions of sections 1212.112 through 1212.120.

1212.112 REQUIREMENTS FOR THE DESIGN OF FIRE SUPPRESSION SYSTEMS: All buildings and structures required by section 1213.111 to have a fire suppression system shall incorporate a complete system of automatic sprinklers conforming to the requirements of the National Fire Protection Association Publication NFPA-13 of 1973.

1212.113 MONITORING OF THE SPRINKLER SYSTEM: Such a system shall be provided with waterflow monitoring devices adequate to ensure that the operation of any sprinkler head will serve to actuate an alarm system and at the same time will indicate the location of the waterflow monitoring device on a register (or annunciator or central control board, etc.). The system shall also be provided with a distinct supervisory signal to indicate a condition that will impair the satisfactory operation of the sprinkler system. This shall include, but need not be limited to the monitoring of control valves, fire pump power supply and running condition, and other components necessary for the satisfactory operation of the sprinkler system. The system shall be so arranged that when water flows in the sprinkler system, an alarm shall be automatically transmitted to the fire department that is legally committed to serve in the area in which the building is located by the most direct and reliable method, as approved by the head of the fire department.

1212.114 ALARM SYSTEM REQUIREMENTS: (a) The operation of the waterflow monitoring device shall sound an audible alarm on the floor on which the sprinkler operates, and the floor immediately above; (b) the operation of any waterflow monitoring devices or any fire detection device shall automatically activate a voice alarm system on a predetermined selective basis, dependent upon the locations of the detectors and waterflow devices. The central control station shall contain controls for the voice alarm system so that a selective or general voice alarm may be manually initiated. Upon activation of the voice alarm system, a pre-recorded message shall be automatically transmitted via one (1) of the voice communication systems.

1212.115 VOICE COMMUNICATION SYSTEMS: A one-way (address) communication system shall be provided for the transmission of the voice alarm system message to the building occupants. The system shall provide one-way communication capabilities between the Central Control Station

TABLE 12-3

CONDITIONS REQUIRING SPRINKLERS

	TYPES OF CONSTRUCTION								
USE	1	2A	2B	2C	3A	3B	3C	4A	4B
A	>3 ST or >40 FT >10,000 ft²	>3 ST or >40 FT >7,500 ft²	>2 ST or >30 FT >6,000 ft²	>1 ST or >20 FT >3,000 ft²	>2 ST or >30 FT >6,000 ft²	>1 ST or >20 FT >3,000 ft²	>1 ST or >20 FT >3,000 ft²	>1 ST or >20 FT >3,000 ft²	
	AND WHEN > 3,000 AND < 6 FT ABOVE GRADE								
B-1	>3 ST or >40 FT >10,000 ft²	>3 ST or >40 FT >7,500 ft²	>2 ST or >30 FT >6,000 ft²	>1 ST or >20 FT >3,000 ft²	>2 ST or >30 FT >6,000 ft²	>1 ST or >20 FT >3,000 ft²	>1 ST or >20 FT >3,000 ft²	>1 ST or >20 FT >3,000 ft²	
	AND WHEN > 3,000 ft² AND < 6 FT ABOVE GRADE								
B-2	ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
C	>20,000 ft²	>20,000 ft²	>10,000 ft²	>7,500 ft²	>10,000 ft²	>7,500 ft²	>7,500 ft²	>6,000 ft²	>6,000 ft²
D UNPIERCED ENCLOSURES	>20,000 ft²	>20,000 ft²	>10,000 ft²	>7,500 ft²	>10,000 ft²	>7,500 ft²	>7,500 ft²	>6,000 ft²	>6,000 ft²
	ALL COMPLETELY ENCLOSED BUILDINGS (NOTE SECTION 1212.13)								
E	ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								

ABBREVIATIONS

WKSHP - Workshop
ST - Stories
ft² - Square feet
HCM - Highly combustible material
> - More than, greater than
< - Less than
≥ - equal to or greater than
≤ - equal to or less than

TABLE 12-3 (CONTINUED)

TYPES OF CONSTRUCTION

USE	1	2A	2B	2C	3A	3B	3C	4A	4B
F-1	1. ALL PORTIONS USED FOR STORAGE OR WKSHP INVOLVING HCM 2. ALL AREAS SPECIFIED IN SECTION 416.91 (THEATRES) 3. ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
F-2	1. ALL PORTIONS USED FOR STORAGE OR WKSHP INVOLVING HCM 2. ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
F-3	>12,000 ◻	>12,000 ◻	>12,000 ◻	>12,000 ◻	>12,000 ◻	>12,000 ◻	>12,000 ◻	>12,000 ◻	
	ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
F-4	1. ALL PORTIONS USED FOR STORAGE OR WKSHP INVOLVING HCM 2. ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
F-5	ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
F-6	REFER TO FORM F-6 -- (SCHOOLHOUSE STRUCTURAL STANDARDS) FOR REQUIREMENTS								
F-7	USE REQUIREMENTS FOR USE GROUP E								

ABBREVIATIONS

WKSHP - Workshop
ST - Stories
◻ - Square feet

HCM - Highly combustible materials
> - More than, greater than
< - Less than

≥ - equal to or greater than

≤ - equal to or less than

TABLE 12-3 (Continued)
TYPES OF CONSTRUCTION

USE	1	2A	2B	2C	3A	3B	3C	4A	4B
H-1	1. ALL PORTIONS USED FOR STORAGE OR WKSHP INVOLVING HCM 2. ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
H-2	1. ALL PORTIONS USED FOR STORAGE OR WKSHP INVOLVING HCM 2. ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE 3. SPRINKLERS SHALL NOT BE REQUIRED IN PATIENT ROOMS IN HOSPITALS								
L-1 L-2 L-3	1. ALL PORTIONS USED FOR STORAGE OR WKSHP INVOLVING HCM 2. ALL BUILDINGS > 70 FT IN HEIGHT ABOVE GRADE								
GARAGES FPR-4	> 10,000 ⌀ ON ANY FLOOR	> 2 ST	> 2 ST	> 2 ST & ROOF DECK	> 2 ST	> 2 ST	> 2 ST	> 2 ST	N.P.
FPR-4 OPEN PKG. GARAGES	> 6 ST AND > 10,000 ⌀ ON ANY ONE FLOOR REQUIRES SPRINKLERS ABOVE 6TH FLOOR								
TRUCK	> 70 FT IN HEIGHT ABOVE GRADE			> 4 ST > 10,000⌀	> 4 ST > 10,000⌀	> 4 ST > 10,000⌀	> 4 ST > 10,000⌀	> 4 ST > 10,000⌀	> 4 ST > 10,000 ⌀
	STORAGE OF TRUCKS LOADED WITH COMBUSTIBLE MATERIALS								
BUS	ALL > 2 ST OR 30 FT	Or	PASSENGER TERMINALS {STORAGE AND LOADING}		FOR > 3 BUSES				
GROUP 1	WHERE UPPER STORIES USED FOR OTHER PURPOSES (SECTION 1213.13)								
PUBLIC BELOW GRADE	ALL STORIES WHICH HAVE > 1/2 HEIGHT BELOW GRADE								
UNLIMITED AREA BLDGS.	≤ 1 ST, ≤ 85 FT							N.P.	N.P.

ABBREVIATIONS

WKSHP - Workshop
ST - Stories
⌀ - Square feet
HCM - Highly combustible material
> - More than, greater than
< - Less than
≥ - equal to or greater than
≤ - equal to or less than

and the following terminal areas: elevators, elevator lobbies; exitway access corridors and exitway stairways; office areas exceeding one thousand (1,000) square feet in area; dwelling units; and hotel guest rooms or suites.

A two-way fire department communication system may be required at the discretion of the appropriate fire department authority and shall be designed to comply with the requirements of the fire department.

1212.116 SMOKE CONTROL: In buildings of Use Group E (Business), L-1 (Residential-Hotel) and L-2 (Residential-Multi-family) over seventy (70) feet high, natural or mechanical ventilation for the removal of products of combustion shall be provided in every story and shall consist of one (1) or more of the following:

a) Mechanical air handling equipment designed to direct return and exhaust air directly to the outdoors under fire conditions.

b) Panels or windows, in the exterior wall, which can be opened from an approved location other than the fire door. Such venting facilities shall be provided at the rate of twenty (20) square feet per fifty (50) lineal feet of exterior wall in each story, and distributed around the perimeter at not more than fifty (50) foot intervals. Such panels shall be clearly identified as required by the fire department.

c) Approved tempered glass may be used in lieu of the openable panels described above.

d) A continuous shaft through which smoke and heat can be mechanically vented to the outdoors. The size of the shaft shall be uniform throughout and of such dimensions as to provide one (1) air change per minute in the largest compartment served anywhere in the building. Openings into the shaft shall be protected with an automatic single-piece shutter located as high in the room as possible and designed to vent the entire compartment.

e) Any other approved design (see section 108.13) which will produce equivalent results.

1212.117 ELEVATORS: In buildings of Use Group E (Business), L-1 (Residential-Hotel) and L-2 (Residential-Multi-family) over seventy (70) feet high, at least one (1) elevator shall be provided for fire department emergency access to all floors. Elevator operation shall be in accordance with the Department of Public Safety, Board of Elevator Regulations.

1212.12 ASSEMBLY USES: A two-source system shall be provided in such parts of all theatres and assembly halls (use groups F-1 and F-3) designated in article 4. A one-source system shall be provided to protect exhibition halls, museums or other use group F-3 occupancies

used for the display or sale of combustible products, goods or materials, or having combustible display equipment, either on a temporary or permanent basis, whenever the area of such use exceeds twelve thousand (12,000) square feet in area.

1212.13 UNPIERCED ENCLOSURES: All completely enclosed buildings designed for industrial occupancy which are provided with artificial means of light and ventilation as specified in section 511, shall require a two-source automatic sprinkler system protected with central supervisory service; except in refrigerating plants and buildings or parts thereof used for cold storage of meats or other food products.

1212.2 NUMBER OF RISERS: In each fire area, there shall be at least one (1) riser of adequate size to furnish all the heads therein contained in one (1) story.

1212.3 PROHIBITED CONNECTIONS: No auxiliary connection shall be made to sprinkler risers for sill cock, house service, standpipe or other hose outlet purpose.

1212.4 MECHANICAL PROTECTION: Risers shall be protected from mechanical injury and shall not be located close to windows.

1212.5 PROTECTION FROM FREEZING: All discharge, heating or filling pipes where exposed to the weather shall be protected from freezing and the water in all sprinkler tanks subject to freezing shall be provided with internal heating equipment or approved frostproof enclosures.

1212.6 PROTECTION FROM CORROSION: Wherever necessary, sprinkler pipes and hangers shall be protected against corrosion from moisture and the heads shall be covered with an approved chemically-treated coating for protection from chemical fumes when required by the building official.

1212.7 DRAINAGE OF DISCHARGE: Provision shall be made for discharge of the overflow of water on every floor of sprinklered buildings designed for industrial and storage uses to comply with the Massachusetts State Plumbing Code.

1212.8 FIRE DEPARTMENT CONNECTION: Every sprinkler system shall be equipped with one (1) or more approved fire department connections as required by the fire department. The size, threads and accessories shall be uniform with the equipment of the local fire department. Each such connection shall be suitably marked with raised letters "FIRE DEPARTMENT CONNECTION - AUTOMATIC SPRINKLERS"; or when only stories below grade are so equipped, "FIRE DEPARTMENT CONNECTION - BASEMENT SPRINKLERS" or "CELLAR SPRINKLERS" as the case may be.

1212.9 MAIN CONTROL VALVE: Every sprinkler system shall be provided with a readily accessible outside screw and yoke valve or an indicator gate valve to control all sources of water supply except that from the fire department connection.

SECTION 1213.0 SPRINKLER WATER SUPPLIES

Automatic sprinkler systems shall have at least one (1) approved automatic source of water supply meeting the requirements of this section.

1213.1 PUBLIC WATER SPRINKLER SUPPLY: Direct connections to public water supplies shall be capable of supplying water at not less than fifteen (15) pounds per square inch pressure for the maximum number of sprinkler heads in the designated fire area.

1213.2 SPRINKLER GRAVITY TANK: Gravity tanks shall be capable of supplying twenty-five (25) percent of the number of sprinkler heads in the maximum protected fire area for a period of twenty (20) minutes but in no case shall the capacity of any one (1) tank be less than five thousand (5,000) gallons.

1213.3 SPRINKLER PRESSURE TANK: Pressure tanks shall be capable of supplying twelve and one-half (12 1/2) percent of the number of sprinkler heads in the maximum protected fire area; but in no case shall the capacity be less than three thousand (3,000) gallons of water for a wet pipe system, nor less than five thousand (5,000) gallons for a dry pipe system; nor shall any single tank have a capacity of more than six thousand (6,000) gallons. The tank shall be maintained two-thirds full of water under a pressure of seventy-five (75) pounds per square inch at all times.

1213.4 SPRINKLER FIRE PUMP: Automatic fire pumps shall be of an approved type with a supply capacity of at least five hundred (500) gallons per minute. The pumps shall be adequate to supply fifty (50) percent of the sprinkler heads in the maximum protected fire area and shall be located in a room enclosed with two (2) hour fire-resistive construction.

1213.5 COMBINED WATER SUPPLY: When the sprinklers and standpipes are supplied from one (1) tank, it shall comply with the provisions of section 1207.2 and the standpipe supply shall be drawn from the top portion of the tank.

1213.6 PARTIAL SPRINKLER SYSTEMS: Where approved by the building and fire officials, partial systems serviced from the building water supplies may be used in isolated hazardous locations.

SECTION 1214.0 DRY PIPE AUTOMATIC SYSTEMS

When a building or structure requiring an automatic sprinkler system under the provisions of the Basic Code is subject to temperatures below freezing, an automatic dry pipe system or other approved thermostatically controlled open or closed sprinkler system shall be installed in accordance with the approved rules.

1214.1 THERMOSTATIC CONTROL: In other than standard dry pipe systems the thermostatic control shall be arranged to admit water to the system and simultaneously give an alarm.

1214.2 AUXILIARY MANUAL CONTROL: All such thermostatically controlled systems shall also be provided with auxiliary manual controls.

SECTION 1215.0 NON-AUTOMATIC SPRINKLER SYSTEMS

1215.1 SPECIAL FLOODING INSTALLATIONS: In buildings equipped with automatic sprinkler systems, the enclosures housing special hazardous processes or used for the storage of flammable or highly combustible materials may be protected with an open pipe sprinkler installation equipped with jumbo or deluge heads with such control as may be directed by the fire official.

SECTION 1216.0 SPECIAL FIRE PROTECTION

1216.1 ELEVATOR SERVICE: In buildings of Use Group E (Business) and L-1 (Residential-Hotel) in every building or structure exceeding one hundred and fifty (150) feet in height and in buildings during the course of construction exceeding seventy (70) feet in height, at least one elevator shall be available at all times for fire department use as provided in Department of Public Safety, Board of Elevator Regulations ELV-2. Every building or structure exceeding seventy (70) feet in height must have an elevator complying with the provisions of section 1212.117. In all other buildings or structures exceeding one hundred fifty (150) feet in height and in buildings during the course of construction exceeding seventy (70) feet in height, at least one elevator shall be available at all times for fire department use.

1216.2 FIRE ALARM SYSTEMS: All buildings over seventy (70) feet in height shall have a fire alarm system as required in section 1212.114. Furthermore, all buildings and structures where required by the provisions of section 1218 shall be protected with an approved fire alarm system, or by approved watchman supervisory and manual fire alarm services where allowed.

1216.3 CENTRAL STATION ALARM SYSTEMS: When required under the provisions of this Code, in buildings designed for special hazard uses, including film studios, and proxylin manufacturing (use group A), large public assembly buildings (use group F) with an occupancy load of more than three hundred (300), and hospitals and similar institutional buildings (use group H-2) requiring automatic fire extinguishing equipment under the provisions of the Basic Code, protective signaling equipment shall be provided with connections to a local central station in the building, to an outside supervisory central station, or with direct fire department connection over private wire.

1216.4 WATER CURTAINS FOR WALL OPENINGS: In all buildings and structures designed for high hazard (use group A), storage (use group B), mercantile (use group C), and industrial (use group D) uses involving the storage, sale or processing of flammable materials or products, the exterior wall openings located on or within six (6) feet of interior lot lines shall be protected with an approved water curtain.

1216.5 UNENCLOSED EXITWAYS: In existing multi-family (use group L-1) and other residential buildings, (use group L-2) existing exitways not now enclosed as provided in article 6 may be protected with water curtains or partial sprinkler systems when approved by the building official.

1216.6 WATER CURTAINS FOR FLOOR OPENINGS: Unenclosed floor openings shall be protected with automatically controlled water curtains as specified in section 515.

1216.7 YARD SYSTEMS: Shipyards, oil storage plants, lumber yards, amusement or exhibition parks, and similar occupancies and uses involving high fire and life hazards shall be provided with, in addition to the fire suppression and safety equipment required within the structures by the Basic Code, an installation of fire hydrants and associated fire-fighting equipment, as required by the fire department authority.

1216.8 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 1217.0 MANUAL FIRE-EXTINGUISHING EQUIPMENT

All hand-operated auxiliary fire-extinguishing equipment shall be of an approved type suitable to the occupational use of the building and shall be installed in corridors and other locations, visible and readily accessible to the occupants of the building in accordance with the requirements of the fire official and as herein specified.

1217.1 CABINETS: When auxiliary emergency equipment is enclosed in cabinets, they shall be of an approved type of noncombustible construction equipped with readily openable keyless doors or with readily broken glass access panels.

SECTION 1218.0 FIRE ALARM SYSTEMS

1218.1 PLANS AND SPECIFICATIONS: Where required by this Code, the plans and specifications for fire alarm systems shall show the location

and number of all sending stations and signals with specifications of the type, construction, and operation of the system including all automatic detection devices. Installation of all equipment shall conform to the standards of the reference section of this article.

1218.2 WHERE REQUIRED: Fire alarm systems are required in the locations listed in section 1218.21. The details of the criteria in each location are listed also in section 1218.21.

EXCEPTIONS: All buildings and structures over seventy (70) feet in height above grade shall have fire alarm systems as required by the provisions of section 1212.114.

All buildings and structures and sections of buildings and structures equipped with an automatic fire suppression system are not required to be equipped with an automatic fire alarm system (except for buildings and structures seventy (70) feet in height above grade or more) but shall have a manual fire alarm system conforming to the provisions of section 1218.21 for the use and conditions as specified in the appropriate section.

1218.21 FIRE ALARM SYSTEM LOCATIONS

1218.211 AUTOMATIC FIRE WARNING SYSTEMS IN RESIDENTIAL USES L-1, L-2 AND L-3: Every building or structure not exceeding seventy (70) feet in height above mean grade to be occupied for residential purposes, shall be subject to the following provisions. All systems shall conform with the provisions of NFPA 101 and NFPA 74.

a) L-1 Use Group

1) all buildings less than thirty (30) feet in height above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to audible alarms.

2) all buildings thirty (30) feet in height or more above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to an audible alarm and the system shall be of the supervised type.

b) L-2 Use Group

1) all buildings less than thirty (30) feet in height above mean grade or containing no more than twelve (12) dwelling units shall contain automatic smoke detectors or automatic smoke and heat detectors connected to an audible alarm.

2) all buildings thirty (30) feet in height or more above mean grade or containing thirteen (13) or more dwelling units shall contain automatic smoke detectors or automatic smoke and heat detectors connected to an audible alarm and the system shall be of the supervised type.

c) L-3 Use Group

1) all buildings less than thirty (30) feet in height above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to audible alarms.

2) all buildings thirty (30) feet in height or more above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to an audible alarm, and the system shall be of the supervised type.

1218.212 INSTITUTIONAL (USE GROUP H): Fire alarm systems in institutional use group H-2 of new and existing buildings which are used as health care facilities, including hospital, nursing home, residential-custodial care facilities, and similar uses shall have fire alarm systems complying with the provisions of NFPA 101 of 1967.

In all other new and existing buildings of use group H, an approved automatic fire alarm system is required. In addition, an approved manual fire alarm system is required in conjunction with the automatic fire alarm system. For buildings of up to one (1) story in height and less than two thousand five hundred (2,500) square feet in area, an uncoded alarm system may be used. Otherwise, an individually coded closed circuit general alarm shall be used.

Where an institutional use comprises more than one building, a combination unit or zone and general alarm coded system shall be used and an approved indicating annunciator installed as required by the building official and the fire official.

1218.213 NURSERY, DAY CARE CENTER AND SIMILAR USES (USE GROUP H): All facilities operated on a regular basis as a nursery, day care center, kindergarten or similar uses shall have a fire alarm system provided as follows:

a) Facilities for up to twenty-four (24) children shall be provided with a local alarm system.

b) Facilities for twenty-five (25) or more children shall be provided with an approved electrical fire alarm system

consisting of approved smoke or smoke and heat detectors located in all occupied rooms and as required by the building official. The alarms shall be distinctive and audible everywhere on the floor. There also shall be at least one (1) manual alarm on each floor which shall sound all alarms on other floors simultaneously and continuously when operated.

An approved secondary or emergency source of power shall be provided for the entire alarm system.

1218.214 SCHOOLS (USE GROUP F-6): All new public schools and all new private and university teaching buildings shall have an approved automatic fire alarm system. An approved manual fire alarm system is also required in conjunction with the automatic fire alarm system. In all existing public schools and all existing private and university teaching buildings, a manual fire alarm system shall be required. All protective signaling equipment shall be provided with connections to a local central station in the building, to an outside supervisory central station, or with direct fire department connection over private wire.

1218.215 MERCANTILE (USE GROUP C): All mercantile buildings which have one (1) or more levels above grade to which the public is admitted shall have an approved manual fire alarm system. For buildings one (1) story or less and less than twenty-five hundred (2,500) square feet in area, an uncoded closed circuit fire alarm shall be used. Otherwise, an individually coded closed circuit general fire alarm system shall be used.

1218.216 INDUSTRIAL (USE GROUP D): All industrial buildings where twenty five (25) or more individuals are employed above the first or ground floor shall have an approved manual fire alarm system. In buildings not exceeding two (2) stories in height with not more than twenty five hundred (2,500) square feet of area in any one (1) 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, an uncoded closed circuit fire alarm system may be used. Otherwise, an individually coded closed circuit fire alarm system shall be used.

1218.217 BUSINESS (USE GROUP E): All office buildings of three (3) stories or more, but less than seventy (70) feet in height unless equipped with an approved fire suppression system, shall have an approved manual fire alarm system. This system shall be an individually coded closed circuit general fire alarm system.

NFPA	No. 13	1973	Installation of Sprinkler Systems
NFPA	No. 14	1973	Standpipes and Hose Systems
NFPA	No. 101	1967	Life Safety Code
NFPA	No. 101	1971	Life Safety Code
NFPA	No. 101	1973	Life Safety Code
NFPA	No. 71	1972	Central Station Signaling Systems
NFPA	No. 72A	1972	Local Protective Signaling Systems
NFPA	No. 72B	1972	Auxiliary Signaling Systems
NFPA	No. 72C	1972	Remote Station Signaling Systems
NFPA	No. 72D	1972	Proprietary Signaling Systems

ARTICLE 13

PRECAUTIONS DURING BUILDING OPERATIONS

SECTION 1300.0 SCOPE

The provisions of this article shall apply to all construction operations in connection with the erection, alteration, repair, removal or demolition of buildings and structures. In addition, the following regulations also shall apply when not covered by this Code: Department of Labor and Industries, Division of Industrial Safety Industrial Bulletin No. 12, Rules and Regulations for the Prevention of Accidents in Construction Operations.

SECTION 1301.0 PLANS, SPECIFICATIONS AND SPECIAL PERMITS

1301.1 TEMPORARY CONSTRUCTION: Before any construction operation is started, plans and specifications when required by the building official shall be filed with him showing the design and construction of all sidewalk sheds, truck runways, trestles, foot bridges, guard fences and other similar devices required in the operation; and the approval of the building official shall be secured before the commencement of any work.

1301.2 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.

1301.3 TEMPORARY ENCROACHMENTS: Subject to the approval of the building official, sidewalk sheds, underpinning and other temporary protective guards and devices may project beyond the interior and street lot lines as may be required to insure the safety of the adjoining property and the public. When necessary, the consent of the adjoining property owner shall be obtained.

SECTION 1302.0 TESTS

1302.1 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.

1302.2 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 (2½) 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 1303.0 INSPECTION

When inspection of any construction operation reveals that any unsafe or illegal conditions exist, the building official shall notify the owner as specified in section 122.12 and direct him to take the necessary remedial measures to remove the hazard or violation.

1303.1 FAILURE TO COMPLY WITH ORDERS: Unless the owner so notified proceeeds 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 sections 124 and 125. All expenses incurred in the correction of such unsafe conditions shall become a lien on the property.

SECTION 1304.0 EXISTING BUILDINGS

1304.1 PROTECTION: All existing and adjoining public and private property shall be protected from damage incidental to construction operations.

1304.2 CHIMNEY, SOIL AND VENT STACKS: Whenever a new buiding or structure is erected to greater or less heights than an adjoining building, the construction and extension of new or existing chimneys shall conform to the provisions of section 1006.

1304.3 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 necessary and support the adjoining building or structure by proper foundations to comply with section 1306.

1304.31 MAINTENANCE: In case an existing party wall is intended to be used by the person who causes an excavation to be made, and such party wall is in good condition and sufficient for the use of both the existing and proposed building, such person shall preserve the party wall from injury and support it by proper foundations at his own expense, so that it shall be and shall remain as safe and useful as it was before the excavation was commenced. During the demolition, the party wall shall be maintained weather-proof and structurally safe by adequate bracing until such time as the permanent structural supports shall have been provided.

1304.32 BEAM POCKETS: When a structure involving a party wall is being demolished, the owner of the demolished structure shall, at his own expense, secure all wall anchors at the beam ends of the standing wall and shall brick-up all beam and joist pockets and otherwise maintain the safety and usefulness of the wall.

1304.33 PARTY WALL EXITWAYS: No party wall balcony or horizontal exit shall be destroyed unless and until a substitute means of egress has been provided and approved by the building official.

1304.4 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.

SECTION 1305.0 PROTECTION OF PUBLIC AND WORKMEN

Whenever a building or strucutre 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.

1305.1 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 714.0.

1305.2 SIDEWALK SHED.

1305.21 WITHIN TEN (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 raised to exceed forty (40) feet in height, or whenever a building more then forty (40) 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.

1305.22 WITHIN TWENTY (20) FEET OF STREET LOT LINE: When the building being demolished or erected is located within twenty (20) feet of the street lot line and is more than forty (40) feet in height, exterior flare fans or catch platforms shall be erected at vertical intervals of not more than two (2) stories.

1305.23 BUILDING HIGHER THAN SIX (6) STORIES: When the building 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 (½) its height, a sidewalk shed shall be provided.

1305.3 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 material.

1305.4 WATCHMAN: Whenever a building is being demolished, erected, or altered, a watchman shall be employed to warn the general public when intermittent hazardous operations are conducted across the sidewalk or walkway.

SECTION 1306.0 EXCAVATIONS

1306.1 TEMPORARY SUPPORT: Until permanent support has been provided, all excavations shall be safeguarded and protected by the person causing the excavations to be made, to avoid all danger to life or limb. Where necessary, such excavations shall be retained by temporary retaining walls, sheet-piling and bracing or other approved method to support the adjoining earth.

1306.11 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.

1306.12 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 section 124.

1306.13 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 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.

1306.14 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.

1306.2 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.

SECTION 1307.0 REGULATION OF LOTS

1307.1 GRADING OF LOT: When a building or structure has been demolished or removed and no building operation has been projected or approved, the vacant lot shall be filled with non-organic fill, graded and maintained in conformity with adjacent grades. 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; provisions shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

1307.2 UTILITY CONNECTIONS: All service utility connections shall be discontinued and capped in accordance with section 116.1 of this Code.

SECTION 1308.0 RETAINING WALLS AND PARTITION FENCES

When the adjoining grade is not higher than the legal level, 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 869.3 and shall be provided with a guard-rail or fence not less than four (4) feet in height.

SECTION 1309.0 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.

1309.1 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.

1309.2 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.

1309.3 PEDESTRIAN WALKWAYS: No materials or equipment shall be stored on the street without a permit issued by the administrative official having jurisdiction. 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.

1309.4 OBSTRUCTIONS: Materials 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 signals or to hinder the use of street car loading platforms.

SECTION 1310.0 REMOVAL OF WASTE MATERIAL

No material shall be dropped by gravity or thrown outside the exterior walls of a building during demolition or erection. Enclosed chutes shall be 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 1311.0 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 1306.

SECTION 1312.0 SCAFFOLDS

1312.1 LOAD CAPACITY: All scaffolds shall be designed to support two and one-half (2½) times the superimposed live load to be placed thereon but in no case less than one hundred and twenty (120) pounds per square foot.

1312.2 FIRERETARDANT CONSTRUCTION

1312.21 ALL BUILDINGS: All scaffolding exceeding seventy (70) feet or six (6) stories in height used in construction operations involving the erection, alteration or maintenance of buildings, shall be constructed of noncombustible or fireretardant materials complying with the provisions of Section 903.

1312.22 INSTITUTIONAL BUILDINGS: All scaffolding used in construction operations involving the repair or partial demolition of institutional buildings (use groups H-1 and H-2) during occupancy of the building shall be constructed of noncombustible or fireretardant materials complying with the provisions of section 903.

SECTION 1313.0 STAIRWAYS AND LADDERS

1313.1 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.

1313.2 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 1314.0 FIRE HAZARDS

1314.1 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 1206.51. 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.

SECTION 1315.0 DISPUTES

The building official, when requested by any person, aggrieved or otherwise, shall serve a written notice on any owner who fails to conform to the requirements of this article directing him to take the necessary remedial action. If the owner fails to proceed to fully comply with such notice within three (3) days after service or within a reasonable time thereafter as determined by the buiding official, the building official may cause the necessary work to be done when the health, 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.

ARTICLE 14

SIGNS AND OUTDOOR DISPLAY STRUCTURES

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.

1400.1 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 affecting required light and ventilation requirements and use of land shall take precedence over the regulations of the Basic Code.

1400.2 APPROVED RULES: In the absence of approved rules governing details of construction, the provisions of the applicable standards listed in the references of this article shall be deemed to conform to the requirements of the Basic Code unless otherwise specified in this article.

SECTION 1401.0 DEFINITIONS

APPROVED COMBUSTIBLE PLASTIC: a plastic material more than one-twentieth (1/20) inch in thickness which burns at a rate of not more than two and one-half (2½) inches per minute when subjected to the ASTM standard test for flammability of plastics in sheets of six-hundredths (0.06) inch thickness.

BILL BOARD: (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.

COMBINATION SIGN: a sign which combines the characteristics of two (2) or more of the types of signs defined in this section.

DISPLAY SIGN: any fabricated sign, including its structure, consisting of any letter, figure, character, mark, point, plane, marquee sign, design, poster, pictorial picture, stroke, stripe, line, trademark, reading matter, or illuminating device which is constructed, attached, erected, fastened, or manufactured in any manner whatsoever

so that the same is used for the attraction of the public to any place, subject, person, firm, corporation, public performance, article, machine or merchandise whatsoever, and is displayed in any manner whatsoever out of doors for recognized advertising purposes.

DISPLAY SURFACE: the surface which is made available by the structure either for the direct mounting of letters and decoration or for the mounting of the facing material that is intended to carry the entire advertising message.

FACING: the surface of the sign upon, against, or through which the message of the sign is exhibited.

GROUND SIGN: a sign which does not extend or project into or over a public way and is supported by one or more uprights or braces that are in or upon the ground.

LETTERS AND DECORATIONS: the letters, illustrations, symbols, figures, insignia and other devices which are employed to express and illustrate the message of the sign.

MARQUEE SIGN: a sign which is attached to a marquee.

MARQUEE: a fixed or non-adjustable covered structure which is attached to, wholly supported by and projects from a building.

OPEN SIGN: a display sign in which at least fifty (50) percent of the enclosed area is uncovered, or open to the transmission of wind.

POSTER PANEL: (see bill board).

PROJECTING SIGN: a sign which is affixed to a building or structure and extends twelve (12) inches or more beyond the building wall, structure or parts thereof.

ROOF SIGN: a sign which is erected, constructed, or maintained above the roof of a building and does not project more than twelve (12) inches beyond the wall line of the building.

STRUCTURE: the supports, uprights, bracing and framework of a sign.

TEMPORARY SIGN: a sign or cloth or other combustible material, with or without a frame, which is usually attached to the outside of a building on a wall or store front, intended for a limited period of display.

WALL SIGN: a sign which is supported wholly or partially by an exterior wall of a building and extends not more than twelve (12) inches therefrom.

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.

1402.21 COMMONWEALTH OF MASSACHUSETTS REGULATIONS: Outdoor advertising subject to the rules and regulations of the Outdoor Advertising Board requires the approval of the said Board prior to permit issuance.

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.

1402.4 PLANS AND SPECIFICATIONS: Any sign twelve (12) feet or over in height above average adjoining grade, or any free-standing sign with an area of over sixty (60) square feet, or any roof signs, projecting signs, or marquee sign, shall have structural drawings and specifications, including foundations, submitted by a registered professional engineer.

SECTION 1403.0 EXEMPTIONS

The building official shall be notified prior to the painting, erection or alteration of signs or outdoor display structures covered by the provisions of this section and upon determination by said building official, permits may be required for such signs. The provisions of this section shall not be construed to relieve the owner of the sign from responsibility for its painting, erection and maintenance in a safe manner.

1403.1 WALL SIGNS:

1403.11 PAINTED SIGNS: Signs painted on the surface of masonry, concrete, frame or other approved building walls;

1403.12 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;

1403.13 GOVERNMENT BUILDING SIGNS: Signs erected on a municipal, state or federal bulding which announce the name, nature of the occupancy and information as to use of or admission to the premises;

1403.14 OTHER WALL SIGNS: Any wall sign erected on a building or structure, which is not more than one (1) square foot in area;

1403.15 FENCE SIGNS. Signs painted on the surface of enclosure or division fences, or on picket or other ornamental fences.

1403.2 GROUND SIGNS:

1403.21 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;

1403.22 TRANSIT DIRECTIONS: The erection or maintanance 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;

1403.23 STRRET SIGNS: Signs erected by the municipality for street direction.

1403.3 TEMPORARY SIGNS:

1403.31 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;

1403.32 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.

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 the Basic Code, the owner thereof or the person or firm maintaining same, 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 section 125.0.

1404.2 UNLAWFUL SIGNS.

1404.21 EGRESS OBSTRUCTIONS: The building official shall notify the owner or lessee of the building or structure as provided in section 122.12 whenever a sign is so erected as to obstruct free ingress to or egress from a required door, window, fire escape or other required exit-way element.

1404.22 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.

1404.23 ALLEY SIGNS: No signs shall be permitted to project beyond public alley lot lines.

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 section 104.0; 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.

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 natural deterioration, 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.

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, constructed or maintained shall be plainly marked with the name of the person, firm or corporation owning, erecting, maintaining or operating such sign.

SECTION 1408.0 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.

1408.1 DESIGN LOADS.

1408.11 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 thirty (30) pounds per square foot of net exposed area for roof signs, twenty (20) pounds per square foot for ground signs over fifty (50) feet in height and fifteen (15) pounds per square foot for ground signs not more than fifty (50) feet in height.

1408.12 EARTHQUAKE: Signs adequately designed to withstand wind pressures shall generally be considered capable of withstanding earthquake shocks except as provided in section 719 and for combined loading in section 720.

1408.2 ILLUMINATION: Signs shall be illuminated by electrical means and electrical devices and wiring shall be installed in accordance with the requirements of the Massachusetts State Electrical Code. In no case shall any open spark or flame be used for display purposes unless specifically approved by the building official.

1408.3 OBSTRUCTIONS TO EXITWAYS: No sign shall be erected, constructed or maintained so as to obstruct any fire escape, required exitway, window or door opening used as an element of 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.

1408.4 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.

1408.5 USE OF COMBUSTIBLES

1408.51 ORNAMENTAL FEATURES: In all illuminating 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.

1408.52 SIGN FACINGS: Sign facings may be made of approved combustible plastics provided the area of each face is not more than one hundred (100) square feet.

SECTION 1409.0 GROUND SIGNS

1409.1 OBSTRUCTIONS TO TRAFFIC: No ground sign shall be erected so as to obstruct free access to or egress from any building.

1409.2 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.

1409.3 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.

SECTION 1410.0 ROOF SIGNS

1410.1 MATERIALS: All roof signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in section 1408.5. Provision 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.

1410.2 BOTTOM CLEARANCE: There shall be a clear space of not less than four (4) feet between the lowest part of the sign and the roof level except for necessary structural supports.

1410.3 CLOSED SIGNS: A closed roof sign shall not be erected to a height greater than fifty (50) feet above fireproof and noncombustible building (types 1 and 2) nor more than thirty-five (35) feet above the roof of nonfireproof (type 3) buildings.

1410.4 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.

1410.5 COMBUSTIBLE SUPPORTS: Within the Fire District 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.

SECTION 1411.0 WALL SIGNS

1411.1 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 1408.5.

1411.2 REFLECTORS: Lighting reflectors may project eight (8) feet beyond the face of the wall provided such relectors are at least twelve (12) feet above the sidewalk level; but in no case shall such reflectors project beyond a vertical plane two (2) feet inside the curb line.

1411.3 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.

SECTION 1412.0 PROJECTING SIGNS

1412.1 MATERIALS: Projecting signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in section 1408.5.

1412.2 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.

1412.3 CLEARANCES: A clear space of not less than ten (10) feet shall be provided below all parts of such signs.

SECTION 1413.0 MARQUEE SIGNS

1413.1 MATERIALS: Marquee signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in section 1408.5.

1413.2 HEIGHT: Such signs shall not exceed seven (7) feet in height nor shall they project below the facia of the marquee nor lower than ten (10) feet above the sidewalk.

1413.3 LENGTH: Marquee signs may extend the full length but in no case shall they project beyond the ends of the marquee.

SECTION 1414.0 MISCELLANEOUS AND TEMPORARY SIGNS

1414.1 POLE SIGNS: Pole signs shall be constructed entirely of non-combustible materials except as provided in section 1408.5; 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 1412 for projecting signs.

1414.2 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 the permits for temporary signs suspended from or attached to a canopy or marquee shall be limited to a period of ten (10) days.

1414.3 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.

1414.4 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.

1414.5 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 facia thereof but shall not extend closer to the sidewalk than eight (8) feet.

1414.6 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 1415.0 ILLUMINATED SIGNS

1415.1 PERMITS: All electrically illuminated signs shall conform to the requirements of the Massachusetts State Electrical Code. Permits shall be issued for the erection of illuminated signs within the limitations set forth in this article for the location, size and type of sign or outdoor display.

1415.2 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.

Reference Standards - Article 14

Mass-OAB		1973	Rules and Regulations for the Control and Restriction of Billboards, Signs and other Advertising Devices
Mass-DPS	FPR-11		Massachusetts State Electrical Code
ANSI	A60.1	1949	Standard for Signs and Outdoor Display Structures
ASTM	D374	1973	Tests for Thickness of Solid Electrical Insulation
ASTM	D568	1972	Test for Flammability of Flexible Plastics
ASTM	D635	1972	Test for Flammability of Self-Supporting Plastics

ARTICLE 15

ELECTRICAL WIRING AND FIXTURES

Chapter 143, Section 3L of the Massachusetts General Laws Annotated, as amended, provides that all installation, repair and maintenance of electrical wiring and electrical fixtures used for light, heat and power purposes in buildings and structures shall be in conformance with the Massachusetts Electrical Code (Form FPR-11) promulgated by the Board of Fire Prevention Regulations of the Commonwealth of Massachusetts Department of Public Safety.

ARTICLE 16

ELEVATOR, DUMBWAITER, ESCALATOR, AND MOVING WALK REGULATIONS

Chapter 143, Section 69 of the Massachusetts General Laws Annotated, as amended, provides that elevators, dumbwaiters, moving stairways (escalators), and moving walks shall be installed, relocated, or materially changed in conformance with Elevator and Escalator Regulations (Form ELV-1, Revised May, 1969) and Elevator, Dumbwaiter, Escalator, and Moving Walk Regulations (Form ELV-2, Revised 1971) promulgated by the Board of Elevator Regulations of the Commonwealth of Massachusetts Department of Public Safety.

ARTICLE 17

PLUMBING, DRAINAGE AND GASPIPING

Chapter 142, Section 2 of the Massachusetts General Laws Annotated, as amended, provides that all construction, alteration, repair and inspection of plumbing shall be in conformance with the Commonwealth of Massachusetts Uniform State Plumbing Code promulgated by the Board of State Examiners of Plumbers of the Commonwealth of Massachusetts Department of Public Utilities.

Chapter 737 of the Acts of 1960 provides that all construction, alteration, repair and inspection of gas piping shall be in conformance with the Massachusetts Code for Installation of Gas Appliances and Gas Piping promulgated by the Gas Regulatory Board of the Commonwealth of Massachusetts Department of Public Utilities.

ARTICLE 18

AIR CONDITIONING, REFRIGERATION AND MECHANICAL VENTILATION

SECTION 1800.0 SCOPE

The provisions of this article shall control the design and installation of air-conditioning, refrigerating, 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 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 and 522 for emergency ventilation.

1800.1 ACCEPTED ENGINEERING PRACTICE: All such systems and equipment constructed, installed and maintained in accordance with the reference standards of this article shall be deemed to conform to the provisions of this Code.

1800.11 COMMONWEALTH OF MASSACHUSETTS RULES AND REGULATIONS: All installations of gas appliances shall be subject to and must comply with the Massachusetts Code for Installation of Gas Appliances and Gas Piping established under Chapter 737 of the MGLA as amended. Regulations made in accordance with section 10 of Chapter 148 of the MGLA as amended, governing the construction, installation and operation of oil burning equipment. Also, compliance shall be required with the provisions of the rules and regulations issued by the Board of Boiler Rules under the authority of Chapter 146 of the MGLA as amended, governing the construction, installation, testing and inspection of boilers, air tanks, ammonia compressor safety valves, and refrigeration and air-conditioning systems of five (5) tons or more capacity.

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 statutes governing the transportation and use of hazardous gases, explosives and other flammable substances.

SECTION 1801.0 DEFINITIONS:

AIR CONDITIONING: the process of treating air so as to control simultaneously the temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space.

AIR DUCT: a tube or conduit, or an enclosed space or corridor within a wall or structure used for conveying air.

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.

LIMIT CONTROL: a thermostatic device installed in the duct system to shut off the supply of heat at a predetermined temperature of the circulated air.

MECHANICAL VENTILATION: the mechanical process for introducing fresh air or for providing changes of air in a building or structure.

PLENUM CHAMBER: an air compartment or enclosed space to which one or more distributing air ducts are connected.

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.

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.

SMOKE DETECTOR: a device installed in the plenum chamber or in the main supply air duct of an air-conditioning system to automatically shut off the blower and close a fire damper in the presence of smoke.

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.

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.

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 involved or the complications that might arise from the installation 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 article 1, 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-eight (1/8) inches to the foot and shall show the location and arrangement of all

equipment and distribution elements, including safety and pressure controlling devices. All mechanical systems required by the provisions of this Code as part of a fire suppression system shall have drawings and specifications submitted by a qualified registered professional engineer bearing his seal and signature.

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 the Basic Code; or where required for the remedying of existing defective installations; except that permits will not be required for the following systems:

1802.21 RESIDENTIAL BUILDINGS: One and two-family and multi-family dwellings (use 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 (1½) horsepower or larger.

1802.22 UNIT REFRIGERATING SYSTEMS: In business, commercial, industrial and residential use 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.

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 for air conditioning and ventilating systems, hereafter referred to as the standard safety code and the approved rules adopted thereunder. All mechanical systems required under the provisions of this Code as part of a fire suppression system shall be tested and certified by a qualified registered professional engineer in the presence of the building official.

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 the Basic 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 a regrigerating system 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 (use group F) and institutional uses (use group H) 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: Upon inspection or reinspection of a refrigerating, air-conditioning or ventilating system, any defects or deficiencies which require repair to insure safe operation shall be rectified before the system is placed in use.

1804.4 POWER OF CONDEMNATION: When a system or any part thereof is found unsafe to life or property, it shall be condemned and no such system shall be restored to use until it has been made safe and approved by the building official.

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 accepted engineering practice.

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 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.

1807.1 CLASSIFICATION OF BUILDINGS: For the purpose of this article buildings shall be classified in respect to use as follows:

1807.11 INDUSTRIAL BUILDINGS shall include use groups A, B-1, B-2 and D;

1807.12 COMMERCIAL BUILDINGS shall include use groups C and E;

1807.13 PUBLIC ASSEMBLY BUILDINGS shall include use groups F-1, F-2, F-3, F-4, F-5, F-6 and F-7;

1807.14 INSTITUTIONAL BUILDINGS shall include use groups H-1 and H-2;

1807.15 RESIDENTIAL BUILDINGS shall include use groups L-1, L-2 and L-3;

1807.16 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 fireresistive construction complying with the Basic Code.

1807.2 STORAGE OF REFRIGERANTS.

1807.21 MACHINERY ROOMS: All Class T machinery rooms when required under the standard safety code shall be enclosed with vapor-tight construction of not less than two (2) hours fireresistance with one and one-half (1½) hour self-closing fire doors or their approved labeled equivalent complying with article 9. Such rooms shall be ventilated to the outer air in accordance with the standard safety code. Every refrigerating machinery room shall be adequately lighted to furnish an illumination of not less than three (3) foot candles on all parts of the floor.

1807.22 QUANTITY OF REFRIGERANT: 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 fireresistive construction.

1807.23 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 as specified in section 1812.6.

SECTION 1808.0 HEATING AND COOLING EQUIPMENT

1808.1 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 1809.0 PLUMBING AND WATER CONNECTIONS

1809.1 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 the Massachusetts State Plumbing Code.

1809.2 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 1810.0 AUTOMATIC FIRE DOORS AND DAMPERS

1810.1 FIRE WALLS AND FIRE DIVISIONS: An approved fire door or an approved automatic fire damper 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. Approved fire dampers shall comply with section 903.56 and shall be installed in locations prescribed in the standard safety code listed in the references of this article.

1810.2 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 fireresistance as regulated by the fire grading in table 9-1; nor shall such ducts transporting flammable matters extend through fire walls, nor shall they be incorporated in the structural elements of the building.

SECTION 1811.0 INLET AND OUTLET OPENINGS

1811.1 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.

1811.2 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.

1811.3 VENTILATION DUCT OUTLETS: Ventilation ducts from all range hoods including residential exhaust fans shall discharge to the outside atmosphere.

SECTION 1812.0 DUCTS, LININGS AND COVERINGS

1812.1 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 1017 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 size shall be based on the discharge capacity and size of the refrigerating system as specified in the standards.

1812.2 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 meet the test requirements of article 9 for noncombustible materials.

1812.3 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.

1812.4 CLEARANCES: Metal ducts shall be installed not nearer than two (2) inches to any combustible construction unless protected by at least one-quarter (¼) inch of asbestos or other approved noncombustible insulating material.

1812.5 PLENUM CHAMBERS: Plenum chambers shall conform to all the minimum requirements for duct systems, and when such chambers are enclosed in walls or partitions, the enclosures shall be constructed in accordance with the requirements of article 8 for enclosure walls, but in no case shall the fireresistance rating be less than two (2) hours.

1812.6 CORRIDORS AS RETURN DUCTS: In all common 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 604.2. The louvres provided for the transmission of air to and from air-conditioned spaces to such hallways shall be arranged to automatically close after stopping of the fans and shall be equipped with auxiliary manually-operated closing devices.

Reference Standards - Article 18

ANSI	B9.1	1971	Safety Code for Mechanical Refrigeration
NFPA	90A	1973	Air Conditioning and Ventilating Systems
NFPA	90B	1973	Warm Air Heating and Air Conditioning Systems, Residence Type
NFPA	96	1973	Ventilation of Cooking Equipment

ARTICLE 19

MANUFACTURED BUILDINGS, BUILDING COMPONENTS AND MOBILE HOMES

SECTION 1900.0 SCOPE

The provisions of this Article shall govern the materials and methods of construction, the design, manufacture, handling, storage, transportation and installation of manufactured buildings, building components and mobile homes intended for installation in the Commonwealth of Massachusetts and manufactured in said State for shipment to any other state or local governmental jurisdictions in which such buildings, building components and mobile homes and the labels thereon are accepted. Manufactured buildings, building components or mobile homes in any jurisdiction of this State if such manufactured buildings, building components or mobile homes have been approved and certified in accordance with the applicable codes as provided in this article and the rules and regulations pursuant thereto and accepted engineering practice.

1900.1 APPROVAL: The Commonwealth of Massachusetts, Department of Public Safety, Division of Inspection, hereinafter referred to in this article as the Division of Inspection, shall evaluate manufactured buildings, building components and mobile home systems and recommend approval to the Commission of those which it determines to be in compliance with this article and the rules and regulations promulgated pursuant hereto entitled, "Massachusetts State Building Code Commission Rules and Regulations for Manufactured Buildings, Building Components and Mobile Homes," hereinafter referred to in this article as the rules and regulations.

However, all approvals of plumbing, electrical or gas systems shall be made by the appropriate state agencies having jurisdiction, as specified in the said rules and regulations.

1900.11 APPROVED TESTS: The Division of Inspection may utilize the results of approved tests to determine whether a manufactured building, building component or mobile home meets the requirements of this article and the said rules and regulations, if that determination cannot be made from evaluation of plans, specifications and documentation alone.

1900.12 APPROVAL OF COMPLIANCE ASSURANCE PROGRAMS: The Division of Inspection shall evaluate manufacturers compliance assurance programs and make recommendations for approval to the Commission of those which it determines to be in compliance with this article and the said rules and regulations.

1900.13 AUTHORIZATION TO VARY: A manufactured building, building component and mobile home system, or a compliance assurance program, which has been approved, shall not be varied in any way without prior authorization by the Division of Inspection in accordance with said rules and regulations.

SECTION 1901.0 DEFINITIONS

APPROVAL: approval by the State Building Code Commission.

BUILDING COMPONENT: any sub-system, subassembly or other system designed for use in or as part of a structure, which may include structural, electrical, mechanical, plumbing and fire protection systems and other systems affecting health and safety.

BUILDING SYSTEM: plans, specifications and documentation for a system of manufactured building or for a type or a system of building components, which may include structural, electrical mechanical, plumbing and fire protection systems and other systems affecting health and safety, including variations which are submitted as part of the building system.

CERTIFICATION: any manufactured building, building component or mobile home which meets the provisions of article 19 and the rules and regulations pursuant thereto; and which has been labeled accordingly.

COMPLIANCE ASSURANCE PROGRAM: the system, documentation and methods for assuring that manufactured buildings, building components, building systems and mobile homes including their manufacture, storage, transportation and assembly and handling and installation, conform with article 19 and the rules and regulations promulgated pursuant thereto.

INSTALLATION: the process of affixing, or assembling and affixing, manufactured buildings, building components or mobile homes on the building site, and connecting it to utilities, and/or to an existing building. Installation may also mean the connecting of two (2) or more mobile home units designed and approved to be so connected for use as a dwelling.

LABEL: an approved device or seal evidencing certification in accordance with article 19 and the rules and regulations promulgated pursuant thereto.

LOCAL ENFORCEMENT AGENCY: any local agency responsible for the issuance of building permits and permits of other applicable codes.

MANUFACTURED BUILDING: any building which is of closed construction and which is made or assembled in manufacturing facilities, on or off the building site, for installation, or assembly and installation, on the building site. "Manufactured Building" also means any building or open construction for which certification under article 19 is sought by the manufacturer and which is made or

assembled in manufacturing facilities away from the building site for installation, or assembly and installation, on the building site. "Manufactured Building" does not mean "mobile home."

MOBILE HOME: a dwelling unit built on a chassis and containing complete electrical, plumbing and sanitary facilities, and designed to be installed on a temporary or permanent foundation for permanent living quarters.

MOBILE HOME SYSTEM: the plans, specifications and documentation for a design of mobile homes which may include structural, electrical, mechanical, plumbing and fire protection systems and other systems affecting health and safety, including variations which are submitted as part of the mobile home system.

SECTION 1902.0 CERTIFICATION

Notwithstanding the provisions of any other law, manufactured buildings, building components or mobile homes certified pursuant hereto shall be deemed to comply with the requirements of all laws, rules and regulations of the Commonwealth of Massachusetts, and with all of the ordinances, by-laws and rules and regulations of local municipalities, which govern the matters within the scope of the approval and certification applicable to manufactured building, building components or mobile homes.

1902.1 ISSUANCE OF BUILDING PERMITS: Upon application and in conformity with the provisions of this Code, the building official shall issue building permits for installation of certified manufactured buildings, building components or mobile homes.

1902.2 ISSUANCE OF CERTIFICATES OF OCCUPANCY: The building official shall issue a certificate of occupancy for all manufactured building or mobile homes that have been installed and inspected and that meet the requirements of this article.

SECTION 1903.0 RECIPROCITY

If the Commission finds that the standards for the manufacture and inspection of manufactured buildings, building components or mobile homes, prescribed by the statutes or rules and regulations of another state or other governmental agency meet the objectives of this article and the said rules and regulations; and such standards are enforced satisfactorily by such other state or governmental agency, or by their agents; the Division of Inspection shall accept all manufactured buildings, building components or mobile homes which have been certified by such other state or governmental agency and assure that it is properly labeled.

1903.1 CONDITION OF RECIPROCITY: The standards of another state shall not be deemed to be satisfactorily enforced unless such other

state provides for notification to the Division of Inspection of suspensions or revocations of approval issued by that other state, in a manner satisfactory to the Commission.

1903.2 SUSPENSION OF RECIPROCAL CERTIFICATION: The Division of Inspection shall suspend or cause to be suspended certification for the following reasons:

a) if it determines that the standards for the manufacture and inspection of such manufactured buildings, building components or mobile homes of another state or other governmental agency do not meet the objectives of this article and the said rules and regulations or that the standards are not being enforced to the satisfaction of the Division of Inspection;

b) if another state or governmental agency, or its agent, suspends or revokes its approval or certification, the acceptance or certification or both granted under this section shall be suspended or revoked accordingly.

SECTION 1904.0 INSPECTION

Any person or firm manufacturing buildings, building components or mobile homes desiring certification, shall agree in writing that the Division of Inspection has the right to conduct unannounced inspections at any reasonable time.

1904.1 INSPECTION RESPONSIBILITIES OF DIVISION OF INSPECTION: The Division of Inspection shall:

a) periodically make, or cause to be made, inspections of the entire process of manufacture and certification of buildings, building components or mobile homes produced under approved building and mobile home systems and of buildings, building components and approved mobile home systems and mobile homes already certified, in order to verify the reliability of each compliance assurance program and of each approved inspection agency;

b) in addition to other on-site inspection provided for in this section, the Division of Inspection shall inspect, or cause to be inspected, certified manufactured buildings, building components or mobile homes which it determines to have been sufficiently damaged after certification to warrant such inspection, and to take such action with regard to such buildings, building components or mobile homes as is authorized hereof, or as is otherwise ncessary to eliminate dangerous conditions.

No inspection entailing disassembly, damage to or destruction of certified manufactured buildings, building components or mobile homes shall be conducted except to implement the provisions of this article.

1904.2 RESPONSIBILITY OF LOCAL ENFORCEMENT AGENCIES: Local enforcement agencies shall:

a) inspect all manufactured buildings, building components or mobile homes upon, or promptly after installation at the building site to determine whether all applicable instructions or conditions have been followed. This may include tests for tightness of plumbing and mechanical systems, for malfunctions in the electrical system, and a visual inspection for obvious violations of the rules and regulations promulgated pursuant hereto. Destructive disassembly of certified buildings, building components or mobile homes shall not be performed in order to conduct such tests or inspections;

b) local enforcement agencies shall inspect site preparation work, including foundations, installation of any manufactured building, building component or mobile home; and for all utility service connections; including plumbing, electrical, gas, water and sewer, for compliance with the applicable codes.

Nondestructive disassembly may be performed only in accordance with the rules and regulations promulgated pursuant hereto. Local enforcement agencies shall cause the disposition of noncomplying manufactured buildings, building components or mobile homes in accordance with the said rules and regulations.

SECTION 1905.0 MOBILE HOMES

Compliance with the standard for mobile homes as specified in section 1905.1 shall be acceptable evidence of compliance with this provision for mobile homes.

1905.1 REFERENCE STANDARDS FOR MOBILE HOMES: The applicable standard is the 1974 edition of ANSI A119.1, "Standard for Mobile Homes, Body and Frame Design and Construction Requirements, and the Installation of Plumbing, Heating and Electrical Systems," as approved by the American National Standards Institute.

1905.2 EFFECTIVE DATE: All mobile homes manufactured after January 1, 1975 and sold, delivered to or installed on building sites in any jurisdiction of this State shall comply with the provisions of ANSI A119.1 (1974 edition) and with this article and the rules and regulations pursuant thereto.

SECTION 1906.0 MANUFACTURED BUILDINGS AND BUILDING COMPONENTS OTHER THAN MOBILE HOMES

Compliance with all applicable requirements of the Basic Code shall be acceptable evidence of compliance with this provision. Where manufactured buildings and building components are used in combina-

tion with other components, compliance of the entire resulting building with all applicable requirements of the Basic Code shall be acceptable evidence of compliance with this provision.

1906.1 EFFECTIVE DATE: All manufactured buildings and building components built after January 1, 1975 shall comply with the provisions of the Basic Code.

EXCEPTION: All manufactured buildings and building components built prior to January 1, 1975 with the approval of the building official and which met all of the requirements of state laws, rules and regulations, or local by-laws or ordinances in force at that time shall be deemed approved in accordance with the provisions of section 114.3 of the Basic Code; provided that such manufactured buildings or building components are used for the purpose and within the limitations for which they were approved and provided such uses are not detrimental to the health and safety of the occupants and the public.

SECTION 1907.0 SUSPENSION AND REVOCATION OF CERTIFICATION

The Commission shall suspend or revoke all certifications of any manufactured building, building component, or mobile home which do not comply with the provision of this Code or with the rules and regulations promulgated under this article.

1907.1 LABELS OF CERTIFICATION: The Division of Inspection shall remove all labels of certification from any such manufactured building, building component or mobile home until such time as it is brought into compliance with this article and the said rules and regulations.

1907.2 NOTICE OF SUSPENSION OR REVOCATION: Notice shall be submitted in writing to the affected parties stating the reason for the suspension or revocation.

SECTION 1908.0 APPEALS PROCEDURE

All appeals from suspension or revocation shall be heard by the State Building Code Appeals Board as specified in the pertinent provisions of section 127 of the Basic Code.

MASSACHUSETTS

RULES AND REGULATIONS FOR MANUFACTURED BUILDINGS, BUILDING COMPONENTS AND MOBILE HOMES

FORWARD

The promulgation and adoption of these uniform Rules and Regulations could not have been accomplished without the cooperative effort of the Massachusetts State Building Code Commission, Massachusetts Department of Public Safety, Massachusetts Board of Fire Prevention, Massachusetts State Examiners of Electricians, Massachusetts Board of State Examiners of Plumbers and the Massachusetts Gas Regulatory Board. With the use of these Rules and Regulations and the codes promulgated by the respective boards, there is established a statewide mechanism for acceptance into this Commonwealth of certified and approved Manufactured Buildings, Building Components and Mobile Homes.

More significantly, however, this method places the State on record as a proponent of technological change in an industry whose impact is both profound and pervasive on every citizen of the Commonwealth. Through the implementation of this system, the State will fulfill a most important obligation--that of promoting an improved quality of life in the most cost-efficient manner possible.

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PART I GENERAL

SECTION I ADMINISTRATION

1.1 TITLE

The State Building Code Commission, Massachusetts Board of Fire Prevention Regulations, Massachusetts Gas Regulatory Board and the Massachusetts Board of State Examiners of Plumbers herewith establish the Rules and Regulations for Manufactured Buildings, Building Components and Mobile Homes.

1.2 DEFINITIONS

Unless otherwise expressly stated in the State Building Code, the following terms shall, for the purpose of these Rules and Regulations, have the meaning indicated in this section:

APPROVAL: approval by the State Administrative Agencies.

BUILDING COMPONENT: any sub-system, subassembly or other system designed for use in or as part of a structure, which may include structural, electrical, mechanical, plumbing and fire protection systems and other systems affecting health and safety.

BUILDING SYSTEM: plans, specifications and documentation for a system of manufactured building or for a type or a system of building components, which may include structural, electrical, mechanical, plumbing and fire protection systems and other systems affecting health and safety, including variations which are submitted as part of the building system.

CERTIFICATION: any manufactured building, building component or mobile home which meets the provisions of the applicable Codes and the Rules and Regulations pursuant thereto; and which has been labeled accordingly.

CODE: the Commonwealth of Massachusetts State Building Code or Specialized Codes as defined herein.

COMMISSION: the Commonwealth of Massachusetts State Building Code Commission.

DEPARTMENT - DPS: the Department of Public Safety.

INSPECTION AGENCIES: independent agency, sometimes referred to as "third party agency," retained by the manufacturer and approved by the State Administrative Agencies to perform inspections and evaluations of building systems, compliance assurance programs, manufactured buildings, building components and mobile homes.

INSTALLATION: the process of affixing, or assembling and affixing a manufactured building, building component or mobile home on the building site, and connecting it to utilities, and/or to an existing building. Installation may also mean the connecting of two (2) or more mobile home units designed and approved to be so connected for use as a dwelling.

LABEL: an approved device or seal evidencing certification in accordance with the applicable Codes and the Rules and Regulations promulgated pursuant thereto.

LOCAL ENFORCEMENT AGENCY: a department or agency in a municipality charged with the enforcement of the State Building Code and appropriate Specialized Codes which include, but are not limited to, the State Plumbing Code, Electrical Code and Gas Code.

MANUFACTURED BUILDING: any building which is of closed construction and which is made or assembled in manufacturing facilities, on or off the building site, for installation, or assembly and installation, on the building site. "Manufactured Building" also means any building or open construction for which certification under the applicable Codes is sought by the manufacturer and which is made or assembled in manufacturing facilities away from the building site for installation, or assembly and installation, on the building site. "Manufactured Building" does not mean "mobile home."

MOBILE HOME: a dwelling unit built on a chassis and containing complete electrical, plumbing and sanitary facilities, and designed to be installed on a temporary or permanent foundation for permanent living quarters.

MOBILE HOME SYSTEM: the plans, specifications and documentation for a design of mobile homes which may include structural, electrical, mechanical, plumbing and fire protection systems and other systems affecting health and safety, including variations which are submitted as part of the mobile home system.

SPECIALIZED CODES: Specialized construction codes, rules and regulations pertaining to building construction, reconstruction, alterations, repair, removal or demolition promulgated by and under the authority of the various boards which have been authorized from time to time by the general court. The specialized codes shall include, but not be limited to, the State Plumbing Code, Electrical Code, and Gas Code.

STATE ADMINISTRATIVE AGENCIES: boards, commissions, departments or agencies authorized to promulgate, adopt and amend codes and rules and regulations relating to buildings and structures and parts thereof and limited to the Massachusetts State Building Code Commission, Massachusetts Board of Fire Prevention Regulations (Massachusetts State Electrical Code), Massachusetts Gas Regulatory Board and the Massachusetts Board of State Examiners of Plumbers.

STATE ENFORCEMENT AGENCIES: boards, commissions, departments or agencies authorized to enforce the provisions of the codes and rules and regulations which have been promulgated, adopted and amended and which relate to buildings or structures and parts thereof and limited to the Department of Public Safety, Massachusetts Gas Regulatory Board, Massachusetts Board of State Examiners of Plumbers, and the Massachusetts State Examiners of Electricians.

1.3 SCOPE

A. These Rules and Regulations govern the design, manufacture, handling, storage, transportation and installation of manufactured buildings, building components and mobile homes intended for installation in this State and/or manufactured in this State for shipment to any other state in which such building, building components, or mobile homes and the labels thereon are accepted.

B. Subject to local zoning ordinances and by-laws, manufactured buildings, building components or mobile homes may be sold for, delivered to, or installed on, building sites located in any jurisdiction of this State if such buildings, building components or mobile homes have been approved and certified pursuant to the applicable Codes and these Rules and Regulations.

1.4 ADMINISTRATION AND ENFORCEMENT

The State Building Code Commission and the State Enforcement Agencies shall enforce all provisions of these Rules and Regulations. The State Enforcement Agencies shall have the responsibility for evaluating and recommending approval to the State Administrative Agencies of building systems, and for inspecting and recommending certification of manufactured buildings, building components and mobile homes for compliance with these Rules and Regulations and the applicable Codes. The State Enforcement Agencies and the local enforcement agencies shall accept manufactured buildings, building components, mobile homes, building systems and compliance assurance programs labeled and certified by inspection agencies approved by the State Administrative Agencies.

1.5 AUTHORIZATION OF THIRD PARTY INSPECTIONS

Upon recommendation of the State Enforcement Agencies, the State Administrative Agencies may authorize inspection agencies, sometimes referred to as third party inspection agencies, to perform all or part of the inspection and certification of manufactured buildings, building components, mobile homes, building systems and compliance assurance programs, including either or both the issuance and the attachment of labels thereto. The State Administrative Agencies may suspend or revoke such authorization for cause.

1.6 APPROVALS AND COMPLIANCE

Upon the recommendation of the State Enforcement Agencies, the State Administrative Agencies may approve building systems and compliance assurance programs which comply with the codes, standards, specifications and requirements and these Rules and Regulations.

1.7 TIME OF MANUFACTURE

For purposes of these regulations, a manufactured building, building component or mobile home is deemed to be manufactured at such time as the label is attached to it in accordance with the approved compliance assurance program.

1.8 RETROACTIVE CHANGES

No changes in the Codes, standards, specifications and requirements of these Rules and Regulations shall apply retroactively.

1.9 AMENDMENTS

The State Administrative Agencies shall notify the Commission, and the Commission shall notify all interested parties including State Enforcement Agencies, inspection agencies, manufacturers with approved building systems, and local governmental jurisdictions of all amendments to these Rules and Regulations, and each manufacturer shall have no more than 180 days following the sending of notification or such time as the State Administrative Agencies shall deem reasonable following the sending of such notifications to them, to submit to the Commission compliance assurance program revisions in order to comply with such amendments. Where imminent danger to life safety is involved, the State Administrative Agencies may require that immediate effect be given such amendments to the Codes, standards, specifications and requirements so adopted.

SECTION 2 COMPLIANCE ASSURANCE PROGRAMS

2.1 APPROVAL

In order to obtain approval for manufactured buildings, building components or mobile homes, a manufacturer shall submit a building system for evaluation to the State Building Code Commission for approvals by the State Administrative Agencies in accordance with these Rules and Regulations. The State Administrative Agencies shall notify the Commission of their approval or disapproval.

2.2 SUITABILITY

Prior to a full evaluation, the State Enforcement Agencies shall determine that building systems and/or the application for approval of the compliance assurance program submitted to it are suitable for processing. In the event that the application is found to be unsuitable for processing, the applicant shall be notified in writing of such unsuitability and the basis thereof, within thirty (30) days of the date the application is received by the Commission. In such event, all but twenty-five ($25) dollars of the fee will be returned and the findings of unsuitability will be without prejudice. Any subsequent submission shall be treated as a new application.

2.3 REQUISITES

The State Enforcement Agencies may require tests to determine whether a compliance assurance program meets the Codes, standards and requirements of the evaluation of plans, specifications and documentation. The procedures used shall be reviewed and evaluated by the State Administrative Agencies in accordance with these Rules and Regulations. The costs of such tests shall be borne by the applicant.

2.4 NOTIFICATION OF DISAPPROVAL

In the event a compliance assurance program is disapproved by the State Administrative Agencies, the Commission shall notify the applicant with a written explanation of the reasons for such disapproval thereto.

2.5 APPROVAL - EVIDENCE

Approval of a compliance assurance program shall be evidenced by the stamp of approval of the State Administrative Agencies on each sheet of the compliance assurance program, or by other effective means of identification. Each sheet shall be serially numbered and shall indicate effective dates of revision. One copy of all approved plans, specifications and documentation shall be returned to the applicant.

2.6 APPROVAL - REPORT

The State Enforcement Agencies shall prepare and the State Administrative Agencies shall issue to the applicant a building system approval report signed by the drafter and by the persons in charge of the evaluation, which shall be numbered and which shall contain a summary description of the building system and all of the conditions of its use including installation instructions.

2.7 APPROVAL - VARIATIONS

A building system and compliance assurance program, or any amendment thereto which has been approved, shall not be varied in any way without prior written authorization by the State Administrative Agencies. All amendments shall be in writing and shall be made a part of the written record of the approval.

2.8 AMENDMENTS - PROPOSED

Amendments to compliance assurance programs may be proposed by submitting to the Commission for approvals by the State Administrative Agencies, appropriate plans, specifications, or documentation showing the effect of the proposed amendment on each building system, and the required fee.

2.9 COMPLIANCE ASSURANCE PROGRAM

A manufacturer shall obtain approval from the State Administrative Agencies of a compliance assurance program for his building system. Buildings, building components or mobile homes shall be manufactured in accordance with an approved program in order to be certified. Compliance assurance programs shall be submitted to the Commission for approvals by the State Administrative Agencies in accordance with these Rules and Regulations.

SECTION 3 CERTIFICATION

Manufactured buildings, building components or mobile homes, accepted by the State Enforcement Agencies or an inspection agency as having been

manufactured according to an approved building system and an approved compliance assurance program, shall be certified by the State Administrative Agencies upon the recommendation of the State Enforcement Agencies as complying with the requirements of the applicable Codes and these Rules and Regulations. Certification shall be evidenced by the attachment of a label to each certified manufactured building, building component (or groups of components) or mobile homes.

3.1 MANUFACTURER'S DATA PLATE

3.11 CONTENTS

The following information shall be placed directly or by reference on one or more permanent manufacturer's data plates in the vicinity of the electrical distribution panel, or in some other designated location acceptable to the State Administrative Agencies, on the manufactured building, building component or mobile home where it will be readily accessible for inspection:

a) Manufacturer's name and address;

b) Serial number of the unit;

c) Label serial number;

d) Name and date of applicable building, plumbing, gas and electrical Codes and issue of their accumulative supplements complied with;

e) Model designation and name of manufacturer of major factory-installed appliances;

f) Identification of permissible type of gas for appliance and directions for water and drain connection;

g) Snow, wind, seismic and other live loads;

h) Electrical ratings - instructions and warnings on voltage;

i) Special conditions or limitations on use of the units, including unsuitability for areas in which specified environmental conditions prevail;

j) Methods of assembly or joining multiple units;

k) Type of construction, including fire rating, occupancy class, interior finish flame spread class, and toxicity class;

l) Building height and story limitation;

m) Floor area;

n) Minimum side yard requirements for fire rating.

If, in the opinion of the State Administrative Agencies, the shape or

size of a building component is such that this information cannot be attached to it permanently, the information may be placed in a manual crated with the component or on a tag attached to the crate in which the component is shipped, if the information is not such that the future occupant of the building should know it. If the occupant will need to know the information, it shall be contained in a manual which shall be presented to the occupant upon transfer of possession. If life safety is involved, the item in question shall be plainly labeled.

3.2 LABELS

Each manufactured building, building component or mobile home, which is certified pursuant to the applicable Codes and these Rules and Regulations, shall have permanently attached thereto, in a visible location as shown on the approved building system, an approved label which cannot be removed therefrom without destroying such label.

3.21 CONTENTS

An approved label shall bear the following information:

a) "This label certifies that this building (or building component or mobile home) has been manufactured in accordance with an approved building system and compliance assurance program approved by the Commonwealth of Massachusetts State Administrative Agencies and inspected by_____."

b) Label serial number;

c) Building system approval number;

d) Manufacturer's serial number;

e) The words "See data plate located on_____."

f) Date of manufacture.

At the direction of the State Administrative Agencies, labels and data plates may be limited in size and content for components whose shape and size does not permit the full information to be placed thereon.

3.22 ISSUANCE

The approved label shall be issued through the Department of Public Safety or its agents in accordance with the following:

a) If the State Administrative Agencies delegated the issuance of labels to an inspection agency, the agency shall be required to obtain approval from the Department of Public Safety for the manner in which they are handled;

b) Labels must be serially numbered;

c) A manufacturer's complaince assurance program, submitted in accordance with the Rules and Regulations hereof, shall include requirements for issuance, possession of, attachment of and accounting for all labels to assure that labels are attached only to buildings, building components, or mobile homes manufactured pursuant to an approved building system and inspected pursuant to an approved compliance assurance program.

d) If the State Enforcement Agencies determine that the manufacturer's record of compliance is such that the State Administrative Agencies or inspection agency need not maintain an inspector in a given plant at all times, the Department or inspection agency may entrust labels to the custody of one or more employees of the manufacturer, who shall be charged with controlling the use of such labels. Such employees shall not be given custody of more labels than are necessary to accommodate the manufacturer's anticipated production for one month. If the conditions of custody are violated, the Department or an inspection agency shall immediately regain possession of all labels that have not been applied to the manufactured buildings, building components or mobile homes and shall take such further action with respect to buildings, mobile homes or components already labeled and with respect to future labeling, as it may deem necessary to assure compliance with the applicable codes and these Rules and Regulations.

3.3 RECORDS OF LABELS

Permanent records shall be kept of the handling of all labels, indicating at least how many labels have been applied to buildings or building components (or groups of components) or mobile homes, which labels have been applied to which buildings, building components or mobile homes, the disposition of any damaged or rejected labels, and the location and custody of all unused labels. Such records shall be maintained by the manufacturer or by the inspection agency. A copy of such records covering attachment of each label shall be sent to the Deparment upon request and the Department shall forward all such records to the State Administrative Agencies.

3.4 ATTACHMENT OF LABELS

The inspection agency shall attach in consecutive numerical sequence labels to buildings, building components or mobile homes manufactured in accordance with an approved building system and meeting the requirements of an approved compliance assurance program.

a) Manufacturers shall attach labels to manufactured buildings, building components or mobile homes manufactured in accordance with an approved compliance assurance program, if custody of the labels has been entrusted to them in accordance with this Section.

3.5 SUSPENSION AND REVOCATION

The State Enforcement Agencies or an inspection agency may suspend or revoke, or cause to be suspended or revoked, the certification of any manufactured building, building component or mobile home which the State Enforcement Agencies or an inspection agency finds not to comply with the applicable Codes or these Rules and Regulations, or which has been manufactured pursuant to a building system or a compliance assurance program for which approval has been suspended or revoked, or which has not been manufactured in accordance with the approved compliance assurance program. The State Enforcement Agencies or an inspection agency shall remove or cause to be removed, labels from any such manufactured building, building component or mobile home until it is brought into compliance with the applicable Codes and these Rules and Regulations. Notice of suspension or revocation of certification shall be in writing with the reasons for suspension or revocation clearly set forth therein.

a) Upon suspension or revocation of the approval of any building system or compliance assurance program, no further labels shall be attached to any manufactured buildings, building components or mobile homes manufactured pursuant to the building system or compliance assurance program with respect to which the approval was suspended or revoked. Upon termination of such suspension or revocation, labels may again be attached to the manufactured building, building component or mobile home manufactured after the date approval was reinstated. Should any building, building component or mobile home have been manufactured during the period of suspension or revocation, it shall not be labeled unless the State Enforcement Agencies or inspection agency have inspected such building, building component or mobile home and is satisfied that all requirements for certification have been met.

b) The manufacturer shall return all labels allocated for a manufactured building, building component or mobile home to the Department no later than thirty (30) days from the effective date of any suspension or revocation of the State Enforcement Agencies or inspection agency, of the building system or compliance assurance program pursuant to which the manufactured building, building component or mobile home is being manufactured. The manufacturer shall also return to the Department all labels which it determines for any reason are no longer needed.

3.6 VARIATIONS OF CERTIFIED UNITS

Manufactured buildings, building components or mobile homes certified and labeled pursuant to the applicable Codes and these Rules and Regulations shall not be varied in any way prior to the issuance of a certificate of occupancy without resubmission to the Commission for approval of the State Administrative Agencies of the variation and of the unit which includes the variation. The State Enforcement Agencies or an inspection agency shall inspect the building, building component or mobile home wherever it is located and such inspection may include such tests or destructive or nondestructive disassembly as the State Enforcement Agencies or an inspection agency deems necessary

to assure compliance with the applicable Codes and these Rules and Regulations. Local Enforcement Agencies may be designated by the State Administrative Agencies as inspection agencies for such purposes.

SECTION 4 INSPECTION BY THE STATE ENFORCEMENT AGENCIES OR THEIR AGENTS

The State Enforcement Agencies shall make, or cause to be made, such inspections of the entire processing of manufacturing, certifying, handling, storing and transporting of manufactured buildings, building components and mobile homes produced pursuant to approved building systems as they deem necessary.

4.1 INSPECTION OF FACILITIES

As part of the process of evaluating building systems and compliance assurance programs, the State Enforcement Agencies shall inspect, or cause to be inspected, the manufacturing facilities in which the buildings, building components or mobile homes are to be manufactured.

4.2 INSPECTION ACCORDING TO COMPLIANCE ASSURANCE PROGRAMS

The State Enforcement Agencies or an inspection agency shall make such inspections as may be required by an approved compliance assurance program, or as may be deemed necessary by the State Enforcement Agencies.

4.3 INSPECTION OF DAMAGED COMPONENTS

Prior to the issuance of a certificate of occupancy, the State Enforcement Agencies or an inspection agency shall inspect, or cause to be inspected, certified manufactured buildings, building components or mobile homes which it determines to have been sufficiently damaged after certification to warrant such inspection and to take such action with regard to such buildings, building components or mobile homes as is authorized hereof, or as is otherwise necessary to eliminate dangerous conditions. The local enforcement agencies may be designated by the State Administrative Agencies as the inspection agency.

4.31 REPAIRING DAMAGED COMPONENTS

The State Enforcement Agencies or an inspection agency shall require manufactured buildings, building components or mobile homes which are so damaged as to no longer comply with the applicable Codes and these Rules and Regulations, to be repaired and made to comply within a reasonable time; or if they are so damaged that they cannot be brought into compliance, the State Enforcement Agencies or inspection agency shall order that the labels be removed from such buildings, building components or mobile homes.

4.32 IRREPARABLY DAMAGED COMPONENTS

Irreparably damaged buildings, building components or mobile homes shall be disposed of by the manufacturer.

4.4 MONITORING INSPECTION AGENCY

The State Enforcement Agencies or their designated agents shall examine each approved inspection agency, at any reasonable time, and without prior announcement, in order to monitor the reliability of each agency and of its monitoring of each compliance assurance program. Each such examination shall investigate the adequacy of all procedures used by the agency in monitoring compliance assurance programs including inspection, tests, production methods, process controls, operator performance, materials, receipts, storage and handling, workmanship standards, records and all other activities which implement the compliance assurance program in the manufacturing facility, during transport, on-site, and at critical subcontractors' facilities. The results of such examinations shall be filed with the office of the Commission. Copies of such reports shall be sent to the inspection agency and the State Administrative Agencies. Inspection agencies shall be specifically notified by the Commission of any deficiencies and of the manner and time by which such deficiencies must be eliminated. If deemed necessary by the State Enforcement Agencies an inspection agency's approval may be suspended or revoked by the State Administrative Agencies as provided herein.

4.41 PRIOR TO APPROVAL

Such examinations may also be conducted before approving an inspection agency.

4.5 INSPECTION BY DISASSEMBLY

No inspection entailing disassembly, damage to or destruction of certified manufactured buildings, building components or mobile homes shall be conducted except to implement these Rules and Regulations.

SECTION 5 LOCAL ENFORCEMENT AGENCY PROCEDURES AND INSPECTIONS

5.1 PERMIT APPLICATIONS

Upon application in conformity with the provisions of the appropriate Codes, local enforcement agencies shall issue appropriate permits for certified manufactured buildings prior to installation, and shall not withhold approval of the appropriate permits for buildings containing certified building components which in all other respects comply with all applicable Codes, provided that any manufactured buildings, building components or mobile homes found by the State Enforcement Agencies not to comply with the appropriate Codes or these Rules and Regulations shall be brought into compliance before such permit shall be issued. An application to local enforcement agencies for an appropriate permit shall, when requested, in addition to any other requirements contain:

5.11 PERMIT APPLICATION - STATE OF CONTENT

A statement that the work to be performed under such permit is to include the installation of a certified manufactured building or building component in accordance with the provisions of the

applicable Codes, the statement to be signed by the applicant or his agent, with the appropriate address;

5.12 PERMIT APPLICATION - BUILDING SYSTEM

A true copy of the approved building system with respect to which the manufactured building or building component was manufactured or is to be manufactured, where one has not previously been furnished to that local enforcement agency; and

5.13 PERMIT APPLICATION - BUILDING SYSTEM APPROVAL

A copy of the Building System Approval Report, where it has not previously been furnished to that local enforcement agency.

5.2 INSPECTION OF SITE PREPARATION AND SERVICE CONNECTIONS

Appropriate local enforcement agencies shall inspect site preparation work including foundations, not within the scope of the approval and certification, and the structural, mechanical, plumbing and electrical connections among units, for compliance with applicable law, rules and regulations.

5.3 COMPLIANCE WITH INSTRUCTIONS

Appropriate local enforcement agencies shall inspect all manufactured buildings, building components or mobile homes upon, or promptly after, installation at the building site to determine whether all instructions in the Building System Approval Report or conditions listed on the manufacturer's data plate have been followed.

This may include tests for tightness of plumbing and mechanical systems, and for malfunctions in the electrical system and a visual inspection for obvious nonconformity with the approved building system.

5.31 DISASSEMBLY PROHIBITED

Unauthorized destructive disassembly of certified buildings and building components and mobile homes shall not be performed in order to conduct such tests or inspections, except as provided in section 4.3, nor shall there be imposed standards or test criteria different from those adopted by the State Enforcement Agencies or specified in the Building System Approval Report.

5.32 OPENING PANELS

Non-destructive disassembly may be performed only to the extent of opening access panels and cover plates.

5.4 DISPOSITION OF NONCOMPLYING UNITS

Local enforcement agencies shall cause the disposition of noncomplying manufactured buildings and building components after consultation with the State Enforcement Agencies and reasonable notice to the manufacturer

or owner thereof, as the case may be, of the proposed disposition.

5.5 CERTIFICATES OF OCCUPANCY

Appropriate local inspectors shall issue certificates of occupancy for certified manufactured buildings and mobile homes containing certified building components which otherwise comply with all the applicable Codes, after they have been installed and inspected pursuant to the applicable Codes and these Rules and Regulations, provided that any manufactured building, building component or mobile home found not to comply with the Building System Approval Report shall be brought into compliance before such certificate of occupancy shall be issued.

5.6 REPORTING OF VIOLATIONS TO DEPARTMENT OF PUBLIC SAFETY

When any local enforcement agency is making an inspection and finds violations or suspected violations, it shall report the details of the violations in writing to the Department. Where violations are hazardous to occupants, a certificate of occupancy shall not be issued and the building shall not be occupied before such hazards are corrected. If the violations are not hazardous, a provisional certificate of occupancy may be issued. The Department shall forward all such reports of violations to the State Administrative Agencies.

SECTION 6 FEES

6.1 DEPOSIT FOR APPLICATION TO THE COMMISSION

A deposit shall be required upon application to the Commission to perform any of the functions in these Rules and Regulations.

6.2 ESTABLISHMENT OF FEES

Fees charged by the Commission for functions performed shall be in accordance with the fee schedule established by the State Administrative Agencies as specified in Part VI, Section 18 of these Rules and Regulations.

SECTION 7 NOTIFICATION OF CHANGES IN NAME, ADDRESS, OWNERSHIP OR LOCATION

7.1 NOTIFICATION BY MANUFACTURERS

Manufacturers shall notify the Commission in writing within ten (10) days of any of the following occurrences.

a) The corporate name is changed;

b) The main address of the company is changed;

c) There is a change in twenty-five (25) percent or more of the ownership interest of the company within a twelve (12) month period;

d) The location of any manufacturing facility is changed;

e) A new manufacturing facility is established; or

f) There are changes in principal officers of the firm.

The Commission shall notify the State Administrative Agencies of such occurences.

7.2 NOTIFICATION BY INSPECTION AGENCIES

Inspection agencies shall notify the Commission in writing within ten (10) days of any of the following occurences:

a) The company name is changed;

b) The main address of the company is changed;

c) There is a change in twenty-five (25) percent or more of the ownership interest or control of the company within a twelve (12) month period;

d) The location of any testing facility is changed;

e) A new testing facility is established; or

f) There are changes in principal officers and key supervisory and responsible personnel of the firm.

The Commission shall notify the State Administrative Agencies of such occurences.

SECTION 8 PROPRIETARY INFORMATION

All information relating to building systems and compliance assurance programs which the manufacturer or other party considers proprietary shall be so designated by him at the time of its submission, and shall be so held by the State Enforcement Agencies and State Administrative Agencies, except as the State Administrative Agencies determine in each case, that disclosure is necessary to carry out the purposes of the applicable Codes and these Rules and Regulations.

PART II REQUIREMENTS FOR SUBMISSION OF BUILDING SYSTEMS AND COMPLIANCE ASSURANCE PROGRAMS

SECTION 9 BUILDING SYSTEMS

Building systems shall meet the requirements set forth below to be evaluated for compliance with the standards, specifications and requirements adopted by the State Administrative Agencies.

9.1 GENERAL REQUIREMENTS

9.11 PLANS, SPECIFICATIONS AND DOCUMENTATION

Building systems, including all plans, specifications and other documentation, shall be submitted in quadruplicate to the Commission who shall act as the depository and disburser of all such items. The Commission shall forward to the appropriate State Enforcement Agencies plans, specifications and documentation for their approvals.

9.12 FORM AND FEES

Building systems shall be submitted in the form prescribed by the State Administrative Agencies and shall be accompanied by all required fees.

9.13 IDENTIFICATION

All documents submitted with the application shall be identified to indicate the manufacturer's name, office address and address of the manufacturing facility.

9.14 PLANS SHOWING ELEMENTS

Plans shall be submitted showing all elements relating to specific systems on properly identifiable sheets.

9.15 APPLICATION - APPROVED ARCHITECT OR ENGINEER

Each building system application shall bear the signature and seal of an approved registered architect or registered professional engineer certifying that the building system complies with the applicable Codes and standards promulgated herein.

9.16 ON-SITE WORK IDENTIFIED

All work to be performed on-site, including connection of all systems, equipment and appliances, shall be identified and distinguished from work to be performed in the manufacturing facility.

9.17 SPACE FOR STATE ADMINISTRATIVE AGENCIES APPROVAL STAMP

A 3" x 4" blank rectangular space shall be provided on all sheets of plans near the title box for the State Administrative Agencies stamp of approval.

9.18 MATERIAL GRADE AND QUALITY

Grade, quality and identification of all material shall be specified.

9.19 CALCULATIONS AND TEST REPORTS

Design calculations and test reports shall be specified.

9.191 DRAWINGS TO SCALE

Drawings shall be drawn to scale.

9.192 LABEL AND DATA PLATE LOCATION

Drawings shall indicate the location of the approved label and data plate.

9.193 DRAWINGS DATED AND IDENTIFIED

Drawings shall be dated and identified. The number of sheets in each set shall be indicated.

9.2 REQUIRED CONSTRUCTION DETAILS

Building systems for manufactured buildings shall provide or show, but not be limited to, the details listed below including the method of their testing or evaluation, or both. These requirements shall apply to the building systems for building components only to the extent deemed necessary by the State Enforcement Agencies to permit a proper evaluation of the building component.

9.21 GENERAL

a) Details and methods of installation of manufactured buildings or building components on foundations and/or to each other.

b) All exterior elevations.

c) Cross sections as necessary to identify major building components.

d) Details of flashing, such as at openings and at penetrations through roofs and subcomponent connections. Indicate flashing material and guage to be used.

e) Attic access and attic ventilation.

f) Exterior wall, roof and soffit material as well as finish.

g) Interior wall and ceiling finish material.

h) Fire separation walls.

i) Sizes, locations and types of doors and windows.

j) Recommended foundation plans, vents and underfloor access.

9.22 BUILDING CLASSIFICATION

a) Occupancy or use.

b) Area, height, and number of stories.

c) Type of construction.

d) Fire resistance ratings.

9.23 SPACE AND FIRE SAFETY

a) Details of fire resistance rated assemblies for all stairway enclosures, doors, walls, floors, ceilings, partitions, columns, roof and shaft enclosures.

b) Details as to width of all aisles, exits, corridors, passageways and stairway enclosures.

c) Toxocity and flame spread classification of finished materials.

9.24 STRUCTURAL DETAIL REQUIREMENTS

a) Engineer's calculations of structural members, where appropriate,

b) Design soil bearing value.

c) Structural and framing details of all floors, roof and walls.

d) Details and stress diagrams of roof trusses.

e) Details of reinforcing steel.

f) Complete loading schedule.

g) Column loads and column schedule.

h) Lintel schedule.

i) Size, spacing and details of all structural elements.

j) Grade or quality of all structural elements (lumber, steel, etc.).

k) Elevation of structural elements, walls or sections thereof, providing resistance to vertical loads or lateral forces.

l) Complete details of all structural connections.

9.25 MECHANICAL DETAIL REQUIREMENTS

a) Location of all equipment and appliances. Indicate equipment and appliances listed or labeled by approved agencies.

b) Heat loss calculations, where appropriate.

c) Manufacturer's name, make, model, number, BTU, and input rating of all equipment and appliances, as appropriate, or the equal thereof.

d) Duct and register locations, sizes, and materials.

e) Clearances from combustible material or surfaces for all ducts, flues and chimneys.

f) Method of providing required combustion air and return air.

g) Location of flues, vents and chimneys and clearances from air intakes and other vents and flues.

h) Details regarding dampers in ducts penetrating fire separations.

i) Complete drawings of fire sprinkler system, standpipe system or fire alarm system, if required.

j) Detail of elevator or escalator system, including method of emergency operation.

9.26 PLUMBING DETAIL REQUIREMENTS

a) Plan or schematic drawing of the plumbing layout, including but not limited to, size of piping, fitting, traps and vents, cleanouts and valves, gas, water, and drainage system.

b) Plumbing materials, and location of all equipment and appliances to be used. Indicate fixture unit capacity of system(s) and the make, model, and rating/capacity of equipment and appliances. Indicate equipment and appliances listed or labeled by approved agencies.

c) Make and model of safety controls (such as for water heaters), their location, and whether listed or labeled by approved agencies.

d) How piping is to be supported and intervals of support.

e) Location of vents above roofs and required clearances, including but not limited to clearances from air intakes, other vents and flues.

f) Methods of testing.

9.27 ELECTRICAL DETAIL REQUIREMENTS

a) Plan of service equipment, including service entrance, conductors, service raceway and clearances above ground and above structures.

b) Method and detail for grounding service equipment.

c) Single line diagram of the entire electrical installation.

d) Load calculations for service and feeders.

e) Sizes of all feeders and branch circuits.

f) Size, rating and location of main disconnect/overcurrent protective devices.

g) Method of interconnection between manufactured buildings or building components and location of connections.

h) Location of all outlets and junction boxes.

i) Method of mounting fixtures and wiring installations.

SECTION 10 COMPLIANCE ASSURANCE PROGRAMS

Compliance assurance programs shall be approved if they meet the requirements set forth in this section. It is the manufacturer's responsibility to execute every aspect of this program. The manufacturer shall continue to be responsible for all corrective actions required and the contractural relationship between the manufacturer and the inspection agency shall not diminish such responsibility. The manufacturer shall cooperate with the inspection agency by providing the inspection agency with all necessary reports, information, documents, records, facilities, equipment, samples and other assistance for assuring compliance.

The manufacturer's compliance assurance program shall be submitted to the Commission in the form of a compliance assurance manual which shall contain complete documentation of all compliance assurance activities of both the manufacturer and the inspection agency. The manual shall be comprehensively indexed, and shall treat the material listed here in detail.

10.1 ORGANIZATION REQUIREMENTS

a) A procedure for periodic revision of the manual.

b) An organizational structure for implementing and maintaining the compliance assurance program and its functional relationship to other elements of the organization structure of the manufacturer, which structure shall provide for independence from the production department.

   1) Company officers and employees in charge of the compliance assurance program must be identified, and their training and qualifications specified.

c) A uniform system of audit (in-depth analysis of program effectiveness and means to identify deficiencies) to monitor program performance periodically.

d) Complete and reliable records of manufacturing and site operations, if any (suitable means of storage, preservation and accessibility of copies of forms to be utilized shall be included).

e) A system to control changes in production or inspection procedures.

f) A system to assure that working drawings and specifications, working instructions and standards, procurement documents, etc., conform to the approved building system.

g) A serial numbering system for buildings or building components.

h) The method of safekeeping, handling and attaching labels and identificati of those employees responsible therefor.

10.2 MATERIALS CONTROL

a) Procedure to assure effective control over procurement sources to ensure that materials, supplies and other items used in production and site operations, if any, conform to the approved plans, specifications and quality requirements.

b) Procedures for inspection of materials, supplies and other items at the point of receipt.

c) Method of protection of materials, supplies and other items against deterioration prior to their incorporation in the certified buildings or building component.

d) Provision for disposal of rejected materials, supplies and other items.

10.3 PRODUCTION CONTROL

a) Procedures for timely remedial and preventive measures to assure product quality.

b) Provision, maintenance and use of testing and inspection.

c) Provision for frequency of sampling inspections.

d) Provision of necessary authority to reject defective work and carry out compliance assurance functions, notwithstanding any conflict with production department goals and needs.

e) A schematic of the manufacturing operation showing the location of inspection stations, and "hold" points for mandatory inspection characteristics.

f) Inspection and test procedures, including accept/reject criteria and mandatory inspection characteristics.

g) Standards of workmanship.

h) Provision of disposal of rejects.

10.4 FINISHED PRODUCT CONTROL

a) Procedure for final inspection of all manufactured buildings or building components before shipment to the site or storage point, including identification and labeling.

b) Procedures for handling and storing all finished manufactured buildings or building components, both at the manufacturing plant or other storage point and after delivery to the building site.

c) Procedures for packing, packaging and shipping operations and related inspections.

d) Procedures for transportation, including all measures to protect against damage while in transit, and setting forth the modes of transportation to be utilized and the carrying equipment and procedures.

10.5 INSTALLATION CONTROL

a) Installation procedures including component placement, equipment and procedures, field erection and finishing work, utility connection instructions and all appropriate on-site inspection criteria and test descriptions.

b) Organizational provisions for field repair and disposal of rejects.

10.6 PERMISSION FOR INSPECTION

The manufacturer shall provide the Commission with written permission, signed and notarized, for the State Enforcement Agencies to inspect his manufacturing facilities, his products, and building sites under his control at any reasonable time without prior announcement.

10.7 INSPECTIONS BY THE STATE ENFORCEMENT AGENCIES

The Compliance Assurance Manual shall contain detailed plans for inspections by the State Enforcement Agencies or inspection agency.

PART III APPROVAL OF INSPECTION AGENCIES

SECTION 11 REQUIREMENTS FOR SUBMISSION

An inspection agency seeking approval shall submit a quadruplicate application to the Commission which shall include the items listed in this section.

11.1 ARTICLES OF INCORPORATION

The original Articles of Incorporation of the agency and all subsequent amendments thereto, as filed in the State of Incorporation.

11.2 BYLAWS

The bylaws of the organization, if any.

11.3 BUSINESS AFFILIATIONS OF MEMBERS

The names, addresses and business affiliations of all members of the Board of Directors and of top management personnel.

11.4 STOCK OWNERSHIP

Individual interests representing more than ten (10) percent of the outstanding ownership reflecting the financial interest of the agency's Board of Directors and top management personnel.

11.5 CERTIFICATIONS

Certification by the agency that:

a) Its Board of Directors, as a body, and its technical personnel, as individuals, can exercise independence of judgment; and

b) Its activities pursuant hereto will result in no financial benefit to the agency via stock ownership, or other financial interests in any producer, supplier or vendor of products involved, other than through standard published fees for services rendered.

11.6 EXPERIENCE OF DIRECTORS

Names, years of experience, state in which professionally registered and other qualifications of the directors of inspection or evaluation programs.

11.7 EXPERIENCE OF EMPLOYEES

Names and years of experience of employees practicing in the following disciplines: architecture, structural engineering, mechanical engineering, electrical engineering, fire protection and other branches of engineering; the state in which each is registered and the service each performs.

11.8 ORGANIZATION CHART

An organization chart showing management and supervisory persons including the number of graduate engineers and architects, and the names of all consulting engineers or architects, designating which are full-time and which are part-time employees.

11.9 NUMBER AND LOCATION OF PERSONNEL

Number and location of factory inspectors, supervisors, and other technicians, including evaluators of factory inspectors and the qualifications of each specialized group, including records of work experience, licenses held and other pertinent qualifications; description of the types of work each group and each technician is expected to perform and the qualifications of each group and each technician to perform the work assigned.

11.10 EMPLOYEES TRAINING PROGRAMS

An outline of the training program, if any, of the agency to assure that all inspectors, evaluators and other technicians are properly trained to do each job assigned to them.

11.11 EMPLOYEE SUPERVISION

An outline of the general procedures for supervision of inspectors and evaluators, including checking and evaluation of their work.

11.12 NON-EMPLOYEES RELATIONSHIPS

All engineers, technicians and other personnel who will perform services for the organization but who are not employees of the organization, and the supervisory and other relationships which each will have to the agency.

11.13 PRODUCTS EVALUATED

Type of products, components, equipment, structures and other items which the organization has evaluated, tested or inspected and the number of years of experience the organization has had with each, and the type of codes, standards, specifications and requirements with respect to which the organization has had experience in providing evaluation, inspection or testing services, and the number of years experience with each.

11.14 FREQUENCY CAPABILITY

Description of the frequency with which the agency is capable of performing inspections or evaluations.

11.15 STATES APPROVED IN

List of the states in which the agency is now approved to inspect or evaluate manufactured buildings, building components, or mobile homes

or parts thereof for compliance with approved building systems.

SECTION 12 PROCEDURES FOR APPROVING INSPECTION AGENCIES

12.1 QUALIFICATIONS

Upon the recommendation of the State Enforcement Agencies, State Administrative Agencies may approve inspection agencies which meet the requirements of the applicable Codes and these Rules and Regulations and which the State Administrative Agencies find otherwise qualified to perform the functions proposed to be delegated to them.

12.2 SUITABILITY OF APPLICATION

Prior to a full evaluation of an application for approval, the Commission shall determine whether such application is suitable for processing. In the event the application is found to be unsuitable for processing, the applicant shall be notified in writing of such unsuitability and the basis thereof within thirty (30) days of the date the application is received by the Commission.

In such event, all but $25.00 of the fee will be returned, and the rulings of unsuitability shall be without prejudice. Any subsequent submission shall be treated as a new application.

12.3 APPROVALS

In the event of approval by the State Administrative Agencies, an inspection agency shall be notified by a letter from the Commission indicating such approval and stating specifically the functions which the applicant has been approved to perform. Such approval shall not constitute the actual delegation of such functions.

SECTION 13 SUSPENSION AND REVOCATION

13.1 GROUNDS

The State Administrative Agencies may suspend or revoke its approval of any inspection agency if the approval was issued in error; was issued on the basis of incorrect information; was issued in violation of any of the applicable Codes or these Rules and Regulations; if the inspection agency violates any of the applicable Codes or these Rules and Regulations; if examination discloses that the agency failed to perform properly; or for such other cause as may be deemed sufficient by the State Administrative Agencies to warrant such action.

13.2 PROCEDURES

13.21 GENERAL

If the State Administrative Agencies suspend or revoke the approval of an inspection agency, the inspection agency shall be given notice in writing from the Commission of the suspension or revocation with the reasons therefor set forth therein. Manufacturers being evaluated or

inspected by such agencies, all local enforcement agencies within this State and the State Enforcement Agencies shall also be notified in writing of such suspension or revocation. Such notices shall contain instructions to the manufacturer and to the local enforcement agency as to the procedures to be followed regarding manufactured buildings, building components or mobile homes previously certified by an agency whose approval has been suspended or revoked.

13.22 RECORDS

An inspection agency whose approval has been suspended or revoked shall within ninety (90) days of the suspension or revocation, deliver to the custody of the Commission the originals of all records required to be maintained during the course of the inspection agency's operations pursuant to the applicable Codes and these Rules and Regulations.

13.23 LABELS

An inspection agency for which approval has been suspended or revoked shall within ninety (90) days of the suspension or revocation, deliver to the custody of the Department all labels in the agency's possession, under its control, or for which it is responsible pursuant to the applicable Codes and these Rules and Regulations.

PART IV RECIPROCITY

If the State Administrative Agencies find that the standards for the manufacture and inspection of manufactured buildings, building components or mobile homes prescribed by statute or rules and regulations of another state, or other governmental agency, meet the objectives of the applicable Codes and these Rules and Regulations, and are enforced satisfactorily by such other state or other government agency, or by their agents, the State Enforcement Agencies shall accept manufactured buildings, building components or mobile homes which have been certified by such other state or governmental agency, and the Department shall assure that the appropriate label is attached thereto. The standards of another state or governmental agency shall not be deemed to adequately be enforced unless such other state or governmental agency provides for notification to the Department of suspensions or revocations of approvals issued by that other state of governmental agency in a manner satisfactory to the State Administrative Agencies and so notified the Department. The Department shall notify the State Administrative Agencies of any action taken under this section.

SECTION 14 PROCEDURES FOR GRANTING OR REFUSING RECIPROCITY TO ANOTHER JURISDICTION

14.1 EVALUATION

The State Administrative Agencies may evaluate the statute, codes, rules and regulations of another state or governmental agency at any time.

14.2 METHOD OF EXTENDING RECIPROCITY

If the State Administrative Agencies find that the standards prescribed by the statute or rules and regulations of another state or another governmental agency meet the objectives of the appropriate Codes and that these rules and regulations are satisfactorily enforced, it may extend reciprocity to that jurisdiction by:

a) Giving notice to any requesting manufacturer;

b) Giving notice to the Administrative Agency of the other jurisdiction;

c) Giving notice to the State Enforcement Agencies and all local enforcement agencies in this state.

14.3 REJECTIONS

If the standards of the other state or governmental agency do not meet the objectives of the appropriate Codes or are inadequately enforced, or both, reciprocity shall not be extended. In that event, the Commission shall notify any requesting manufacturer and the Administrative Agency of the other state of the refusal and the reasons therefor.

SECTION 15 PROCEDURES FOR RECIPROCITY CERTIFYING MANUFACTURED BUILDINGS, BUILDING COMPONENTS OR MOBILE HOMES

A manufacturer from a jurisdiction to which reciprocity has been extended shall submit to the Commission evidence that his building system and compliance assurance program have been approved by such state or governmental agency. The Commission shall verify the approval and shall notify the State Administrative Agencies, local enforcement agencies and the manufacturer in writing of such verification and that properly labeled buildings, building components or mobile homes of his manufacture will be accepted.

SECTION 16 SUSPENSION AND REVOCATION

The Commission shall suspend or revoke or cause to be suspended or revoked, the acceptance or certification or both of such reciprocally certified manufactured buildings, building components or mobile homes if the State Enforcement Agencies determine that the standards for the manufacture and inspection of which manufactured buildings, building components or mobile homes of such other state or other governmental agency do not meet the objectives of the appropriate Codes and these Rules and Regulations, or that such standards are not being enforced to the satisfaction of the State Enforcement Agencies. If such other state or governmental agency or its agents should suspend or revoke its approval and certification, the acceptance of certification or both granted under this Part shall be revoked or suspended accordingly. Notice to the State Administrative Agencies, local enforcement agencies, manufacturer and to the Administrative Agency of such other state of such suspension or revocation shall be in writing with the reasons for such suspension or revocations set forth therein. Appeals from such suspension or revocations shall receive timely review.

PART V APPEALS

SECTION 17 HEARINGS

All hearings shall comply with the applicable sections of the applicable Codes and the Rules and Regulations thereof established for the purpose of appeal.

PART VI SCHEDLUE OF FEES

SECTION 18 ESTABLISHMENT

The following is the SCHEDULE OF FEES established by the State Administrative Agencies for certifying manufactured buildings, building components and mobile homes. Fees shall be made payable to the "Commonwealth of Massachusetts State Building Code Commission" and shall accompany all applications for certification.

18.1 COMPLIANCE ASSURANCE PROGRAMS AND BUILDING SYSTEMS

a) An initial fee of five hundred ($500.00) dollars shall be charged each manufacturer for its certified compliance assurance program for each plant desiring certification. There shall be an additional charge of one hundred ($100.00) dollars per certified building system, except that there shall be no such additional charge per building component. The maximum fee charged under this section shall be one thousand ($1,000.00) dollars for each manufacturing plant.

18.2 THIRD PARTY INSPECTION AGENCIES

a) An initial fee of five hundred ($500.00) dollars shall be charged to each third party inspection agency.

18.3 ANNUAL RENEWAL FEES

a) One year from the date of certification of the manufacturer and the third party inspection agency, and every year thereafter certification is in effect, there shall be paid an annual renewal fee of two hundred and fifty ($250.00) dollars for each such certification.

18.4 LABELS

a) A fee of twelve dollars and fifty ($12.50) cents per unit of a mobile unit of a mobile home or manufactured building shall be charged for each label issued by the Department. Double wide units of mobile homes shall be treated as two units for this purpose.

1) A "unit" as used in this section shall mean any building or portion thereof which is towed or shipped separately to be somehow tied toge at the site.

b) A fee of one ($1.00) dollar per building component shall be charged for each label issued by the Department for building components.

2) Manufacturers of building components shall be permitted to use

any labels as approved by State Administrative Agencies. If such labels are supplied by any source other than the Department, there shall be no charge for such labels.

c) Mutilated labels may be replaced at the option of the Department, at a cost of two ($2.00) dollars each.

d) Upon satisfactory proof to the Department of lost or stolen labels, not the result of negligence, labels may be replaced at a cost of two ($2.00) each.

e) Labels shall be purchased from the Department by the inspection agency or manufacturer.

ARTICLE 20

LIGHT-TRANSMITTING PLASTIC CONSTRUCTION

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 plastics which meet the strength, durability, sanitary and fireresistive requirements of the Basic Code and the reference standards of this article, shall be permitted, subject to the limitations of this article.

2000.11 APPLICATION FOR APPROVAL: Applicants desiring to use an approved plastic material, shall furnish evidence of the approval for the intended use from the State Building Code Commission.

2000.2 IDENTIFICATION: All plastic materials approved for use under the Basic Code shall be identified by the trade formula number or name or other acceptable identification so that it can be ascertained that the material is approved.

SECTION 2001.0 DEFINITIONS

APPROVED PLASTIC: any thermoplastic, thermosetting or reinforced thermosetting plastic material which meets the requirements of section 2000.1.

Class SE: plastic materials which are self-extinguishing (ASTM D 635).
Class VSB: plastic materials which have a burning rate less than 0.8 inches per minute (ASTM D 635).
Class SB: plastic materials which have a burning rate of less than 2.5 inches per minute (ASTM D 635).

Materials that give off smoke or gases more dense or more toxic than that given off by conventionally used interior finish materials under comparable exposure to heat or flame shall not be permitted.

LIGHT-DIFFUSING SYSTEM: a suspended construction consisting in whole or in part of lenses, panels, grids or baffles suspended below lighting fixtures.

PLASTIC GLAZING: material glazed or set in frame or sash and not held by mechanical fasteners which pass through the glazing material.

PLASTIC ROOF PANELS: approved plastic materials which are mechanically fastened to structural members or to structural panels or sheathing and which are used as light-transmitting media in roofs.

PLASTIC WALL PANEL: approved plastic materials which are mechanically fastened to structural members or to structural panels or sheathing and which are used as light-transmitting media in exterior walls.

REINFORCED THERMOSETTING PLASTIC: a thermosetting plastic reinforced with a glass fiber mat having not less than one and one-half (1 1/2) ounces of glass fiber per square foot.

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 non-reformable product when cured under the application of heat or pressure.

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

2003.1 USE IN TYPE 4-B CONSTRUCTION: Doors, sash and framed openings which are not required to be fire protected may be glazed with approved plastic materials in buildings of Type 4-B construction.

2003.2 USE GROUP D: In all types of construction of use group D, doors, sash and framed openings which are not required to be fire protected may be glazed with approved plastic materials.

2003.3 OTHER CLASSES OF CONSTRUCTION AND USE GROUP: In other classes of construction and use, such openings not required to be fire protected by section 916 may be glazed or equipped with approved plastic materials subject to the following requirements:

a) The area of such glazing shall not exceed twenty-five (25) percent of the wall face of the story in which it is installed. (See section 2003.4.)

b) 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 a unit or pane shall not exceed four (4) feet. There shall be a minimum three (3) feet vertical spandrel wall between stories.

c) Exceptions:

1) 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 wall face and the story when installed in the first three (3) stories above grade.

2) Approved thermoplastic materials may be installed in areas up to fifty (50) percent of the wall area of each story in structures less than one hundred fifty (150) feet in height which are provided on each floor above the first floor 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 structural loading requirements.

2003.4 AUTOMATIC SPRINKLERS: When complete automatic fire sprinkler protection is provided in the building the permissible area of glazing permitted by 2003.3 (a) may be increased one hundred (100) percent.

SECTION 2004.0 EXTERIOR WALL PANELS

2004.1 GENERAL: Approved plastic materials may be used as wall panels, in exterior walls not required to have a fireresistive rating (except in Use Groups A, F-1, F-2 and H), subject to the following requirements:

2004.11 INSTALLATION: Exterior wall panels installed as provided herein shall not alter the type-of-construction classification of the building.

2004.12 AREA LIMITATION AND SEPARATION: Area limitation and separation requirements of exterior wall panels shall be as provided in table 20-1.

2004.13 SPANDREL SEPARATION: Vertical spandrel wall separation between stories shall be as follows:

a) Three (3) feet for SE and VSB plastic wall panels.

b) Four (4) feet for SB plastic wall panels.

2004.14 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 thirty-six (36) inches from the surface of the wall in which plastic wall panels are installed, there need be no vertical separation at that floor except that provided by the vertical thickness of the projection.

2004.2 AUTOMATIC SPRINKLERS: 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 given in table 20-1 may be increased one hundred (100) percent, but in no case shall the area of plastic wall panels exceed fifty (50) percent of the wall area.

TABLE 20-1 - AREA LIMITATION AND SEPARATION REQUIREMENTS FOR PLASTIC WALL PANELS*

Fire Separation (ft.)	Class of Plastic	Max. % Area of Ext. Walls in Plastic Panels	Max sq. ft. Single area	Minimum Separation of Panels (ft.) Vertical	Horizontal
6 ft. or less	-	NP	NP	-	-
6 ft. or more	SE	10	50	8	4
But less than 11 ft.	VSB,SB	NP	NP	-	-
11 ft. or more	SE	25	90	6	4
But less than 30 ft.	VSB,SB	15	70	8	4
Over 30	SE,VSB	50	Not Limited	3**	0
	SB	50	100	6**	3

**See section 2004.14.

2004.3 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 installations.

SECTION 2005.0 ROOF PANELS

2005.1 GENERAL: Approved plastic roof panels may be installed (except in use groups A, F-1, 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 fireresistance rating by table 2-5.

Roof panels shall meet the requirements of sections 302.6 Roof Coverings, 903.4 Classifications of Roof Coverings, and 928.0 Roof Coverings, except when installed on buildings outside Fire District No. 1.

2005.2 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.

2005.3 LOCATION: Where exterior wall openings are required to be fire protected by section 916, no roof panel or unit shall be installed within six (6) feet of such exterior wall.

2005.4 AREA LIMITATIONS: Roof panels or units 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 the following:

Class of Plastic	Maximum Area Individual Unit or Panel (sq. ft.)	Maximum Aggregate Area (% of Floor Area)
SE	300	30
VSB	200	25
SB	100	20

2005.5 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 2005.4.

b) low hazard uses such as swimming pool shelters, greenhouses, etc. are exempt from the panel area limitations of section 2005.4 provided the buildings 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

2006.1 SKYLIGHT ASSEMBLIES: Skylight assemblies may be glazed with approved plastic materials (except in use group A) in accordance with the following provisions.

2006.11 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.

2006.12 MAXIMUM AREA OF SKYLIGHT UNITS: Each skylight unit shall have a maximum area within the curb of one hundred (100) square feet.

2006.13 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.

2006.14 SEPARATION: Skylights shall be separated from each other by a distance of not less than four (4) feet measured in a horizontal plane.

2006.15 LOCATION: Where exterior wall openings are required to be fire protected by section 916, no skylight shall be installed within six (6) feet of such exterior wall.

2006.16 EXCEPTIONS: Except for use 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 2006.13 if the skylights are used as a fire venting system or if the building is equipped with a complete automatic fire sprinkler system.

2006.17 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.

SECTION 2007.0 LIGHT-DIFFUSING SYSTEMS

2007.1 GENERAL: Light-diffusing systems shall not be installed in use groups A and H nor in exitways. Plastic diffusers shall be supported directly or indirectly from ceiling or roof construction by use of noncombustible hangers. Hangers shall be at least No. 12 U.S. Standard gauge galvanized wire or equivalent.

2007.2 INSTALLATION: Approved plastic diffusers shall comply with section 922 (Interior Finish) unless the plastic panels will fall from their mountings before igniting and at an ambient temperature of at least two hundred (200) degrees F. below their ignition temperature.

2007.3 SIZE LIMITATIONS: Individual panels or units shall not exceed ten (10) feet in length nor sixteen (16) square feet in area.

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 installations only above the light-diffusing system. Areas of light-diffusing systems shall not be limited if properly protected by approved automatic sprinklers.

SECTION 2008.0 PARTITIONS

2008.1 GENERAL: Approved plastic partitions may be installed as provided in section 910.4 Exceptions to Fireresistive Partitions.

SECTION 2009.0 BATHROOM ACCESSORIES

2009.1 USE OF PLASTICS: Approved plastics shall be permitted as glazing in shower stalls, shower doors, bathtub enclosures, and similar accessory units.

Reference Standards Article 20

ANSI	Z97.1	1972	Performance Specifications and Methods of Test for Transparent Safety Glazing Material Used in Buildings
ASTM	D374	1973	Tests for Thickness of Solid Electrical Insulation
ASTM	D635	1972	Test for Flammability of Self-Supporting Plastics
ASTM	D1929	1968	Test for Ignition Properties of Plastics
ASTM	D2843	1970	Standard Method of Test for Measuring the Density of Smoke from the Burning of Decomposition of Plastics
ASTM	E84	1970	Method of Test for Surface Burning Characteristics of Building Materials

ARTICLE 21

BUILDING CODE PROVISIONS FOR ONE AND TWO FAMILY DWELLINGS

Contained within Article 21 of the State Building Code are provisions which shall regulate one and two-family dwellings. These provisions are supplied to provide a single comprehensive basic reference for one and two-family dwellings.

The requirements for one and two-family dwellings are also supplied in other articles of the Basic Code on a performance-oriented basis. This article supplies far more extensive information on acceptable specifications, details, and methods of construction for one and two-family dwellings.

The provisions supplied within Article 21, as they apply to one and two-family dwellings, shall be considered as being applicable as stated, independently of the rest of the Basic Code. Any requirements for which provision is not made within this article, shall be subject to the provisions of the other articles of the Basic Code.

ARTICLE 21

BUILDING CODE PROVISIONS FOR ONE AND TWO-FAMILY DWELLINGS

SECTION 2100.0 BUILDING PLANNING

2100.1 GENERAL: Conformity with the applicable material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2100.2 DESIGN CRITERIA: One and two-family dwelling structures shall be designed based on the wind, snow and live load crtieria of Article 7 of the Basic Code and the live load criteria of Appendix H of the Basic Code.

2100.3 LOCATION ON LOT: Exterior walls of dwellings located less than two (2) feet from property lines shall have not less than one (1) hour fireresistive rating.

Openings shall not be permitted in exterior walls of dwellings located less than three (3) feet from the property line.

2100.4 LIGHT AND VENTILATION: All habitable rooms shall be provided with aggregate glazing area of not less than ten (10) square feet nor one-tenth (1/10) of the floor area of such rooms. One-half (1/2) of the required area of glazing shall be openable.

EXCEPTION: A combination of natural and mechanical ventilation shall be allowed when evidence is submitted that the combination meets the minimum requirements established in this article.

The minimum design standard for mechanical ventilation, either used by itself or in combination with natural ventilation, shall be 0.25 cfm/ft^2 of room floor area.

The maximum mechanical ventilation allowed for bathroom and kitchen shall be fifty (50) cfm for each room.

If a window is available in a bathroom, which is unrestricted and opens directly to the outer air, no mechanical ventilation shall be necessary.

2100.5 ROOM SIZES: Habitable rooms shall have an area of not less than seventy (70) square feet.

Habitable rooms except kitchens shall be not less than seven (7) feet in any horizontal dimension.

2100.6 CEILING HEIGHT: Habitable rooms shall have a clear height from floor to finished ceiling of not less than seven and one-half (7 1/2) feet, except that in attics and top stories the height shall

be not less than seven and one-third (7 1/3) feet over not less than one-third (1/3) the area of the floor when used for sleeping, study or similar activity.

EXCEPTION: Beams and girders spaced not less than four (4) feet on center may project not more than six (6) inches below the required ceiling height.

All other rooms, including hallways and corridors, shall have a ceiling height of not less than seven (7) feet measured to the lowest projection from the ceiling.

2100.7 SANITATION: Every dwelling unit shall meet the requirements of the Department of Public Health and the Massachusetts State Plumbing Code relative to sanitation.

2100.8 GLAZING: Glazing in entrance and exit doors and fixed glazed panels immediately adjacent to doors, sliding glass doors, storm doors, bathtub enclosures, shower doors, and similar glazed

TABLE 2100-1 GLAZING REQUIREMENTS

Glazing Location	Size of Individual Panes	Thickness and Type of Glass Permitted[1]						
		.115 in. Annealed	3/16 in. Annealed (minimum)	1/8 in. Tempered[2]	3/16 in. Tempered[2]	1/4 in. Laminated[2]	1/4 in. Wire[2]	1/8 in. Rigid Plastic[2]
Entrance & Exit Doors & Adjacent Fixed Glazed Panels	Over 6 sq/ft.	No	Yes	Yes	Yes	Yes	Yes	Yes
Sliding Glass Doors (both fixed & sliding panels)	All sizes	No	No	Yes	Yes	Yes	Yes	Yes
Storm Doors	All sizes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shower Doors	All sizes	No	No	Yes	Yes	Yes	Yes	Yes
Bathtub Enclosures	All sizes	No	No	Yes	Yes	Yes	Yes	Yes

Note 1: Glass shall conform with reference standard RS-21-2. Annealed glass shall be protected by grills on both exposed sides.

Note 2: Safety Glazing Materials shall conform with reference standard RS-21-2.

The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

MICHAEL S. DUKAKIS
GOVERNOR
CHARLES A. J. THEODORE
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

(617) 72

MEMORANDUM

TO: All Code Purchasers

FROM: Charles J. Dinezio, Executive Director
State Building Code Commission

DATE: October 8, 1975

SUBJECT: Section 2100.11 of the State Building Code (Page 21-3)

This is merely to notify you that in the reprinting of the second edition of the State Building Code an editorial error had been made.

The correct minimum width of a hallway or exitway access is 3 feet NOT 3' 8" as indicated.

Please correct your code books accordingly.

CJD:av

ACP-103-75

openings which may be subject to frequent and recurrent accidental human impact shall comply with Table 2100-1.

Such glass shall be identified by a permanent marking on each piece.

EXCEPTION: Fixed glass panels nineteen (19) inches or less in width or located not less than eighteen (18) inches above adjacent finished floor or walking surfaces.

2100.9 PRIVATE GARAGES: There shall be no openings from a private garage directly into a room used for sleeping purposes. Other openings between the garage and residence shall be equipped with doors of wood or steel or composite construction providing a fire rating equivalent to twenty (20) minutes.

The garage shall have five-eighths (5/8) inch fire code sheetrock on any side facing or adjacent to the house, and wherever the attic area is continuous between the garage and the house a firestop of one-half (1/2) inch gypsum sheetrock shall be used to form a barrier to separate the garage and house.

Garage and carport floor surfaces shall be of approved noncombustible material.

2100.10 MEANS OF EGRESS: In one and two-family dwellings, each dwelling unit shall have two independent means of egress, remote as possible from each other and leading to grade, in addition, every floor within a dwelling unit shall have at least one (1) means of egress which shall provide a continuous and unobstructed path leading to grade.

Sleeping rooms shall have at least one (1) openable window or exterior door to permit emergency exit or rescue. Where windows are provided they shall have a sill height of not more than forty-eight (48) inches above the floor and shall provide not less than five (5) square feet of openable area with no dimension less than twenty-two (22) inches.

2100.11 DOORWAYS AND HALLWAYS: The minimum clear width of single doorways shall be thirty-two (32) inches; except at grade level leading directly to the outside, the doorway may be thirty (30) inches in width.

The minimum clear width of every exitway doorway to or from a stairway shall be thirty-six (36) inches.

The minimum height of required egress doorways shall be six (6) feet eight (8) inches.

The minimum width of a hallway or exitway access shall be three (3) feet ~~eight (8) inches.~~

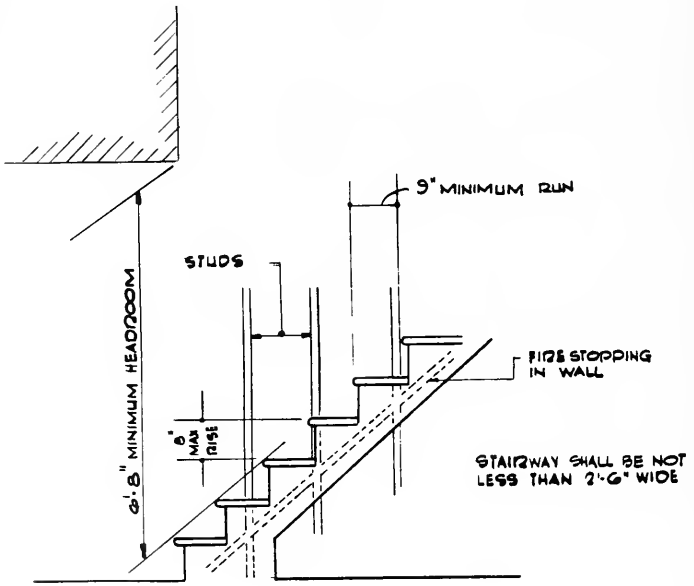
2100.12 LANDING: A landing shall be provided on each side of an exit door and shall have a minimum width and depth of three (3) feet. Storm, screen or other doors accessory to exit doors which swing over stairs shall require a landing where it swings in the direction of stairs.

EXCEPTION: A landing is not required where the exit door does not swing over the stair.

The landing over which a door does not swing shall be located not more than seven and one-half (7 1/2) inches below the threshold level. The landing over which the door swings shall be located not more than one and one-half (1 1/2) inches below the threshold level.

2100.13 STAIRWAYS: Stairways shall be not less than three (3) feet in clear width and the headroom, rise and run shall conform to Figure 2100-1. Minimum headroom for basement and service stairs shall be six (6) feet four (4) inches. Handrails may project from each

FIGURE 2100-1



STAIR DETAIL

NOTE: INDICATE FIRESTOPPING AS THE DOTTED LINES PARALLEL TO THE STAIR STRINGERS

side of stairway a distance of three and one-half (3 1/2) inches into the required width.

Spiral stairways are permitted provided the width of the tread at a point not more than twelve (12) inches from side where the treads are narrower is not less than nine (9) inches and the minimum width is not less than six (6) inches.

2100.14 HANDRAILS AND GUARDRAILS: Handrails having minimum and maximum heights of thirty (30) inches and thirty-four (34) inches, respectively, measured vertically from the nosing of the treads shall be provided on at least one (1) side of stairways of three (3) or more risers. Open sides of stairs shall be protected.

All enclosed floor and roof openings, open and glazed sides of landings and ramps, balconies or porches which are more than thirty (30) inches above grade or floor below, and roofs used for other than service of the building, shall be protected by guardrails. Guardrails shall be not less than thirty-six (36) inches in height. Open guardrails and stair railings shall have intermediate rails or an ornamental pattern such that a sphere six (6) inches in diameter cannot pass through. The height of stair railings on open sides may be thirty (30) to thirty-four (34) inches in height in lieu of providing a thirty-six (36) inch guardrail and handrail.

2100.15 GUTTERS: Gutters shall be provided when roof overhangs are less than twelve (12) inches in width for one (1) story or twenty-four (24) inches in width for two (2) stories.

2100.16 MINIMUM SIZE OF GUTTERS: Gutters shall have the same area as downspouts for spacings up to forty (40) feet between downspouts. The width of the gutter shall be increased by one (1) inch for each additional twenty (20) feet of gutter.

2100.17 DOWNSPOUTS: Downspouts shall be sized on the basis of approximately one hundred (100) square feet of roof surface to one (1) square inch leader.

2100.18 SMOKE/HEAT DETECTORS: Every building or structure erected or substantially altered to be occupied as a one or two-family dwelling unit shall be protected throughout with automatic smoke or smoke and heat detection devices. Such devices shall initiate the sounding of an alarm capable of being heard in all occupied areas. Such a system shall conform to the requirements of reference standard RS-21-13.

SECTION 2101.0 FOUNDATIONS

2101.1 GENERAL: Foundations, footings and basement walls shall be constructed in accordance with the requirements of this section.

2101.2 MATERIALS: Conformity with the applicable standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

The ultimate compressive strength of concrete at twenty-eight (28) days shall be not less than two thousand (2,000) pounds per square inch except where weather exposure requires a greater strength or cement content.

2101.3 FOOTINGS: All exterior walls shall be supported on continuous solid masonry or concrete footings. Where the bearing capacity of the soil can be demonstrated as adequate, the footing may be eliminated. Other structural systems which can be shown to be adequate for the conditions to safely support all imposed loads, may be used.

Foundation walls shall extend at least six (6) inches above the finished grade adjacent to the foundation at all points.

Foundations for all buildings where the surface of the ground slopes more than one (1) foot in ten (10) feet shall be level or shall be stepped so that both top and bottom of such foundations are level.

Unformed foundation walls may be used when soil conditions warrant and subject to the approval of the building official.

Foundation walls in all cases shall extend below the frost line.

2101.4 BASEMENT WALLS: Basement walls shall be constructed in accordance with the provisions of this section and footings in accordance with accepted practice.

Where unstable soil or ground water conditions do not exist, walls may be constructed of unreinforced masonry or concrete with the thickness shown in Table 2101-1.

Where unstable soil conditions exist or in Seismic Zones specified by the State Building Code Commission, basement walls may be constructed of reinforced masonry or concrete as set forth in Table 2101-2 provided the walls are not subjected to equivalent fluid pressures of more than thirty (30) pounds per square foot.

EXCEPTION: Basement walls retaining less than four (4) feet of unbalanced fill need not be reinforced.

Basement walls subjected to more than thirty (30) pounds per square foot equivalent fluid pressure shall be designed in accordance with accepted engineering pratices.

Backfill adjacent to the wall shall not be placed until the wall has sufficient strength or has been sufficiently braced to prevent damage by the backfill.

Basement walls shall be drained and dampproofed in accordance with Section 2101.5 and Section 2101.6 respectively.

TABLE 2101-1 MINIMUM THICKNESS AND ALLOWABLE DEPTH OF UNBALANCED FILL FOR UNREINFORCED MASONRY AND CONCRETE BASEMENT WALLS[1] WHERE UNSTABLE SOIL OR GROUND WATER CONDITIONS DO NOT EXIST

Foundation Wall Construction	Nominal Thickness (inches)	Maximum depth of unbalanced fill in feet[1]		
		Type of Super-Structure		
		Wood Frame	Masonry Veneer	Masonry
Masonry of Hollow Units	8	4 (6)	4.5 (6)	5 (7)
	10	5 (7)	5.5 (7)	6 (7)
	12	7	7	7
Masonry of Solid Units	6	3	4	4
	8	5 (7)	5.5 (7)	6 (7)
	10	6 (7)	6 (7)	6.5 (7)
	12	7	7	7
Plain Concrete	6[2]	4	4	4
	8	7	7	7
	10	7	7	7
	12	7	7	7
Rubble Stone	Foundation walls of rubble stone shall be at least 16 inches thick. Rough or random rubble shall not be used as foundations for walls exceeding 35 feet in height.			

Note 1: The depth of unbalanced fill may be increased up to the values shown in parenthesis where it is warranted by soil conditions. Unbalanced fill is the height of outside finish grade above the basement floor or inside grade.

Note 2: Six (6) inch plain concrete walls shall be formed both sides.

TABLE 2101-2 REINFORCEMENT REQUIRED FOR BASEMENT WALLS SUBJECTED TO NOT MORE THAN 30 POUNDS PER SQUARE FOOT EQUIVALENT FLUID PRESSURE

Material Type	Height of[3] Unbalanced Fill in Feet	Length of Wall Between Supporting Masonry or Concrete Walls in Feet	Minimum[1] Wall Thickness in Inches	Required Reinforcing	
				Horizontal Bar in Upper 12 Inches of Wall	Size and Spacing of Vertical Bars
Hollow Masonry	4 or less	unlimited	8	not required	not required
	more than 4	design required	design req.	design required	design required
Concrete or Solid Masonry[2]	4 or less	unlimited	8	not required	not required
	more than 4	less than 8	8	2-No. 3	No. 3 @ 18" O.C.
	8 or less	8 to 10	8	2-No. 4	No. 3 @ 18" O.C.
	8 or less	10 to 12	8	2-No. 5	No. 3 @ 18" O.C.
	more than 8	design required	design req.	design required	design required

Note 1: Thickness of concrete walls may be six (6) inches provided reinforcing is placed not less than one (1) inch nor more than two (2) inches from the face of the wall not against the earth.

Note 2: Solid masonry shall include solid brick or concrete units and hollow concrete units with all cells grouted.

Note 3: Backfilling shall not be commenced until after the wall is anchored to the floor.

2101.5 WATERPROOFING: Drains shall be provided around foundations enclosing habitable or usable spaces located below grade and which are subjected to ground water conditions. Drains shall be installed at or below the area to be protected and shall discharge by gravity or by mechanical means into an approved drainage system.

The top joints and perforations of drain tiles shall be protected with strips of building paper and the tiles shall be placed on two (2) inches of crushed rock and covered with not less than six (6) inches of the same material.

2101.6 DAMPPROOFING: Exterior foundation walls of masonry construction enclosing basements shall be dampproofed by applying not less than three-eighths (3/8) inch of portland cement parging to the wall from footing to finish grade. The parging shall be covered with a coat of approved bituminous material applied at the recommended rate. Exterior foundation walls of concrete

construction enclosing basements shall be dampproofed by applying a coat of approved bituminous material to the wall from the footing to the finish grade at the recommended rate.

Foundation walls of habitable rooms located below grade shall be waterproofed with membranes extending from the edge of the footing to the finish grade line. The membrane shall consist of either two (2) ply hot-mopped felts, six (6) mil polyvinyl chloride, fifty-five (55) pound roll roofing or equivalent material. The laps in the waterproofing membrane shall be sealed and firmly affixed to the wall.

Basement walls may be dampproofed or waterproofed using materials or methods of construction other than covered in the section where approved by the building official.

2101.7 FOUNDATION STUDS: Foundation studs shall have a minimum length of fourteen (14) inches and shall be not less in size and spacing than the studding required for exterior walls, and when exceeding four (4) feet in height shall be of the size required for an additional story.

Foundation studs of exterior walls and bearing partitions shall be thoroughly and effectively braced in accordance with Figure 2102-2.

Column bases shall be protected against decay or corrosion except when approved wood of natural decay resistance or treated wood as set forth in Section 2101.8 is used.

EXCEPTION: Basement posts or columns supported by piers projecting two (2) inches above the finish floor and separated therefrom by an approved impervious barrier.

The columns shall be adequately anchored to prevent lateral displacement at either their top or the bottom. Wood columns shall be not less in nominal size than four (4) inches by four (4) inches and steel columns shall be not less than three (3) inch diameter standard pipe or approved equivalent.

2101.8 PROTECTION AGAINST DECAY AND TERMITES: The expression "approval" as used in the following statements means approval in accordance with the procedure established by the Basic Code.

a) WHERE CONDITIONS ARE FAVORABLE TO DECAY:

1) WOOD IN CONTACT WITH THE GROUND: All wood in contact with the ground and supporting permanent structures shall be approved or treated wood.

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

occupance, for temporary structures and for fences.

b) 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 or treated wood. Adequate ventilation shall be provided.

c) SILLS: All sills which rest on concrete or masonry exterior walls and are less than six (6) inches from exposed earth shall be of approved durable or treated wood.

d) SLEEPERS AND SILLS: Sleepers and sills on a concrete or masonry slab which is in direct contact with earth shall be of approved durable or treated wood.

e) POSTS OR COLUMNS: Posts or columns in cellars shall be supported by piers projecting at least two (2) inches above the finish floor and separated therefrom by an approved impervious barrier except when approved durable or treated wood is used. Posts or columns used in damp locations below grade shall be of approved durable or treated wood.

f) 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 or treated wood is used.

g) CLEARANCE BETWEEN WOOD SIDING: Clearance between wood siding and earth on the exterior of a building shall be not less than six (6) inches.

h) WHERE APPROVED DURABLE OR TREATED WOODS ARE REQUIRED: Where approved durable or treated woods are required in this Code, the building official may require identification by an approved mark or certificate of inspection.

i) PRESSURE TREATMENT: Where pressure treatment of wood members is required by the Basic Code, preservatives and methods of treatment shall conform to the standards for pressure treatment and preserving of lumber listed in the reference standards of this article.

j) WOOD APPROVED FOR USE IN ACCORDANCE WITH SECTION 2101.8 a, 1, AS BEING DECAY RESISTANT ARE AS FOLLOWS: heartwood of redwood, cypress, black walnut, catalpa, chestnut, osage orange, red mulberry, white oak or cedar.

k) WOOD APPROVED FOR USE IN ACCORDANCE WITH SECTION 2101.8 a, 1, AS BEING TERMITE RESISTANT ARE AS FOLLOWS: heartwood of bald cypress, redwood and eastern red cedar.

Lumber and plywood required to be preservatively treated in accordance with this article shall bear the quality mark of an approved inspection agency.

2101.9 UNDERFLOOR SPACE: The space between the bottom of the floor joists and the earth under any building (except such space as is occupied by a basement or cellar) shall be provided with a sufficient number of ventilating openings through foundation walls or exterior walls to insure ample ventilation, and such openings shall be covered with a corrosion-resistant wire mesh not greater than one-half (1/2) inch nor less than one-quarter (1/4) inch in any dimension. The minimum total area of ventilating openings shall be proportioned on the basis of two (2) square feet for each one hundred (100) square feet of crawl space area. One such ventilating opening shall be within three (3) feet of each corner of said buildings.

EXCEPTIONS:

a) Ventilation openings may be vented to the interior of buildings where warranted by climatic conditions.

b) The total area of ventilation openings may be reduced to one-fifteen-hundredths (1/500) of the underfloor area where the ground surface is treated with an approved vapor barrier material.

c) Ventilation openings may be omitted on one side.

An access crawl hole eighteen (18) inches by twenty-four (24) inches shall be provided to the underfloor space.

The underfloor grade shall be cleaned of all vegetation and organic material.

SECTION 2102.0 WALL CONSTRUCTION

2102.1 GENERAL: Wall and partition construction shall conform to the requirements of this section.

Conformity with the applicable grading material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2102.2 WOOD

a) IDENTIFICATION: All load-bearing lumber, plywood and particleboard shall conform to applicable standards or grading rules and shall be so identified by the grade mark, or certificate of inspection issued by an approved grading or inspection bureau or agency. The grade mark for such load-bearing lumber shall provide adequate information to determine the "f" and "E" values.

b) GRADE: All headers and studs shall be of No. 2, Standard or Stud Grade Lumber or equivalent.

EXCEPTIONS:

1) Bearing studs not supporting floors may be No. 3, One Star or Utility Grade or equivalent provided the studs are spaced not more than sixteen (16) inches on center.

2) Nonbearing studs may be of No. 3, One Star or Utility Grade or equivalent lumber.

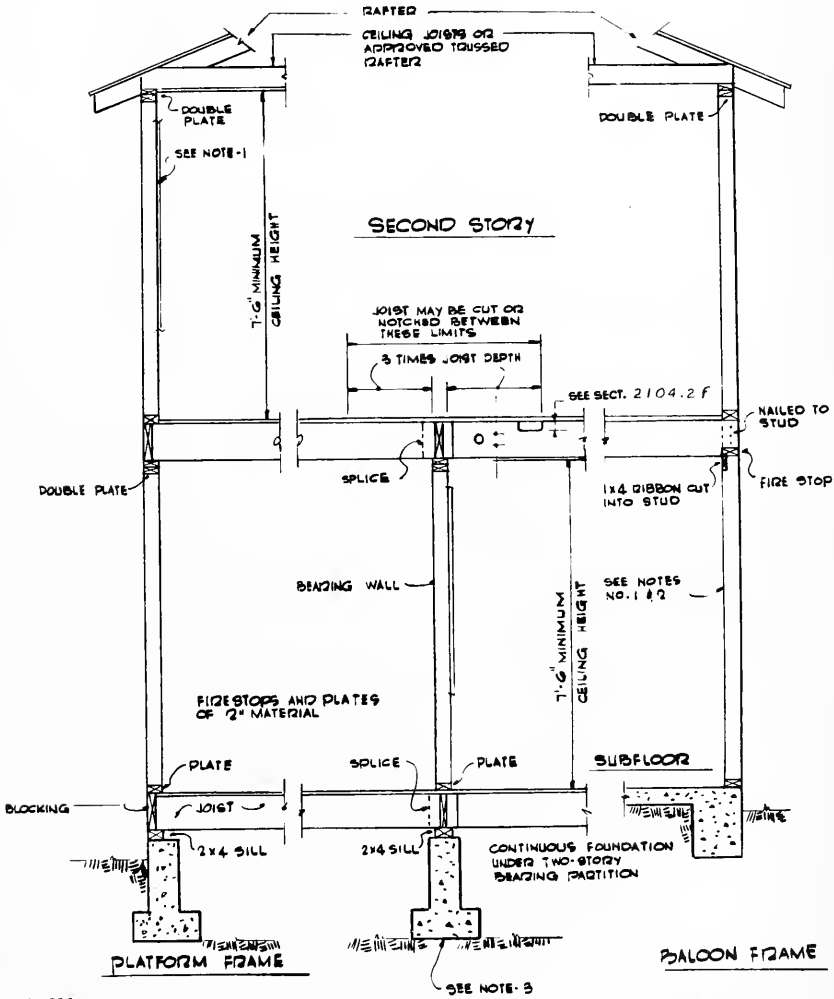
c) CONSTRUCTION: Exterior walls of wood frame residential buildings shall be constructed in accordance with Figures 2102-1 and 2102-2 and nailed in accordance with Table 2102-1.

Exterior walls subject to wind pressures greater than thirty (30) pounds per square foot, as established in the Basic Code shall be designed in accordance with accepted engineering practice.

Interior load-bearing partitions shall be constructed, framed and firestopped as specified for exterior walls. Interior nonbearing partitions may be constructed with two (2) inch by four (4) inch flat studs spaced sixteen (16) inches on centers.

d) CUTTING AND NOTCHING: Stud partitions containing plumbing, heating or other pipes shall be so framed and the joists underneath so spaced as to give proper clearance for the piping. Where bearing partitions containing such piping run parallel to the floor joists, the double joists required underneath such partitions shall be spaced to permit the passage of such pipes. Where plumbing, heating, or other pipes are placed in or partly in a partition, necessitating the cutting of the soles or plates, a metal tie not less than one-eighth (1/8) inch thick and one and one-half (1 1/2) inches wide shall be fastened to the plate across and to each side of the opening with not less than four (4) 16d nails.

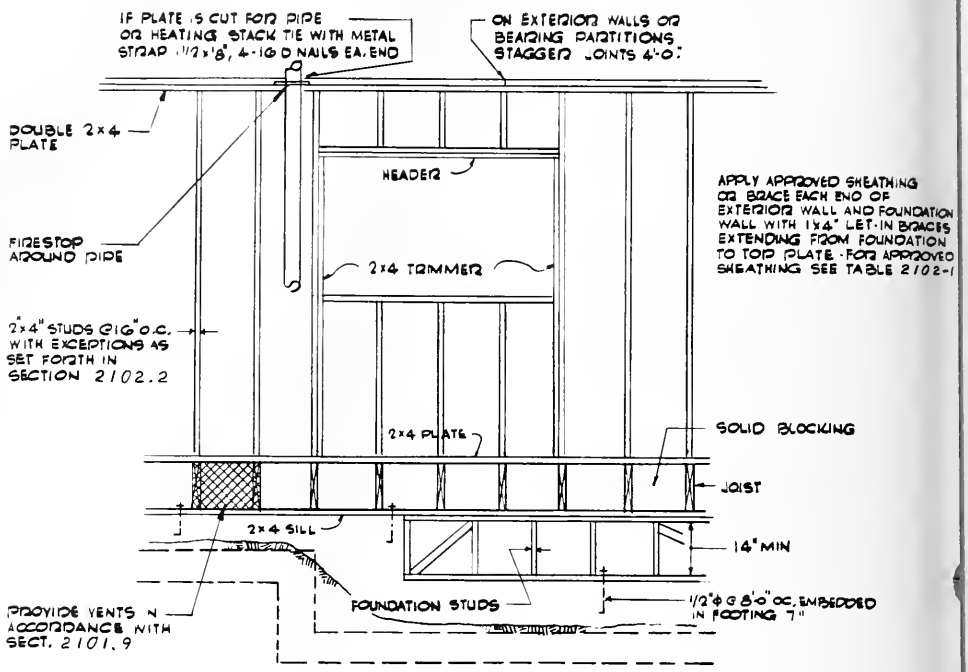
FIGURE 2102-1 STRUCTURAL FRAMING DETAILS



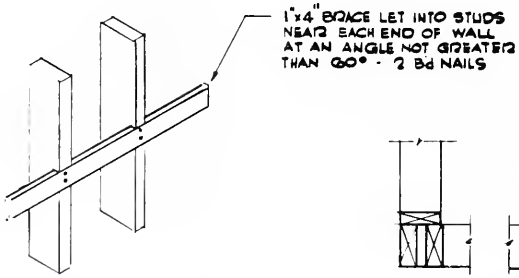
NOTES:

1. ALL BEARING STUDS IN ONE AND TWO STORY BUILDINGS SHALL BE 2"x4" SPACED 16" O.C. EXCEPTION: STUDS MAY BE SPACED 24" O.C. WHERE THEY DO NOT SUPPORT FLOORS AND ARE ADEQUATELY BRACED WITH FIGURE NO. B4 AND TABLE NO. 4A.
2. ALL BEARING STUDS IN THE FIRST STORY OF THREE STORY BUILDINGS SHALL BE EITHER 2"x6" OR 3"x4" SPACED 16" O.C.

FIGURE 2102-2 WALL FRAMING DETAILS



WALL FRAMING ABOVE FOUNDATION



LET-IN BRACE

CORNER STUDS

TABLE 2102-1 FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING MATERIALS	NUMBER & TYPE[1] OF FASTENER[2, 3, 5]	SPACING OF FASTENERS
Joist to sill or girder, toe nail	3-8d	-
1" x 6" subfloor or less to each joist, face nail	2-8d 2-staples, 1 3/4"	- -
Wider than 1" x 6" subfloor to each joist, face nail	3-8d 4-staples, 1 3/4"	- -
2" subfloor to joist or girder, blind and face nail Sole plate to joist or blocking, face nail Top or sole plate to stud, end nail Stud to sole plate, toe nail Doubled studs, face nail Doubled top plates, face nail Top plates, tapa and intersections, face nail	2-16d 16d 2-16d 4-8d or 3-16d 16d 16d 2-16d	- 16" o.c. - - 24" o.c. 16" o.c. -
Continued header, two pieces	16d	16" o.c. along each edge
Ceiling joists to plate, toe nail Continuous header to stud, toe nail Ceiling joist, taps over partitions, face nail Ceiling joist to parallel rafters, face nail Rafter to plate, toe nail	2-16d 4-8d 3-16d 3-16d 3-8d	- - - - -
1" brace to each stud and plate, face nail	2-8d 2-staples, 1 3/4"	- -
1" x 6" sheathing to each bearing, face nail	2-8d 2-staples, 1 3/4"	- -
1" x 8" sheathing to each bearing, face nail	2-8d 3-staples, 1 3/4"	- -
Wider than 1" x 8" sheathing to each bearing, face nail	3-8d 4-staples, 1 3/4"	- -
Built-up corner studs	16d	30" o.c.
Built-up girder and beams	20d	32" o.c. at top & bottom & ataggered 2-20d at ends & at ea. splice
2-inch planks	2-16d	at each bearing
Roof rafters to ridge, valley or hip rafters, toe nail face nail	 2-16d 3-16d	 - -
Collar ties to rafters, face nail	3-8d	-

TABLE 2102-1 (continued)

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION[1] OF FASTENERS[2, 3, 5]	SPACING OF FASTENERS edges	SPACING OF FASTENERS inter. sup.[4]
Plywood subfloor, roof and wall sheathing to frame			
1/2 inch - 5/16 inch	6d staple 16 ga.	6" 4"	10" 7"
5/8 inch - 3/4 inch	8d smooth or 6d deformed	6"	10"
7/8 inch	8d	6"	10"
1 inch - 1 1/8 inch	10d smooth or 8d deformed	6"	6"
Other wall sheathing[7]			
1/2" Fiberboard Sheathing	1-1/2" galvanized roofing nail 6d common nail staple 16 ga. 1-1/8" long	3"	6"
25/32" Fiberboard Sheathing	1-3/4" galvanized roofing nail 8d common nail staple 16 ga. 1-1/2" long	3"	6"
1/2" Gypsum Sheathing	1-1/2" galvanized roofing nail 6d common nail staple 16 ga. 1-1/2" long	4"	8"
Particleboard wall sheathing (Exterior-Type 2-B-1) 3/8" - 1/2"	6d common nail	6"	12"
5/8" - 3/4"	8d common nail staple 16 ga. 1-1/2" long	6"	12"
Combination subfloor-underlayment to framing			
3/4 inch and less	6d deformed	6"	10"
7/8 inch - 1 inch	8d deformed	6"	10"
1-1/8 inches - 1-1/4 inches	10d smooth or 8d deformed	6"	6"

Note 1: All nails are smooth-common, box or deformed shanks except where otherwise stated.

Note 2: Nail is a general description and may be T-head, modified round head or round head.

Note 3: Staples are 16 gauge wire and have a minimum seven-sixteenths (7/16) inch O.D. crown width.

Note 4: Nails shall be spaced at not more than six (6) inches o.c. at all supports where spans are forty-eight (48) inches or greater. Nails shall be spaced at not more than ten (10) inches o.c. at intermediate supports for floors.

Note 5: The number of fasteners required for connections not included in this table shall be based on the values set forth in Reference Standard RS-21-6.

Note 6: Four (4) foot x eight (8) foot or four (4) foot x nine (9) foot panels shall be applied vertically.

e) HEADERS: The allowable space for headers in bearing walls shall not exceed the values set forth in Table 2102-2.

Exceptions are allowed when an engineering analysis using standard accepted practice is provided to justify variations from the above table.

f) FIRESTOPPING: Firestopping shall be provided to cut off all concealed draft openings (both vertical and horizontal) and form an effective fire barrier between stories, and between a top story and the roof space. It shall also be used in:

1) stud walls at ceilings and floor levels.

2) any other locations not specifically mentioned above, such as holes for pipes, shafting, behind furring strips, and similar places which could afford a passage for flames.

Firestopping shall consist of approved noncombustible materials or of wood two (2) inches nominal thickness. If width of opening is such that more than one (1) piece of lumber is necessary, there shall be two (2) thicknesses of one (1) inch material with staggered joints.

TABLE 2102-2 MAXIMUM ALLOWABLE SPANS FOR HEADERS SUPPORTING WOOD FRAME WALLS

Size of Steel Header	Size of Wood Header [3,4]	Allowable Span of Headers in Feet for Bearing Walls [1,2]			
		No Story Above	One Story Above	Two Stories Above	Allowable Span of Headers in Garages or in Walls not Supporting Floors or Roofs
2-1/2 x 2-1/2 x 1/4	2-2" x 4"	4'	—	—	6'
3-1/2 x 3-1/2 x 1/4	2-2" x 6"	4' to 6'	4'	—	6' to 8'
6 x 1-7/8 JR	2-2" x 8"	6' to 8'	4' to 6'	—	8' to 10'
4 x 2-5/8	2-2" x 10"	8' to 10'	6' to 8'	4' to 6'	10' to 12'
7 x 2-1/8 JR	2-2" x 12"	10' to 12'	8' to 10'	6' to 8'	12' to 16'

Note 1: Based on ten (10) foot tributary floor and roof loads; in other words, headers located in exterior walls and supporting twenty (20) foot span joists or headers located in interior bearing walls and supporting joists spanning ten (10) foot wide rooms on each side.

NOTES FOR TABLE 2102-2 (continued)

Note 2: Based on header providing support for wall height equal to width of opening.

Note 3: Nominal four (4) inch wide single headers may be substituted for the double members.

Note 4: Spans are based on No. 2 or Standard Grade lumber. No. 3 Grade lumber may be used with appropriate design.

TABLE 2102-3 PLYWOOD WALL SHEATHING
Face Grain Parallel or Perpendicular to Studs

		Stud Spacing (inches)		
Minimum Thickness	Panel Identification Index	Siding Nailed to Studs	Sheathing Parallel to Studs	Siding Nailed to Sheathing Sheathing Perpendicular to Studs
5/16	12/0, 16/0 20/0	16	—	16
3/8	16/0, 20/0 24/0	24	16	24
1/2	24/0, 32/16	24	24	24

2102.3 METAL: Steel structural elements in walls and partitions may be either hot rolled structural steel shapes or bar sections or members cold formed to shape from steel sheet, strap or plate, or a fabricated combination thereof. Members shall be straight and free of any defects which would significantly affect their structural performance. The allowable span for steel headers in bearing walls shall not exceed the values set forth in Table 2102-3.

Aluminum structural elements in walls and partitions shall be constructed of materials and designed in accordance with accepted engineering practice.

2102.4 GENERAL MASONRY CONSTRUCTION:

a) CORBELING: Corbels may be built only into solid masonry walls twelve (12) inches or more in thickness. The projection for each course in such corbel shall not exceed one (1) inch and the maximum projection shall not exceed one-third (1/3) the total thickness of the wall when used to support structural members, and not more than six (6) inches when used to support a chimney built into the wall. The top course of all corbels shall be a header course.

b) COMBINED UNITS: In walls or other structural members composed of different kinds or grades of units, materials, or mortars, the maximum stress shall not exceed the allowable stress for the weakest of the combination units, materials, and mortars of which the member is composed. The net thickness of any facing unit which is used to resist stress shall be not less than one and one-half (1 1/2) inches.

c) PIERS: Every structural pier whose width is less than three (3) times its thickness shall be designed and constructed as required for columns.

d) CHASES: Chases and recesses in masonry walls shall be designed and constructed so as not to reduce the required strength or required fireresistance of the wall.

e) STACK BOND: In unreinforced masonry where masonry units are laid in stack bond, longitudinal reinforcements consisting of not less than two (2) continuous wires each with a minimum aggregate cross-sectional area of .017 square inch shall be provided in horizontal bed joints spaced not more than sixteen (16) inches on center vertically.

f) UNSUPPORTED HEIGHT: The unsupported height of masonry walls shall not exceed the values set forth in Table 2102-4. The unsupported height shall be measured between points of anchorage. Footings may be considered as points of lateral support.

Where wall stability is provided by intersecting walls or vertical stiffening elements such as pilasters, the unsupported length may be measured between these elements providing the stiffening elements are anchored to the roof and floor with connectors capable of transmitting all tributary wind and seismic forces.

TABLE 2102-4 ALLOWABLE SPAN FOR MASONRY WALLS BETWEEN LATERAL SUPPORTS

TYPE OF MASONRY WALL	ALLOWABLE[4] H or L (between supports)[1]
Stone	$14 \times t^2$
Cavity and[3] Hollow Units	$18 \times t^2$
Solid and Grouted (plain)	$20 \times t^2$
Reinforced Grouted	$25 \times t^2$

Note 1: Support may be provided by roofs, floors, foundations, beams, etc., in vertical direction or by pilasters, columns, piers, cross walls, etc., in horizontal direction, either but now both are required.

Note 2: "t" is taken as the nominal thickness of the wall in inches.

Note 3: "t" for cavity walls, is the sum of the nominal thickness of the wythes without the cavity.

Note 4: An additional unsupported height of six (6) feet is permitted for gable end walls.

g) LINTELS: Masonry walls shall be reinforced over openings in accordance with Table 2102-5. Exceptions are allowed when an engineering analysis using standard accepted practice is provided to justify variations from the table below.

The reinforcement shall be located in spaces fully grouted to a depth of not less than eight (8) inches and shall extend not less than twelve (12) inches beyond the sides of the opening.

TABLE 2102-5 ALLOWABLE SPAN FOR MASONRY AND STEEL LINTELS SUPPORTING MASONRY WALLS

Number of 1/2"[1] Diameter, or Equivalent Area, Reinforcing Bars	Allowable Span in[2] Feet and Inches			Structural[3] Steel
	No Floor Above	One Floor Above	Two Floors Above	
1	4'-6"	3'-0"	2'-6"	∠ 2-1/2 x 2-1/2 x 5/16 ∠ 3 x 3 x 1/4
2	6'-0"	4'-0"	3'-6"	∠ 3-1/2 x 3-1/2 x 5/16 ST 5 I
3	8'-6"	5'-0"	4'-0"	ST 5 ST 6 I
4	10'-0"	6'-0"	5'-0"	ST 6 ST 8 B

Note 1: Depth of reinforced lintels shall be not less than eight (8) inches and all cells of hollow masonry lintels shall be grouted solid. Reinforcing bars shall extend not less than eight (8) inches into the support.

Note 2: Based on ten (10) foot tributary floor and roof loads; in other words, headers located in exterior walls and supporting twenty (20) foot span joists or headers located in interior bearing walls and supporting joists spanning ten (10) foot wide rooms on each side.

Note 3: Extend steel lintels six (6) inches into the support.

h) ANCHORAGE: Masonry walls shall be anchored to floor and roof systems in accordance with the details shown in Figure 2102-3. Footings may be considered as points of lateral support.

i) REINFORCEMENT: Masonry walls subject to wind loads greater than forty (40) pounds per square foot shall be constructed in accordance with the requirements of this section. The minimum area of reinforcement shall be not less than 0.002 times the gross cross-sectional area of the wall, not more than two-thirds (2/3) of which may be used in either direction. No required vertical reinforcement shall be less than three-eighths (3/8) inch in diameter. Principal wall steel shall have a maximum spacing of four (4) feet on center. A lesser amount of reinforcement may be used to resist tensile stresses specified for partially reinforced masonry construction.

Partially reinforced walls may be considered as reinforced walls for unsupported height provisions provided the reinforcement is designed to resist all horizontal forces and the vertical reinforcement is spaced not more than eight (8) feet on center and not less than .2 square inch of horizontal reinforcement is provided at the top of footings, at top and bottom of openings, at the roof and floor levels and at the top of parapets.

All bars shall be completely embedded in mortar or grout. Joint reinforcement embedded in horizontal mortar joints shall have not less than five-eighths (5/8) inch mortar coverage from the exposed face. All other reinforcement shall have a minimum coverage of one (1) bar diameter over all bars, but not less than three-quarter (3/4) inch except where exposed to weather or soil in which cases the minimum coverage shall be two (2) inches.

j) BEAM SUPPORTS: Beams, girders or other concentrated loads supported by a wall or column shall have bearing of at least three (3) inches in depth measured parallel to the beam and three (3) inches in length upon solid masonry or upon a metal bearing plate of adequate design and dimensions to distribute the load safely, or upon a continuous reinforced masonry member projecting not less than four (4) inches from the face of the wall.

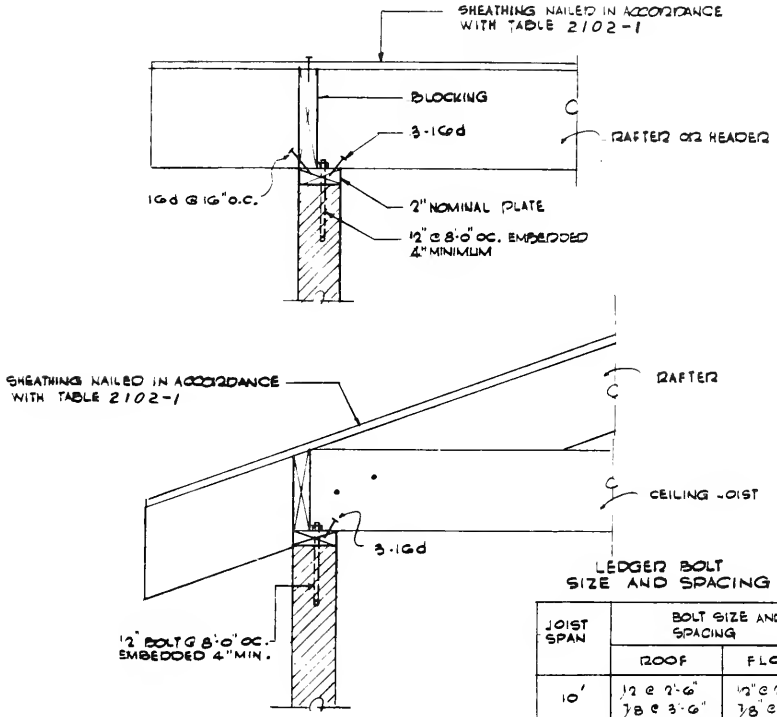
Joists shall be supported in accordance with Figure 2102-3.

2102.5 HOLLOW UNIT MASONRY:

a) GENERAL: Hollow unit masonry shall be laid with full face shell mortar beds and head and end joints shall be solidly silled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.

b) BONDING: Where two (2) or more hollow units are used to make up the thickness of a wall, the stretcher courses shall be bonded at vertical intervals not exceeding thirty-four (34)

FIGURE 2102-3 ANCHORAGE REQUIREMENTS FOR MASONRY WALLS LOCATED WHERE WIND LOADS ARE LESS THAN 30 P.S.F.

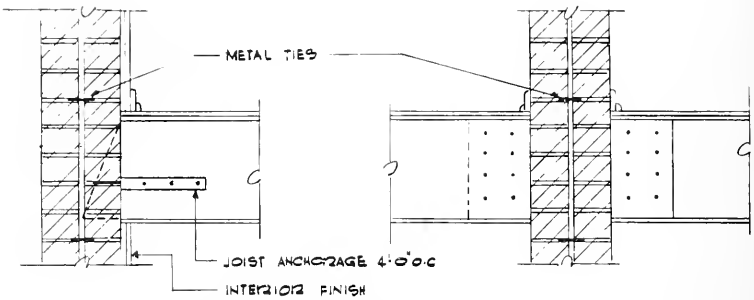


LEDGER BOLT SIZE AND SPACING

JOIST SPAN	BOLT SIZE AND SPACING	
	ROOF	FLOOR
10'	½ @ 2'-6" ⅞ @ 3'-6"	½" @ 2'-0" ⅞" @ 2'-9"
10'-15'	½ @ 1'-9" ⅞ @ 2'-6"	½ @ 1'-4" ⅞ @ 2'-0"
15'-20'	½ @ 1'-3" ⅞ @ 2'-0"	½" @ 1'-0" ⅞" @ 1'-6"

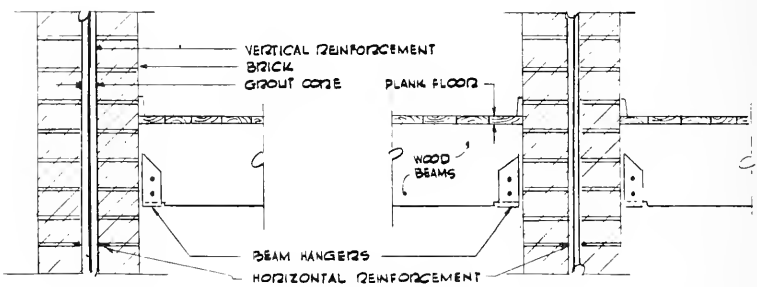
ANCHORAGE REQUIREMENTS FOR MASONRY WALLS

FIGURE 2102-3 (continued)



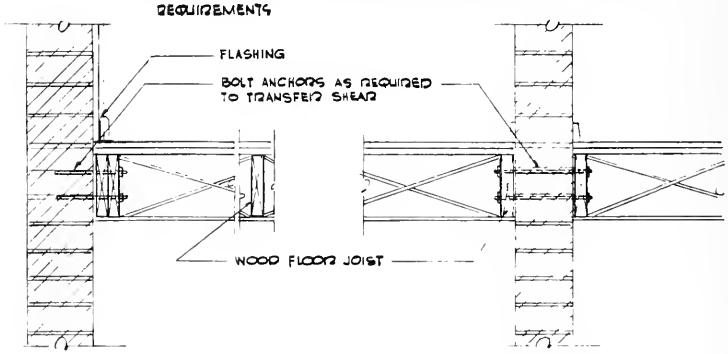
8" BRICK BEARING WALLS - WOOD JOIST FLOOR

1. MASONRY HEADER MAY BE USED IN LIEU OF METAL TIES
2. LARGER BRICK USED IN UNEXPOSED WYTHE FOR ECONOMY



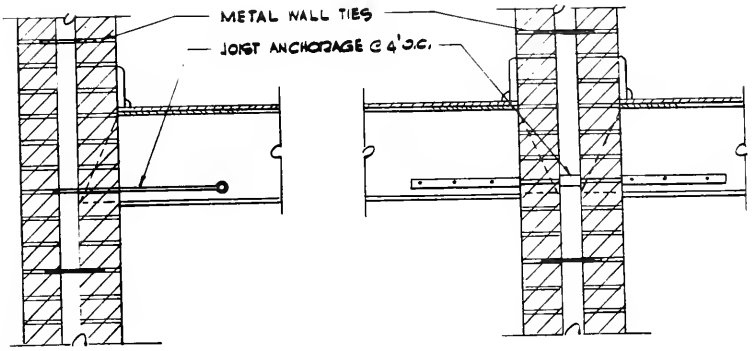
10" RBM BEARING WALLS - PLANK AND BEAM TIMBER FLOOR

1. HORIZONTAL AND VERTICAL REINFORCEMENT WILL VARY W/DESIGN REQUIREMENTS



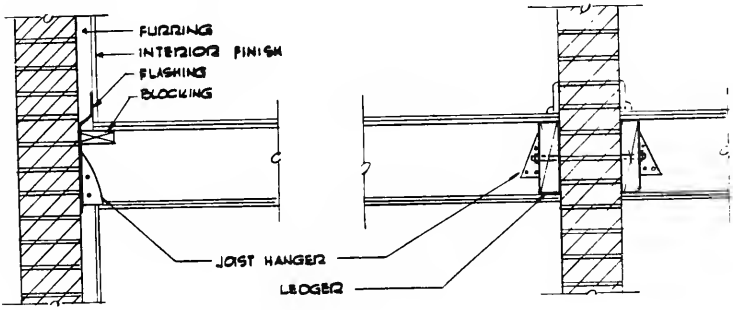
6" BRICK SHEAR WALLS - WOOD JOIST FLOOR

FIGURE 2102-3 (continued)



10" BRICK AND BRICK CAVITY BEARING WALLS
WOOD JOIST FLOOR

1. CAVITY IN INTERIOR WALLS PROVIDES MECHANICAL SPACE AND CONTRIBUTES TO HIGH SOUND RESISTANCE.
2. CAVITY MAY BE INSULATED



6" BRICK BEARING WALLS - WOOD JOIST FLOOR

1. FURRING SPACE MAY BE INSULATED IF DESIRED.

inches by lapping at least four (4) inches over the unit below or by lapping at vertical intervals not exceeding seventeen (17) inches with units which are at least fifty (50) percent greater in thickness than the units below; or by bonding with corrosion-resistant metal ties conforming to the requirements for cavity walls. There shall be one (1) metal tie for not more than each four and one-half (4 1/2) square feet of wall area. Ties in alternate courses shall be staggered, and the maximum vertical distance between ties shall not exceed eighteen (18) inches and the maximum horizontal distance shall not exceed thirty-six (36) inches. Walls bonded with metal ties shall conform to the requirements for allowable stress, lateral support, thickness, height, and mortar for cavity walls.

2102.6 SOLID MASONRY:

a) GENERAL: In each wythe of plain solid masonry, not less than seventy-five (75) percent of the units in any vertical plane perpendicular to the wall plane shall lap the ends of the units above and below a distance not less than one and one-half (1 1/2) inches or one-half (1/2) the height of the units, whichever is greater, or the masonry shall be reinforced longitudinally.

b) BONDING: Adjacent wythes in bearing and nonbearing walls shall be bonded by either headers or metal ties.

Where headers are used the facing and backing shall be bonded so that not less than four (4) percent of the exposed face area is composed of solid headers extending not less than four (4) inches into the backing. The distance between adjacent full-length headers shall not exceed twenty-four (24) inches vertically or horizontally.

Where the backing consists of two (2) or more wythes the headers shall extend not less than four (4) inches into the most distant wythe or the backing wythes shall be bonded together with separate headers whose area and spacing conform to the foregoing.

Where metal ties are used the facing and backing shall be bonded with approved corrosion-resistant unit metal ties or cross wires of masonry joint reinforcement. Unit ties shall be of sufficient length to engage all wythes, with ends embedded not less than one (1) inch in mortar, or shall consist of two (2) lengths the inner embedded ends of which are hooked and lapped not less than two (2) inches.

2102.7 CAVITY WALL MASONRY:

a) GENERAL: Cavity wall masonry is that type of construction made with brick, structural clay tile or concrete masonry units or any combination of such units in which facing and backing are completely separated except for the

metal ties which serve as bonding.

b) CONSTRUCTION: In cavity walls neither the facing nor the backing shall be less than four (4) inches in thickness and the cavity shall be not less than one (1) inch net in width nor more than four (4) inches in width. The backing shall be at least as thick as the facing.

EXCEPTION: Where both the facing and backing are constructed with clay or shale brick, the facing and backing may be three (3) inches in thickness.

The facing and backing of cavity walls shall be bonded with three-sixteenths (3/16) inch diameter steel rods or metal ties of equivalent strength and stiffness embedded in the horizontal joints. There shall be one (1) metal tie for not more than each four and one-half (4 1/2) square feet of wall area for cavity widths up to three and one-half (3 1/2) inches net in width. Where the cavity exceeds three and one-half (3 1/2) inches net in width, there shall be one (1) metal tie for not more than three (3) square feet of wall area. Ties in alternate courses shall be staggered and 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. Rods 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 not less than two (2) inches long. Additional bonding ties shall be provided at all openings, spaced not more than three (3) feet apart around the perimeter and within twelve (12) inches of the opening. Ties shall be of corrosion-resistant metal, or shall be coated with a corrosion-resistant metal or other approved protective coating.

2102.8 GROUTED MASONRY:

a) GENERAL: At the time of laying, all masonry units shall be free of excessive dust and dirt. Only Type M or Type S mortar consisting of a mixture of portland cement, hydrated lime and aggregate shall be used.

b) LOW-LIFT GROUT: Requirements for construction shall be as follows:

1) All units in the two (2) outer tiers shall be laid with full shoved head and bed mortar joints. Masonry headers shall not project into the grout space.

2) All longitudinal vertical joints shall be grouted and shall be not less than three-quarters (3/4) inch in thickness. In members of three (3) or more tiers in thickness, interior bricks shall be embedded into the

grout so that at least three-quarters (3/4) inch of grout surrounds the sides and ends of each unit. All grout shall be puddled with a grout stick immediately after pouring.

3) One (1) exterior tier may be carried up sixteen (16) inches before grouting, but the other exterior tier shall be laid up and grouted in lifts not to exceed six (6) times the width of the grout space with a maximum of eight (8) inches.

4) If the work is stopped for one (1) hour or longer, the horizontal construction joints shall be formed by stopping all tiers at the same elevation and with the grout one (1) inch below the top.

c) HIGH-LIFT GROUT: All units in the two (2) tiers shall be laid with full head and bed mortar joints.

1) The two (2) tiers shall be bonded together with wall ties. Ties shall be not less than No. 9 wire in the form of rectangles four (4) inches wide and two (2) inches in length less than the over-all wall thickness. Kinks, water drips or deformations shall not be permitted in the ties. One (1) tier of the wall shall be built up not more than sixteen (16) inches ahead of the other tier. Ties shall be laid not to exceed twenty-four (24) inches on center horizontally and sixteen (16) inches on center vertically for running bond and not more than twenty-four (24) inches on center horizontally and twelve (12) inches on center vertically for stack bond.

2) Provision shall be made for cleaning grout space. Mortar projections, which project more than one-half (1/2) inch into grout space and any other foreign matter shall be removed from grout space prior to inspection and grouting.

3) The grout space (longitudinal vertical joint) shall be not less than three (3) inches in width and not less than the thickness required by the placement of steel with the required clearances and shall be poured solidly with grout. Masonry walls shall cure at least three (3) days to gain strength before pouring grout.

EXCEPTION: If the grout space contains no horizontal steel, it may be reduced to two (2) inches.

4) Vertical grout barriers or dams shall be built of solid masonry across the grout space the entire height of the wall to control the flow of the grout horizontally. Grout barriers shall be not more than twenty-five (25) feet apart.

5) Grout shall be a plastic mix suitable for pumping without segregation of the constituents and shall be mixed thoroughly. Grout shall be placed by pumping or by an approved alternate method and shall be placed before any initial set occurs and in no case more than one and one-half (1 1/2) hours after water has been added.

6) Grouting shall be done in a continuous pour, in lifts not exceeding four (4) feet. It shall be consolidated by puddling or mechanical vibrating during placing and reconsolidated after excess moisture has been absorbed out before plasticity is lost. The grouting of any section of a wall between control barriers shall be completed in one (1) day with no interruptions greater than one (1) hour.

7) Special inspection during grouting shall be provided where required by the building official.

8) Grout shall not be pumped through aluminum pipes.

2102.9 REINFORCED GROUTED MASONRY:

a) GENERAL: Reinforced grouted masonry shall conform to all of the requirements for grouted masonry specified in Section 2102.8 and also the requirements of this section.

b) CONSTRUCTION: The thickness of grout or mortar between masonry units and reinforcement shall be not less than one-quarter (1/4) inch, except that one-quarter (1/4) inch bars may be laid in horizontal mortar joints at least one-half (1/2) inch thick and steel wire reinforcement may be laid in horizontal mortar joints at least twice the thickness of the wire diameter.

2102.10 REINFORCED HOLLOW UNIT MASONRY:

a) GENERAL: Reinforced hollow unit masonry is that type of construction made with hollow masonry units in which certain cells are continuously filled with concrete or grout, and in which reinforcement is embedded. Only Type M or Type S mortar consisting of a mixture of portland cement, hydrated lime and aggregate shall be used.

b) CONSTRUCTION: Requirements for construction shall be as follows:

1) All reinforced hollow unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled. Walls and cross webs forming such cells to be filled shall be full-bedded in mortar to prevent leakage of grout. All head (or end) joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells. Bond shall be

provided by lapping units in successive vertical courses or by equivalent mechanical anchorage.

2) Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than two (2) by three (3) inches.

3) Cleanout openings shall be provided at the bottom of all cells to be filled at each pour of grout where such grout pour is in excess of four (4) feet in height. Any overhanging mortar or other obstruction or debris shall be removed from the insides of such cell walls. The cleanouts shall be sealed before grouting, and after inspection.

4) Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding one hundred ninety-two (192) diameters of the reinforcement.

5) All cells containing reinforcement shall be filled solidly with grout. Grout shall be poured in lifts of eight (8) feet maximum height. All grout shall be consolidated at time of pouring by puddling or vibrating and then reconsolidated by again puddling later, before plasticity is lost.

   When total grout pour exceeds eight (8) feet in height the grout shall be placed in lifts not exceeding four (4) feet each and special inspection during grouting shall be required. Minimum cell dimension shall be three (3) inches.

6) When the grouting is stopped for one (1) hour or longer, horizontal construction joints shall be formed by stopping the pour of grout one and one-half (1 1/2) inches below the tope of the uppermost unit.

SECTION 2103.0 WALL COVERING

2103.1 GENERAL: Interior and exterior wall covering shall conform to the requirements of this section.

Conformity with the applicable material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2103.2 INTERIOR COVERINGS:

a) GENERAL: Interior coverings shall be installed in accordance with this section and Tables 2103-1, 2103-2, 2103-3, 2103-4, 2103-5 and 2103-6.

b) VERTICAL ASSEMBLIES: Vertical support for lath or gypsum wallboard shall be not less than two (2) inches nominal in least dimension. Wood stripping for furring shall be not less than two (2) inches nominal thickness in the least dimension except that furring strips not less than one (1) inch by two (2) inch dimension may be used over solid backing.

c) INTERIOR LATH: Gypsum lath shall not be installed until weather protection for the installation is provided. Where wood frame walls and partitions are covered on the interior with portland cement plaster or tile or similar material and subject to water splash, the framing shall be protected with an approved moisture barrier.

Thickness, spacing of supports and the methods of attachment of gypsum lath shall be as set forth in Tables 2103-1 and

TABLE 2103-1 MAXIMUM SPACING OF SUPPORTS FOR LATH

TYPE OF LATH[1]	MINIMUM WEIGHT (Per Square Yard) GAUGE AND MESH SIZE	VERTICAL (In Inches)			HORIZONTAL (In Inches)	
		Wood	Metal			
			Solid Plaster Partitions	Other	Wood or Concrete	Metal
Expanded Metal Lath (Diamond Mesh)	2.5 3.4	16 16	16 16	12 16	— 16	— 13½
Flat Rib Expanded Metal Lath	2.75 3.4	16 19	16 24	16 19	16 19	12 19
Stucco Mesh Expanded Metal Lath	1.8 and 3.6	16[2]	—	—	—	—
3/8" Rib Expanded Metal Lath	3.4 4.0	24 24	24 24	24 24	24 24	24 24
Sheet Lath	4.5	24	—	24	24	24
3/4" Rib Expanded Metal Lath	5.4	—	—	—	36[3]	36[3]
Wire Lath — Welded	1.95 pounds, No.11 gauge, 2" x 2" 1.4 pounds, No.16 gauge, 2" x 2" 1.4 pounds, No. 18 gauge, 1" x 1"[4]	24 16 16	24 16 —	24 16 —	24 16 —	24 16 —
Wire Lath — Woven	1.4 pounds, No.17 gauge, 1½" Hexagonal[4] 1.4 pounds, No.18 gauge 1" Hexagonal[4]	16 16	— —	— —	— —	— —
3/8" Gypsum Lath (perforated)		16	—	16	16	16
3/8" Gypsum Lath (plain)		16	—	16	16	18
1/2" Gypsum Lath (perforated)		16	—	16	16	16
1/2" Gypsum Lath (plain)		24	—	24	24	24

Note 1: Metal lath and wire lath used as reinforcement for portland cement plaster shall be furred out away from vertical supports at least one-quarter (¼) inch. Self-furring lath meets furring requirements.

Note 2: Wire backing required on open vertical frame construction except under expanded metal lath and paperback wire lath.

Note 3: Contact or furred ceilings only. May not be used in suspended ceilings.

Note 4: Stucco netting, not to be used as a base for gypsum plaster.

2103-2. Approved wire and sheet metal attachment clips may be used.

Gypsum lath shall be applied with the long dimension perpendicular to supports, and with end joints staggered in successive courses. End joints may occur on one support where lath is applied the full length of the joint.

The type and weight of metal lath, the gauge and spacing of nails and staples, the spacing of supports, and the methods of attachment to wood supports shall be as set forth in Tables 2103-1 and 2103-2, except that gypsum veneer plaster may be applied in one (1) coat.

d) INTERIOR PLASTER: Plastering with gypsum plaster or portland cement plaster shall be not less than three (3) coats when applied over metal lath or wire lath and shall be not less than two (2) coats when applied over other bases permitted by this section except that veneer plaster may be applied in one (1) coat, not to exceed three-sixteenths (3/16) inch thickness.

e) GYPSUM WALLBOARD: All gypsum wallboard shall be installed in accordance with the provisions of this section.

Gypsum wallboard shall not be installed until weather protection is provided.

Supports shall be spaced not to exceed the spacing as set forth in Table 2103-6 for single-ply application.

TABLE 2103-2 MAXIMUM SPACING OF FASTENERS FOR SUPPORT OF LATH

TYPE OF LATH	NAILS			STAPLES[1] (Round or Flattened Wire)				
	Type	Maximum Spacing		Leg[2]	Wire Gage No.	Minimum Crown Width	Maximum Spacing	
		Vertical	Horizontal				Vertical	Horizontal
		(In Inches)		(In Inches)				
Diamond Mesh Expanded Metal Lath and Flat Rib Metal Lath	4d blued box (clinched)[3] 1" No.11 gauge, 7/16" head, barbed	6 6	— —	7/8	16	7/16	6	6
	1-1/2" No.11 gauge, 7/16" head, barbed	6	6					
3/8" Rib Metal Lath and Sheet Lath	1-1/2" No.11 gauge, 7/16" head, barbed	6	6	1-1/4	16	7/16	6	6
3/4" Rib Metal Lath	4d Common 2", No.11 gauge, 7/16" head, barbed	At ribs —	— At ribs	1-3/4 —	16 —	7/16 —	At ribs —	At ribs —
Wire Lath[4]	4d blued box (clinched)[3] 1" No.11 gauge, 7/16" head, barbed 1-1/2" No.11 gauge, 7/16" head, barbed 1 1/4" No. 12 gauge, 3/8" head furring	6 6 6 6	— — 6 —	7/8	16	7/16	6	6
3/8" Gypsum Lath	1-1/8" No.13 gauge, 19/64" head, blued[3]	5	5	7/8	16	7/16	5	5
1/2" Gypsum Lath	1-1/4" No.13 gauge, 19/64" head, blued[3]	5[5] 4[6]	5[5] 4[6]	1 1/8	16	7/16	4	4

Note 1: With divergent points and semi-flattened round wire for gypsum lath.

Note 2: When lath and stripping are stapled simultaneously, increase leg length of staple one-eighth (1/8) inch.

Note 3: For interior only.

NOTES FOR TABLE 2103-2 (continued)

Note 4: Attach self-furring wire fabric lath to supports at furring device.

Note 5: Perforated lath.

Note 6: Plain lath.

All edges and ends of gypsum wallboard shall occur on the framing members, except those edges and ends which are perpendicular to the framing members.

The size and spacing of fasteners shall comply with Table 2103-6.

f) SHOWER AND BATH COMPARTMENTS: Shower and bath compartments shall be finished in accordance with the requirements of the Massachusetts State Sanitary Code promulgated by the Department of Public Health.

g) OTHER INTERIOR FINISHES: Other approved interior finishes shall conform to the applicable reference standards of this article.

2103.3 EXTERIOR COVERINGS:

a) GENERAL: Exterior covering shall be installed in accordance with this section and Tables 2103-1, 2103-2, 2103-3, 2103-5, and 2103.7.

b) EXTERIOR LATH: All lath and lath attachments shall be of corrosion-resistant materials and shall conform to Tables 2103-1 and 2103-2.

Backing for vertical surfaces shall consist of sheathing or of not less than No. 18 U.S. gauge steel wire stretched taut horizontally and spaced not more than six (6) inches apart vertically.

Where lath on vertical surfaces extends between rafters, or other similar projecting members, solid backing shall be installed to provide support for lath and attachments.

Gypsum lath shall not be used, except that on horizontal supports of ceilings or roof soffits, it may be used as backing for metal lath or wire lath and portland cement plaster.

Backing is not required under metal lath or paperbacked wire lath.

c) EXTERIOR PLASTER: Plastering with portland cement plaster shall be not less than three (3) coats when applied over metal lath or wire lath and shall be not less than two (2) coats when applied over masonry, concrete, or gypsum back-

ing. If plaster surface is completely covered by veneer of other facing material, or is completely concealed, plaster application need only be two (2) coats provided the total thickness is as set forth in Table 2103-5.

On wood frame construction with an on-grade concrete floor slab system, exterior plaster shall be applied in such a manner as to cover, but not to extend below, lath, paper and screed.

TABLE 2103-3 THICKNESS OF PLASTER

PLASTER BASE	FINISHED THICKNESS OF PLASTER FROM FACE OF LATH, MASONRY, CONCRETE	
	Gypsum Plaster	Portland Cement Plaster
Expanded Metal Lath	5/8" minimum[1]	5/8" minimum[1]
Wire Lath	5/8" minimum[1]	3/4" minimum (interior)[2] 7/8" minimum (exterior)[2]
Gypsum Lath	1/2" minimum	
Masonry Walls[3]	1/2" minimum	1/2" minimum
Monolithic Concrete Walls[3,4]	5/8" maximum	7/8" maximum
Monolithic Concrete Ceilings[3,4]	3/8" maximum[5]	1/2" maximum
Gypsum Veneer Base[6]	1/16" minimum	

Note 1: When measured from back plane of expanded metal lath, exclusive of ribs, or self-furring lath, plaster thickness shall be three-quarter (3/4) inch minimum.

Note 2: When measured from face of support or backing.

Note 3: Because masonry and concrete surfaces may vary in plane, thickness of plaster need not be uniform.

Note 4: When applied over a liquid bonding agent, finish coat may be applied directly to concrete surface.

Note 5: Approved acoustical plaster may be applied directly to concrete, or over base coat plaster, beyond the maximum plaster thickness shown.

Note 6: Attachment shall be in accordance with Table 2103-6.

Only approved plasticity agents and approved amounts thereof may be added to portland cement when plastic cement is used, no additional lime or plasticizers shall be added. Hydrated lime or the equivalent amount of lime putty used as a plasticizer, may be added to standard portland cement in an amount not to exceed twenty (20) percent by weight of the portland cement.

The proportion of aggregate to cementitious materials shall be as set forth in Table 2103-5.

TABLE 2103-4 GYPSUM PLASTER PROPORTIONS

NUMBER	COAT	PLASTER BASE OR LATH	MAXIMUM VOLUME AGGREGATE PER 100 POUNDS NEAT PLASTER[2] (Cubic Feet)	
			Damp Loose Sand[3]	Perlite or Vermiculite[3]
Two-coat Work	Base Coat	Gypsum Lath	2½	2
	Base Coat	Masonry	3	3
Three-coat Work	First Coat	Lath	2[4]	2
	Second Coat	Lath	3[4]	2[5]
	First and Second Coats	Masonry	3	3

Note 1: Wood fibered gypsum plaster may be mixed in the proportions of one hundred (100) pounds of gypsum to not more than one (1) cubic foot of sand where applied on masonry or concrete.

Note 2: When determining the amount of aggregate in set plaster, a tolerance of ten (10) percent shall be allowed.

Note 3: Combinations of sand and lightweight aggregate may be used provided the volume and weight relationship of the combined aggregate to gypsum plaster is maintained.

Note 4: If used for both first and second coats, the volume of aggregate may be two and one-half (2½) cubic feet.

Note 5: Where plaster is one (1) inch or more in total thickness the proportions for the second coat may be increased to three (3) cubic feet.

TABLE 2103-5 PORTLAND CEMENT PLASTER

Coat	MAXIMUM VOLUME AGGREGATE PER VOLUME CEMENTITIOUS MATERIAL[1]			Approximate Minimum Thickness[5]	Minimum Period Moist Curing	Minimum Interval Between Coats
	Portland Cement Plaster Maximum Volume Aggregate per Volume Cement	Portland Cement-Lime Plaster[2] Maximum Volume Lime per Volume Cement	Maximum Volume Sand per Volume Cement and Lime			
First	4	3/4	4	3/8"[3]	48[6] Hours	48[7] Hours
Second	5	3/4	5	1st and 2nd Coats	48 Hours	7 Days[8]
Finished	3[9]	–	3[9]	1/8"	–	–[8]

Note 1: When determining the amount of aggregate in set plaster, a tolerance of ten (10) percent may be allowed.

Note 2: From ten (10) to twenty (20) pounds of dry hydrated lime (or an equivalent amount of lime putty) may be added as a plasticizing agent to each sack of Type I and Type II Standard portland cement in base coat plaster.

Note 3: No additions of plasticizing agents shall be made.

Note 4: See Table 2103-3.

Note 5: Measured from face of support or backing to crest of scored plaster.

Note 6: Twenty-four (24) hours minimum period for moist curing of interior portland cement plaster.

Note 7: Twenty-four (24) hours minimum interval between coats of interior portland cement plaster.

Note 8: Finish coat plaster may be applied to interior portland cement base coats after a forty-eight (48) period.

Note 9: For finish coat, plaster up to an equal part of dry hydrated lime by weight (or an equivalent volume of lime putty) may be added to Type I, Type II and Type III Standard portland cement.

TABLE 2103-6 APPLICATION OF GYPSUM WALLBOARD

THICKNESS OF GYPSUM WALLBOARD (Inch)	PLANE OF FRAMING SURFACE	LONG DIMENSION OF GYPSUM WALLBOARD SHEETS IN RELATION TO DIRECTION OF FRAMING MEMBERS	MAXIMUM SPACING OF FRAMING MEMBERS (center-to-center) (In Inches)	MAXIMUM SPACING OF FASTENERS (center-to-center) (In Inches)		NAILS[1] — TO WOOD
				NAILS[1,2]	SCREWS[3]	
1/2	Horizontal	Either Direction	16		12	No.13 gauge, 1-3/8" long, 19/64" head No. .098 gauge, 1 1/4" long, Annular ringed 5d, cooler nail
	Horizontal	Perpendicular	24	7	12	
	Vertical		24	8	12	
5/8	Horizontal	Either Direction	16	7	12	No. 13 gauge, 1-5/8" long, 19/64" head No. .098 gauge, 1-3/8" long, Annular ringed 6d, cooler nail
	Horizontal	Perpendicular	24	7	12	
	Vertical	Either Direction	24		12	
Fastening Required with Adhesive Application						
1/2 or 5/8	Horizontal	Either Direction	16	16	16	As required for 1/2" and 5/8" gypsum wallboard, see above
		Perpendicular	24	12	16	
	Vertical	Either Direction	24	24	24	
2-3/8 (3/4 total)	Horizontal	Perpendicular	24	16	16	Base ply nailed as required for 1/2" gypsum wallboard and face ply placed with adhesive
	Vertical	Either Direction	24	24	24	

Note 1: Where the metal framing has a clinching design formed to receive the nails by two (2) edges of metal, the nails shall be not less than five-eighths (5/8) inch longer than the wallboard thickness, and shall have ringed shanks. Where the metal framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be 5d, No. 13½ gauge, one and five-eighths (1 5/8) inches long, fifteen-sixty-fourths (15/64) inch head for one-half (½) inch gypsum wallboard; 6d, No. 13 gauge, one and seven-eighths (1 7/8) inches long, fifteen-sixty-fourths (15/64) inch head for five-eighths (5/8) inch gypsum wallboard.

Note 2: Two (2) nails spaced not less than two (2) inches apart, nor more than two and one-half (2½) inches apart and pairs of nails spaced not more than twelve (12) inches center-to-center may be used.

Note 3: Screws shall be No. 6 with tapered head and long enough to penetrate into wood framing not less than five-eighths (5/8) inch and metal framing not less than one-quarter (¼) inch.

TABLE 2103-7 WEATHER-RESISTANT SIDING ATTACHMENT

Siding Material	Nominal[1] Thickness (Inches)	Joint Treatment	Weather Resistance Membrane Required	TYPE OF SUPPORTS FOR THE SIDING MATERIAL AND FASTENERS[9]				
				Wood or Plywood Sheathing	Fiberboard Sheathing into Stud	Gypsum Sheathing into Stud	Direct to Studs	Number or Spacing of Fasteners
Horiz. Alum.[8] Without Insulation	.019[10]	Lap	No	.120-Nail-1½"	.120-Nail-2"	.120-Nail-2"	Not Allowed	Same as Stud Spacing
Horiz. Alum.[8] Without Insulation	.024	Lap	No	.120-Nail 1½" long	.120-Nail 2" long	.120-Nail 2" long	Not Allowed	Same as Stud Spacing
Horiz. Alum.[8] With Insulation	.019	Lap	No	.120-Nail-1½"	.120-Nail-2½"	.120-Nail-2½"	.120-Nail-1½"	Same as Stud Spacing
Horizontal Asbestos Cement Boards	5/32	(2) Lap	(2) Yes	.113-Nail-1½"	.113-Nail-2"	.113-Nail-1 3/4"	.113-Nail-1 3/8"	2 Nails per Shingle
Shingles[7]	1/8							
Brick Veneer Clay Tile Veneer Concrete Veneer	2 1/4 to 1 2	Sec. 2103.3	Yes	-See Sec. 2103.3 and Figure 2103-1-				
Horizontal Fiberboard[3]	1/2	Sec. 2103.3	No	.099-Nail-2" Staple 1 3/4"	.113-Nail-2 3/4" Staple 2½"	.113-Nail-2½" Staple 2½"	.099-Nail-2" Staple 1 3/4"	Same as Stud Spacing
Hardboard[3] Board and Batten Vertical	1/4	(2)	(2)	.099-Nail-2" Staple 1½"	.099-Nail-2½" Staple 2"	.099-Nail-2" Staple 1 3/4"	.099-Nail-1 3/4" Staple 1½"	6" Panel Edges 8" Inter. Sup.
Hardboard[3] Lap-Siding-Horizontal	7/16	(2)	(2)	.099-Nail-2" Staple 1 7/8"	.099-Nail-2½" Staple 2½"	.099-Nail-2½" Staple 2½"	.099-Nail-2" Staple 1 7/8"	Same as Stud Spacing 2 per Bearing
Vertical Panel Siding	7/16	(2)	(2)	.099-Nail-2" Staple-1½"	.099-Nail-2½" Staple-2½"	.099-Nail-2" Staple-2"	.080-Nail-1 3/4" Staple-1½"	6" Panel Edges 12" Inter. Sup.
Steel[3]	29 ga.	Lap	No	.113-Nail-1 3/4" Staple 1 3/4"	.113-Nail-2 3/4" Staple 2½"	.113-Nail-2½" Staple 2½"	Not Allowed	Same as Stud Spacing
Stone Veneer	2	Sec. 2103.3	Yes	-See Sec. 2103.3 and Figure 2103-3-				
Particleboard Panels	3/8	(2)	(2)	.113-NG 1-2" Staple 1 3/8"	.113-Nail-2½" Staple 2½"	.113-Nail 1-2" Staple 2"	Not Allowed	6" on Edges 8" Inter. Sup.
	5/8	(2)	(2)	.113-Nail-2" Staple 1 7/8"	.113-Nail-2½" Staple 2½"	.113-Nail-2½" Staple 2½"	.113-Nail-2" Staple 1 5/8"	6" on Edges 8" Inter. Sup.
Plywood Panels[11] (Exterior Grade)	3/8	(2)	(2)	.099-Nail-2" Staple 1 3/8"	.113-Nail-2½" Staple 2½"	.099-Nail-2" Staple 2"	.099-Nail-2" Staple 1 3/8"	6" on Edges 12" Inter. Sup.
Wood Rustic, Drop Siding	3/8 Min. 19/32 Av.	Lap	No	Fastener Penetration into Stud - 1"			.113-Nail-2½" Staple-2"	Face Nailing up to 6" Widths, 1 Nail per Bearing. 8" Widths and over, 2 Nails per Bearing
Bevel Butt Tipp	7/16 3/16	Lap Lap	No No					
Shakes[7]	3/8	Lap	Yes	.0915-Nail-2" Staple 2"				
Shingles[7]	3/8	Lap	Yes	16" and 18" Shingles		.076-Nail-1¼"		2 Fasteners per Shingle or Shake
						Staple - 1¼"		
				24" Shingles		.080-Nail-1½"		
						Staple - 1½"		

NOTE FOR TABLE 2103-7

Note 1: Based on stud spacing of sixteen (16) inches o.c. Where studs are spaced twenty-four (24) inches siding may be applied to sheathing approved for that spacing.

Note 2: If boards are applied over sheathing or weather-resistant membrane joints need not be treated. Otherwise vertical joints must occur at studs and covered with batts.

Note 3: Shall be of approved type.

Note 4: Nail is a general description and may be T-head, modified round hear, or round hear with smooth or deformed shanks.

Note 5: Staples shall have a minimum crown width of seven-sixteenths (7/16) inch o.d. and be manufactured of minimum 16 gauge wire.

Note 6: All attachments shall be coated with a corrosion-resistive coating.

Note 7: Shingles and shakes applied over regular density fiberboard or gypsum sheathing shall be fastened to horizontal wood nailers or fiberboard shingle backer.

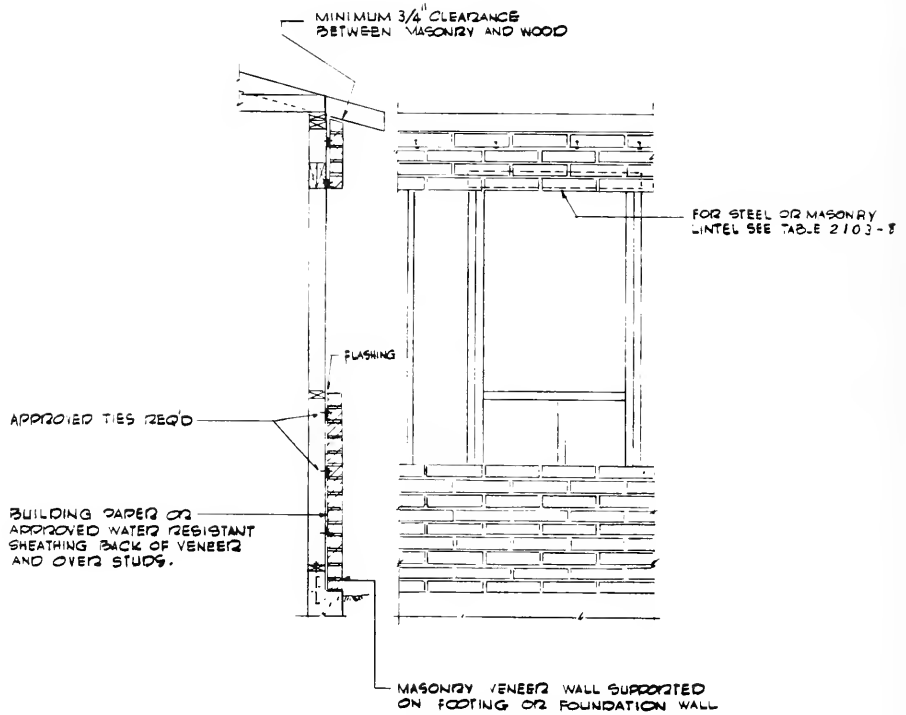
Note 8: Aluminum nails shall be used to attach aluminum siding.

Note 9: Nails or staples must be aluminum, galvanized, or rust-preventative coated and shall be driven into the studs for fiberboard or gypsum backing.

Note 10: Aluminum (0.19-inch) may be unbacked only when the flat areas are five (5) inches or less in the naroow dimension.

Note 11: Three-eighths (3/8) inch plywood may be applied direct to studs spaced sixteen (16) inches on center. One-half (½) inch plywood may be applied direct to studs spaced twenty-four (24) inches on center.

FIGURE 2103-1 MASONRY VENEERED WALL



MASONRY VENEERED WALL

d) MASONRY VENEER, GENERAL: All masonry veneer shall be installed in accordance with this section. Figure 2103-1 and Table 2103-7. Exterior masonry veneer shall not be attached to wood at any point more than thirty (30) feet above the adjacent ground elevation.

1) Masonry veneer shall not support any vertical load other than the dead load of the veneer above. Veneer above openings shall be supported upon lintels of noncombustible material and the allowable span shall not exceed the values set forth in Table 2103-8. The lintels shall have a bearing of not less than four (4) inches.

2) Masonry veneer shall be attached to the supporting wall with corrosion-resistant metal ties.

Veneer ties, if strand wire, shall be not less in thickness than No. 6 U.S. gauge wire and shall have a hook embedded in the mortar joint, or if sheet metal, not less than No. 22 U.S. gauge corrugated. Each tie shall be spaced not more than twenty-four (24) inches on center horizontally and shall support not more than three and one-quarter (3 1/4) square feet of wall area.

EXCEPTION: In wind areas of more than thirty (30) pounds per square foot, each tie shall support not more than two (2) square feet of wall area.

In lieu of such wire ties, an approved method of grouting the veneer to a paperbacked reinforcement attached directly to the studs may be used.

e) WEATHER PROTECTION: Exterior walls shall be covered with a weather-resistant siding and/or membrane.

f) WEATHER-RESISTANT SIDING: The weather-resistant covering shall be attached in accordance with Table 2103-7 and where required the cellular spaces shall be ventilated so as not to make ineffective the firestopping at floor, attic and roof levels. In addition, where cellular spaces are provided with interior non-corrodible vapor type barriers other means shall be used to avoid condensation and leakage of moisture.

g) WEATHER-RESISTANT MEMBRANE: Asphalt-saturated felt free from holes and breaks and weighing not less than fourteen (14) pounds per one hundred (100) square feet or other approved weather-resistant membrane shall be applied over studs or sheathing of all exterior walls as required by Table 2103-7. Such felt or membrane shall be applied weatherboard fashion, lapped not less than two (2) inches at horizontal joints and not less than six (6) inches

at vertical joints.

Such felt or membrane may be omitted in the following cases:

1) Under weather-resistant siding.

2) In accessory buildings.

3) Over water-repellant panel sheathing.

4) Under approved paperbacked metal or wire fabric lath.

5) Under metal lath, wire lath or wire fabric lath on noncombustible construction.

h) 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 junction of chimneys and roofs; in all roof valleys and around all roof openings.

i) PLYWOOD APPLICATION: Exterior plywood 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.

j) ATTACHMENT: All wall coverings shall be securely fastened in accordance with Table 2103-7, or with other approved aluminum, copper, zinc, zinc-coated or other approved corrosion-resistive fasteners.

Shingles and other weather coverings shall be attached with appropriate standard shingle nails or other approved pneumatically, mechanically driven fasteners to furring strips securely nailed to studs, or with approved mechanically-bonding nails.

Wood shingles or shakes attached with approved corrosion-resistive annular grooved nails may be applied over fiberboard shingle backer and nail base type fiberboard sheathing installed in accordance with Table 2103-7. Wood shingles or shakes and asbestos shingles or siding may be nailed directly to approved nail base fiberboard sheathing not less than one-half (1/2) inch nominal thickness with approved corrosion-resistive annular grooved nails.

TABLE 2103-8 ALLOWABLE SPANS FOR LINTELS SUPPORTING MASONRY VENEER

Size of Steel Angle[1]	No Story Above	One Story Above	Two Stories Above	No. of 1/2" or Equivalent Reinforcing Bars[2]
L 3 X 3 X 1/4	6' - 0"	3' - 6"	3' - 0"	1
L 4 X 3 X 1/4	8' - 0"	5' - 0"	3' - 0"	1
L 6 X 3 1/2 X 1/4	14' - 0"	8' - 0"	3' - 6"	2
L2 - 6 X 3 1/2 X 1/4	20' - 0"	11' - 0"	5' - 0"	4

Note 1: Long leg of the angle shall be placed in a vertical position.

Note 2: Depth of reinforced lintels shall be not less than eight (8) inches and all cells of hollow masonry lintels shall be grouted solid. Reinforcing bars shall extend not less than eight (8) inches into the support.

SECTION 2104.0 FLOORS

2104.1 GENERAL: Design of floors shall be based on a loading of thirty (30) pounds per square foot for bedroom area, and forty (40) pounds per square foot for all other areas. Floors shall be constructed in accordance with the requirements of this article and Figures 2102-1, 2102-2, 2104-1, 2105-1 and nailed in accordance with Table 2102-1.

Conformity with the applicable material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2104.2 WOOD:

a) IDENTIFICATION: All load-bearing lumber, plywood and particleboard shall conform to applicable standards or grading rules and shall be so identified by a grade mark, or certificate of inspection issued by an approved lumber grading or inspection bureau or agency. The grade mark on such load-bearing lumber shall provide information adequate to determine "F_b," the allowable stress in bending and "E," the modulus of elasticity.

b) GRADE: All joists and beams shall be of No. 3 or Standard Grade lumber or equivalent. Blocking and sheathing may be of Utility or No. 4 Grade lumber or equivalent.

c) ALLOWABLE SPANS: The unsupported spans of floor joists shall not exceed the values set forth in Tables 2104-1, 2104-2. The modulus of elasticity, "E," and the actual stress in bending, "F_b," shown in the Tables shall not exceed the values as required by Section 2106.1. The values of "F_b" (engineered uses) may be increased fifteen (15) percent for repetitive framing members spaced not more than twenty-four (24) inches o.c.

The allowable spans of girders shall not exceed the values set forth in Tables 2104-3, 2104-4. Exceptions to Tables 2104-3, 2104-4 are allowed when an engineering analysis using standard accepted practice is provided to justify variations from the above-mentioned tables.

The allowable spans and minimum grades for plywood floor sheathing shall conform to the requirements set forth in Tables 2104-5 and 2104-6. The allowable spans for floor sheathing shall conform to the requirements set forth in Table 2104-7.

d) BEARING: The ends of each joist shall have not less than one and one-half (1 1/2) inches of bearing on wood or metal and not less than three (3) inches on masonry except where supported on a one (1) inch by four (4) inch ribbon strip and nailed to the adjacent stud.

e) LATERAL SUPPORT: Joists shall be supported laterally at

TABLE 2104-1 ALLOWABLE SPANS FOR FLOOR JOISTS

40 Lbs. Per Sq. Ft. Live Load
(All rooms except those used for sleeping areas and attic floors.)
Strength - Live Load of 40 lbs. per sq. ft. plus dead load of 10 lbs. per sq. ft. determines the fiber stress value shown.

DESIGN CRITERIA:
Deflection - For 40 lbs. per sq. ft. live load. Limited to span in inches divided by 360.

HOW TO USE TABLES: Enter Table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

JOIST SIZE	SPACING (IN)	Modulus of Elasticity, "E", in 1,000,000 psi																		
		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4
2x6	12.0	6-9 450	7-3 520	7-9 590	8-2 660	8-6 720	8-10 780	9-2 830	9-6 890	9-9 940	10-0 990	10-3 1040	10-6 1090	10-9 1140	10-11 1190	11-2 1230	11-4 1280	11-7 1320	11-11 1410	12-3 1490
	13.7	6-6 470	7-0 550	7-5 620	7-9 690	8-2 750	8-6 810	8-9 870	9-1 930	9-4 980	9-7 1040	9-10 1090	10-0 1140	10-3 1190	10-6 1240	10-8 1290	10-10 1340	11-1 1380	11-5 1470	11-9 1560
	16.0	6-2 500	6-7 580	7-0 650	7-5 720	7-9 790	8-0 860	8-4 920	8-7 980	8-10 1040	9-1 1090	9-4 1150	9-6 1200	9-9 1250	9-11 1310	10-2 1360	10-4 1410	10-6 1460	10-10 1550	11-2 1640
	18.2	5-9 530	6-3 610	6-7 690	7-0 770	7-3 840	7-7 910	7-10 970	8-1 1040	8-4 1100	8-7 1160	8-9 1220	9-0 1280	9-2 1330	9-4 1390	9-6 1440	9-8 1500	9-10 1550	10-2 1650	10-6 1750
	24.0	5-4 570	5-9 660	6-2 750	6-6 830	6-9 900	7-0 980	7-3 1050	7-6 1120	7-9 1190	7-11 1250	8-2 1310	8-4 1380	8-6 1440	8-8 1500	8-10 1550	9-0 1610	9-2 1670	9-6 1780	9-9 1880
	32.0					6-2 1010	6-5 1090	8-7 1150	6-10 1230	7-0 1300	7-3 1390	7-5 1450	7-7 1520	7-9 1590	7-11 1660	8-0 1690	8-2 1760	8-4 1840	8-7 1950	8-10 2060
2x8	12.0	8-11 450	9-7 520	10-2 590	10-9 660	11-3 720	11-8 780	12-1 830	12-6 890	12-10 940	13-2 990	13-6 1040	13-10 1090	14-2 1140	14-5 1190	14-8 1230	15-0 1280	15-3 1320	15-9 1410	16-2 1490
	13.7	8-6 470	9-2 550	9-9 620	10-3 690	10-9 750	11-2 810	11-7 870	11-11 930	12-3 980	12-7 1040	12-11 1090	13-3 1140	13-6 1190	13-10 1240	14-1 1290	14-4 1340	14-7 1380	15-0 1470	15-6 1560
	16.0	8-1 500	8-9 580	9-3 650	9-9 720	10-2 790	10-7 850	11-0 920	11-4 980	11-8 1040	12-0 1090	12-3 1150	12-7 1200	12-10 1250	13-1 1310	13-4 1360	13-7 1410	13-10 1460	14-3 1550	14-8 1640
	19.2	7-7 530	8-2 810	8-9 690	9-2 770	9-7 840	10-0 910	10-4 970	10-8 1040	11-0 1100	11-3 1160	11-7 1220	11-10 1280	12-1 1330	12-4 1390	12-7 1440	12-10 1500	13-0 1550	13-5 1650	13-10 1750
	24.0	7-1 570	7-7 660	8-1 750	8-6 830	8-11 900	9-3 980	9-7 1050	9-11 1120	10-2 1190	10-6 1250	10-9 1310	11-0 1380	11-3 1440	11-5 1500	11-8 1550	11-11 1610	12-1 1670	12-6 1780	12-10 1880
	32.0					8-1 990	8-5 1080	8-9 1170	9-0 1230	9-3 1300	9-6 1370	9-9 1450	10-0 1520	10-2 1570	10-5 1650	10-7 1700	10-10 1790	11-0 1840	11-4 1950	11-8 2070
2x10	12.0	11-4 450	12-3 520	13-0 590	13-8 660	14-4 720	14-11 780	15-5 830	15-11 890	16-5 940	16-10 990	17-3 1040	17-8 1090	18-0 1140	18-5 1190	18-9 1230	19-1 1280	19-5 1320	20-1 1410	20-8 1490
	13.7	10-10 470	11-8 550	12-5 620	13-1 690	13-8 750	14-3 810	14-9 870	15-3 930	15-8 980	16-1 1040	16-6 1090	16-11 1140	17-3 1190	17-7 1240	17-11 1290	18-3 1340	18-7 1380	19-2 1470	19-9 1560
	16.0	10-4 500	11-1 580	11-10 650	12-5 720	13-0 790	13-6 850	14-0 920	14-6 980	14-11 1040	15-3 1090	15-8 1150	16-0 1200	16-5 1250	16-9 1310	17-0 1360	17-4 1410	17-8 1460	18-3 1550	18-9 1640
	19.2	9-9 530	10-6 810	11-1 690	11-8 770	12-3 840	12-9 910	13-2 970	13-7 1040	14-0 1100	14-5 1160	14-9 1220	15-1 1280	15-5 1330	15-9 1390	16-0 1440	16-4 1500	16-7 1550	17-2 1650	17-8 1750
	24.0	9-0 570	9-8 660	10-4 750	10-10 830	11-4 900	11-10 980	12-3 1050	12-8 1120	13-0 1190	13-4 1250	13-8 1310	14-0 1380	14-4 1440	14-7 1500	14-11 1550	15-2 1610	15-5 1670	15-11 1780	16-5 1880
	32.0					10-4 1000	10-9 1080	11-1 1150	11-6 1240	11-10 1310	12-2 1380	12-5 1440	12-9 1520	13-0 1580	13-3 1640	13-6 1700	13-9 1770	14-0 1830	14-6 1970	14-11 2080
2x12	12.0	13-10 450	14-11 520	15-10 590	16-8 660	17-5 720	18-1 780	18-9 830	19-4 890	19-11 940	20-6 990	21-0 1040	21-6 1090	21-11 1140	22-5 1190	22-10 1230	23-3 1280	23-7 1320	24-5 1410	25-1 1490
	13.7	13-3 470	14-3 550	15-2 620	15-11 690	16-8 750	17-4 810	17-11 870	18-6 930	19-1 980	19-7 1040	20-1 1090	20-6 1140	21-0 1190	21-5 1240	21-10 1290	22-3 1340	22-7 1380	23-4 1470	24-0 1560
	16.0	12-7 500	13-6 580	14-4 650	15-2 720	15-10 790	16-5 860	17-0 920	17-7 980	18-1 1040	18-7 1090	19-1 1150	19-6 1200	19-11 1250	20-4 1310	20-9 1360	21-1 1410	21-6 1460	22-2 1550	22-10 1640
	19.2	11-10 530	12-9 610	13-6 690	14-3 770	14-11 840	15-6 910	16-0 970	16-7 1040	17-0 1100	17-6 1160	17-11 1220	18-4 1280	18-9 1330	19-2 1390	19-6 1440	19-10 1500	20-2 1550	20-10 1650	21-6 1750
	24.0	11-0 570	11-10 660	12-7 750	13-3 830	13-10 900	14-4 980	14-11 1050	15-4 1120	15-10 1190	16-3 1250	16-8 1310	17-0 1380	17-5 1440	17-9 1500	18-1 1550	18-5 1610	18-9 1670	19-4 1780	19-11 1880
	32.0					12-7 1000	13-1 1080	13-6 1150	13-11 1220	14-4 1300	14-9 1380	15-2 1450	15-6 1520	15-10 1580	16-2 1650	16-5 1700	16-9 1770	17-0 1830	17-7 1950	18-1 2070

Note: The extreme fiber stress in bending, "F_b", in pounds per square inch is shown below each span.

TABLE 2104-2 ALLOWABLE SPANS FOR FLOOR JOISTS

30 Lbs. Per Sq. Ft. Live Load
(All rooms used for sleeping areas and attic floors.)
Strength - Live Load of 30 lbs. per sq. ft. plus
dead load of 10 lbs. per sq. ft. determines the
fiber stress value shown.

DESIGN CRITERIA:
Deflection - For 30 lbs. per sq. ft. live load Limited to span in inches divided by 360.

HOW TO USE TABLES: Enter Table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

JOIST SIZE	SPACING (IN)	Modulus of Elasticity, "E", in 1,000,000 psi																		
		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4
2x6	12.0	7-5 440	8-0 510	8-6 570	8-11 640	9-4 700	9-9 750	10-1 810	10-5 860	10-9 910	11-0 960	11-3 1010	11-7 1060	11-10 1100	12-0 1150	12-3 1200	12-6 1240	12-9 1280	13-1 1370	13-6 1450
	13.7	7-1 460	7-8 530	8-2 600	8-7 670	8-11 730	9-4 790	9-8 840	10-0 900	10-3 950	10-6 1010	10-10 1050	11-1 1110	11-3 1160	11-6 1200	11-9 1250	11-11 1300	12-2 1340	12-7 1430	12-11 1510
	16.0	6-9 480	7-3 560	7-9 630	8-2 700	8-6 770	8-10 830	9-2 890	9-6 950	9-9 1000	10-0 1060	10-3 1110	10-6 1160	10-9 1220	10-11 1270	11-2 1320	11-4 1360	11-7 1410	11-11 1500	12-3 1590
	19.2	6-4 510	6-10 600	7-3 670	7-8 740	8-0 810	8-4 880	8-8 940	8-11 1010	9-2 1070	9-5 1130	9-8 1180	9-10 1240	10-1 1290	10-4 1350	10-6 1400	10-8 1450	10-10 1500	11-3 1600	11-7 1690
	24.0	5-11 550	6-4 640	6-9 720	7-1 800	7-5 880	7-9 950	8-0 1020	8-3 1080	8-6 1150	8-9 1210	8-11 1270	9-2 1330	9-4 1390	9-7 1450	9-9 1510	9-11 1560	10-1 1620	10-5 1720	10-9 1820
	32.0					6-9 960	7-0 1040	7-3 1110	7-6 1190	7-9 1270	7-11 1330	8-2 1410	8-4 1470	8-6 1530	8-8 1590	8-10 1650	9-0 1710	9-2 1780	9-6 1910	9-9 2010
2x8	12.0	9-10 440	10-7 510	11-3 570	11-10 640	12-4 700	12-10 750	13-4 810	13-9 860	14-2 910	14-6 960	14-11 1010	15-3 1060	15-7 1100	15-10 1150	16-2 1200	16-6 1240	16-9 1280	17-4 1370	17-10 1450
	13.7	9-4 460	10-1 530	10-9 600	11-4 670	11-10 730	12-3 790	12-9 840	13-2 900	13-6 950	13-11 1010	14-3 1060	14-7 1110	14-11 1160	15-2 1200	15-6 1250	15-9 1300	16-0 1340	16-7 1430	17-0 1510
	16.0	8-11 480	9-7 560	10-2 630	10-9 700	11-3 770	11-8 830	12-1 890	12-6 950	12-10 1000	13-2 1060	13-6 1110	13-10 1160	14-2 1220	14-5 1270	14-8 1320	15-0 1360	15-3 1410	15-9 1500	16-2 1590
	19.2	8-5 510	9-0 600	9-7 670	10-1 740	10-7 810	11-0 880	11-4 940	11-9 1010	12-1 1070	12-5 1130	12-9 1180	13-0 1240	13-4 1290	13-7 1350	13-10 1400	14-1 1450	14-4 1500	14-9 1600	15-3 1690
	24.0	7-9 550	8-5 640	8-11 720	9-4 800	9-10 880	10-2 950	10-7 1020	10-11 1080	11-3 1150	11-6 1210	11-10 1270	12-1 1330	12-4 1390	12-7 1450	12-10 1510	13-1 1560	13-4 1620	13-9 1720	14-2 1820
	32.0					8-11 970	9-3 1040	9-7 1120	9-11 1200	10-2 1260	10-6 1340	10-9 1410	11-0 1470	11-3 1540	11-5 1590	11-8 1660	11-11 1730	12-1 1780	12-6 1900	12-10 2010
2x10	12.0	12-6 440	13-6 510	14-4 570	15-1 640	15-9 700	16-5 750	17-0 810	17-6 860	18-0 910	18-6 960	19-0 1010	19-5 1060	19-10 1100	20-3 1150	20-8 1200	21-0 1240	21-5 1280	22-1 1370	22-9 1450
	13.7	11-11 460	12-11 530	13-8 600	14-5 670	15-1 730	15-8 790	16-3 840	16-9 900	17-3 950	17-9 1010	18-2 1060	18-7 1110	19-0 1160	19-4 1200	19-9 1250	20-1 1300	20-5 1340	21-1 1430	21-9 1510
	16.0	11-4 480	12-3 560	13-0 630	13-8 700	14-4 770	14-11 830	15-5 890	15-11 950	16-5 1000	16-10 1060	17-3 1110	17-8 1160	18-0 1220	18-5 1270	18-9 1320	19-1 1360	19-5 1410	20-1 1500	20-8 1590
	19.2	10-8 510	11-6 600	12-3 670	12-11 740	13-6 810	14-0 880	14-6 940	15-0 1010	15-5 1070	15-10 1130	16-3 1180	16-7 1240	17-0 1290	17-4 1350	17-8 1400	18-0 1450	18-3 1500	18-10 1600	19-5 1690
	24.0	9-11 550	10-8 640	11-4 720	11-11 800	12-6 880	13-0 950	13-6 1020	13-11 1080	14-4 1150	14-8 1210	15-1 1270	15-5 1330	15-9 1390	16-1 1450	16-5 1510	16-8 1560	17-0 1620	17-6 1720	18-0 1820
	32.0					11-4 960	11-10 1050	12-3 1120	12-8 1200	13-0 1260	13-4 1330	13-8 1400	14-0 1470	14-4 1540	14-7 1590	14-11 1660	15-2 1720	15-5 1780	15-11 1890	16-5 2020
2x12	12.0	15-2 440	16-5 510	17-5 570	18-4 640	19-2 700	19-11 750	20-8 810	21-4 860	21-11 910	22-6 960	23-1 1010	23-7 1060	24-2 1100	24-8 1150	25-1 1200	25-7 1240	26-0 1280	26-10 1370	27-8 1450
	13.7	14-7 460	15-8 530	16-8 600	17-6 670	18-4 730	19-1 790	19-9 840	20-5 900	21-0 950	21-7 1010	22-1 1060	22-7 1110	23-1 1160	23-7 1200	24-0 1250	24-5 1300	24-10 1340	25-8 1430	26-5 1510
	16.0	13-10 480	14-11 560	15-10 630	16-8 700	17-5 770	18-1 830	18-9 890	19-4 950	19-11 1000	20-6 1060	21-0 1110	21-6 1160	21-11 1220	22-5 1270	22-10 1320	23-3 1360	23-7 1410	24-5 1500	25-1 1590
	19.2	13-0 510	14-0 600	14-11 670	15-8 740	16-5 810	17-0 880	17-8 940	18-3 1010	18-9 1070	19-3 1130	19-9 1180	20-2 1240	20-8 1290	21-1 1350	21-6 1400	21-10 1450	22-3 1500	22-11 1600	23-7 1690
	24.0	12-1 550	13-0 640	13-10 720	14-7 800	15-2 880	15-10 950	16-5 1020	16-11 1080	17-5 1150	17-11 1210	18-4 1270	18-9 1330	19-2 1390	19-7 1450	19-11 1510	20-3 1560	20-8 1620	21-4 1720	21-11 1820
	32.0					13-10 970	14-4 1040	14-11 1130	15-4 1190	15-10 1270	16-3 1340	16-8 1400	17-0 1460	17-5 1530	17-9 1590	18-1 1650	18-5 1720	18-9 1780	19-4 1890	19-11 2010

Note: The extreme fiber stress in bending, "Fb", in pounds per square inch is shown below each span.

the ends by solid blocking or diagonal bridging except where the ends of joists are nailed to a header, band joist or to an adjoining stud. Solid blocking or approved diagonal bridging shall be provided in accordance with Figure 2104-1.

f) NOTCHING: Notches on the ends of joists shall not exceed one-quarter (1/4) the depth. Holes bored in joists shall not be within two (2) inches of the top or bottom of the joists and their diameter shall not exceed one-third (1/3) the depth of the joist. Notches in the top or bottom of joists shall not exceed one-sixth (1/6) the depth and shall not be located in the middle third of the span.

TABLE 2104-3 ALLOWABLE SPAN FOR GIRDERS SUPPORTING ONE FLOOR ONLY

SIZE OF WOOD GIROER		SIZE OF STEEL GIRDER	Floor Live Load (In Pounds Per Sq. Ft.)	SPACING OF GIROERS[2] "S"				
				4'	6'	8'	10'	16'
4" x 4"	–	–	30	5' - 6"	4' - 6"	3' - 6"	3' - 0"	2' - 6"
			40	5' - 0"	4' - 0"	3' - 6"	3' - 0"	2' - 6"
4" x 6"	–	–	30	8' - 0"	6' - 6"	5' - 6"	5' - 0"	4' - 6"
			40	7' - 6"	6' - 0"	5' - 6"	4' - 6"	4' - 0"
4" x 8"	6" x 6"	3 x 2-3/8 x 5.7	30	11' - 0"	9' - 0"	8' - 0"	7' - 0"	5' - 6"
			40	10' - 0"	8' - 6"	7' - 6"	6' - 6"	5' - 0"
4" x 10"	6" x 8"	S4 x 7.7 M6 x 4.4	30	14' - 0"	11' - 6"	10' - 0"	8' - 6"	6' - 0"
			40	13' - 0"	10' - 6"	9' - 6"	8' - 6"	5' - 6"
4" x 12"	6" x 10"	S5 x 10 M7 x 5.5	30	16' - 6"	14' - 0"	12' - 0"	11' - 0"	9' - 0"
			40	16' - 0"	12' - 6"	11' - 0"	10' - 0"	8' - 0"

Note 1: Spans are based on No. 2 or Standard Grade lumber. No. 3 Grade lumber may be used with appropriate design.

Note 2: The spacing "S" is the tributary load to the girder. It is found by adding the unsupported spans of the floor joists on each side which are supported by the girder and dividing by 2.

2104.3 CONCRETE FLOORS (ON GROUND):

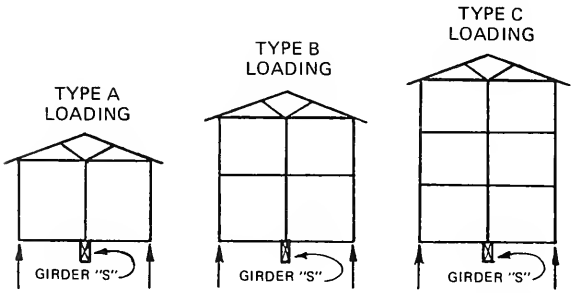
a) GENERAL: Concrete slab-on-ground floors shall be constructed according to accepted engineering practice and in conformity with Figure 2107-1 where applicable. The concrete shall conform to the requirements of section 2101.2 and only approved air-entraining agents shall be used where required.

Slabs shall be constructed with contraction joints, having a depth of at least one-fourth (1/4) the slab thickness, and joints shall be spaced at intervals not more than thirty (30) feet in each direction and slabs not rectangular in shape shall have contraction joints across the slab at points of offset, if offset exceeds ten (10) feet.

EXCEPTION: Contraction joints are not required where 6X6--6/6 welded wire fabric or equivalent is placed at mid-depth of the slab.

TABLE 2104-4 ALLOWABLE SPAN FOR GIRDERS AND REQUIRED SIZE OF COLUMNS AND FOOTINGS TO SUPPORT ROOFS, INTERIOR BEARING PARTITIONS AND FLOORS

Size of Girder Required			Spacing of[2] Girder "S"	Type of Loading[3]			Size of Column[4] Required		Size of Footing[4] Required
Wood[1]		Steel		A	B	C	Steel	Wood	
4" x 12"	6" x 10"	5I10 7JR5.5	10' 15' 20'	5-6" 4-0" –	– – –	– – –	3" Steel Pipe	4" x 4"	2' x 2'
–	6" x 12"	S5 x 14.75 M10 x 9 6B12	10' 15' 20'	8-6" 6-0" 4-6"	5-0" 4-0" –	– – –			
–	–	S7 x 15.3 M12 x 11.8 M8 x 15	10' 15' 20'	12-0" 10-0" 8-0"	9-0" 8-0" 7-0"	8-0" 7-0" 6-0"		6" x 6"	4' x 4'
–	–	S10 x 25.4 M8 x 24	10' 15' 20'	16-0" 13-6" 12-0"	12-6" 10-6" 9-6"	11-0" 10-0" 8-0"		8" x 8"	4' 3" x 4' 3"
–	–	S14 x 22 W10 x 29	10' 15' 20'	20-0" 17-0" 15-0"	16-0" 13-6" 12-0"	13-6" 11-6" 10-0"			



Note 1: Spans for wood girders are based on No. 2 or Standard Grade lumber. No. 3 Grade may be used with appropriate design.

Note 2: The spacing "S" is the tributary load to the girder. It is found by adding the unsupported spans of the floor joists on each side which are supported by the girder and dividing by 2.

Note 3: Figures under type of loading columns are the allowable girder spans.

Note 4: Required size of column is based on girder support from two (2) sides. Size of footing is based on allowable soil pressure of two thousand (2000) pounds per square foot.

TABLE 2104-5 ALLOWABLE SPANS FOR PLYWOOD FLOOR AND ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR TO SUPPORTS[1]

Panel Identification Index[3]	Panel Thickness (Inches)	ROOF[2]				Floor Maximum Span[4] (In Inches)
		Maximum Span (In Inches)		Load Capacity (In Pounds per Square Foot)		
		Edges[9] Blocked	Edges Unblocked	Total Load	Live Load	
12/0	5/16	12		130	100	0
16/0	5/16, 3/8	16		75	55	0
20/0	5/16, 3/8	20		55	45	0
24/0	3/8, 1/2	24	24	60	45	0
30/12	5/8	30	26	55	40	12[5]
32/16	1/2, 5/8	32[6]	28	50[7]	40	16[8]
36/16	3/4	36	30	50[7]	35[7]	16[8]
42/20	5/8, 3/4, 7/8	42	32	45[7]	35[7]	20[8]
48/24	3/4, 7/8	48	36	40[7]	40	24

Note 1: These values apply for Structural I and II, Standard Sheathing and C-C Exterior grades only. Spans shall be limited to values shown because of possible effect of concentrated loads.

Note 2: Uniform load deflection limitation: one-one hundred eightieth (1/180) of the span under live load plus dead load, one-two hundred fortieth (1/240) under live load only.

Note 3: Identification Index appears on all panels in the construction grades listed in Footnote No. 1. The numerator and denominator represent the allowable spans for roofs and floors respectively for blocked panels.

Note 4: Plywood edges shall have approved tongue and groove joints or shall be supported with blocking, unless one-quarter (¼) inch minimum thickness underlayment is installed or finish floor is twenty-five/thirty-seconds (25/32) inch wood strip. Allowable uniform load based on deflection of one-three hundred sixtieth (1/360) of span is one hundred sixty-five pounds per square foot.

Note 5: May be sixteen (16) inch if twenty-five/thirty-seconds (25/32) inch wood strip flooring is installed at right angles to joists.

Note 6: One-half (½) inch thick Structural I, when continuous over two (2) or more spans, 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 twenty-four (24) inches on center, and the live load does not exceed thirty (30) pounds per square foot. For other grades, a thickness of five-eighths (5/8) inch is required.

Note 7: For roof live load of forty (40) pounds per square foot or total load of fifty-five (55) pounds per square foot, decrease spans by thirteen (13) per cent or use panel with next greater identification index.

Note 8: May be twenty-four (24) inch if twenty-five/thirty-seconds (25/32) inch wood strip flooring is installed at right angles to joists.

Note 9: Edges may be blocked with lumber or other approved type of edge support.

b) SITE PREPARATION: The area within the foundation walls shall have all vegetation top soil and foreign material removed and the fill material shall be free of vegetation and foreign material.

The fill shall be compacted to assure uniform support of the slab and except where approved the fill depths shall not exceed twenty-four (24) inches for clean sand or gravel and eight (8) inches for earth.

A four (4) inch thick base course shall be placed on the prepared subgrade, consisting of clean graded sand, gravel, crushed stone or crushed blast-furnace slag passing a two (2) inch sieve and retained on a one-quarter (1/4) inch sieve. An approved vapor barrier with joints lapped six (6) inches shall be placed between the base course and the concrete floor slab.

EXCEPTION: The vapor barrier may be omitted where approved by the building official, based upon local site condition.

2104.4 METAL: Steel structural elements in floors may be either hot-rolled structural steel shapes or members cold formed to shape from steel sheet strip or plate, or a fabricated combination thereof. Members shall be straight and free of any defects which would significantly affect their structural performance.

The allowable span for steel girders or beams and the tributary area for steel columns in floors shall not exceed the values set

TABLE 2104-6 MINIMUM THICKNESS FOR PLYWOOD COMBINATION SUBFLOOR-UNDERLAYMENT[1] PLYWOOD CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENIDCULAR TO SUPPORTS

Species Group	Spacing of Joists		
	16"	20"	24"
1	1/2"	5/8"	3/4"
2,3	5/8"	3/4"	7/8"
4	3/4"	7/8"	1"

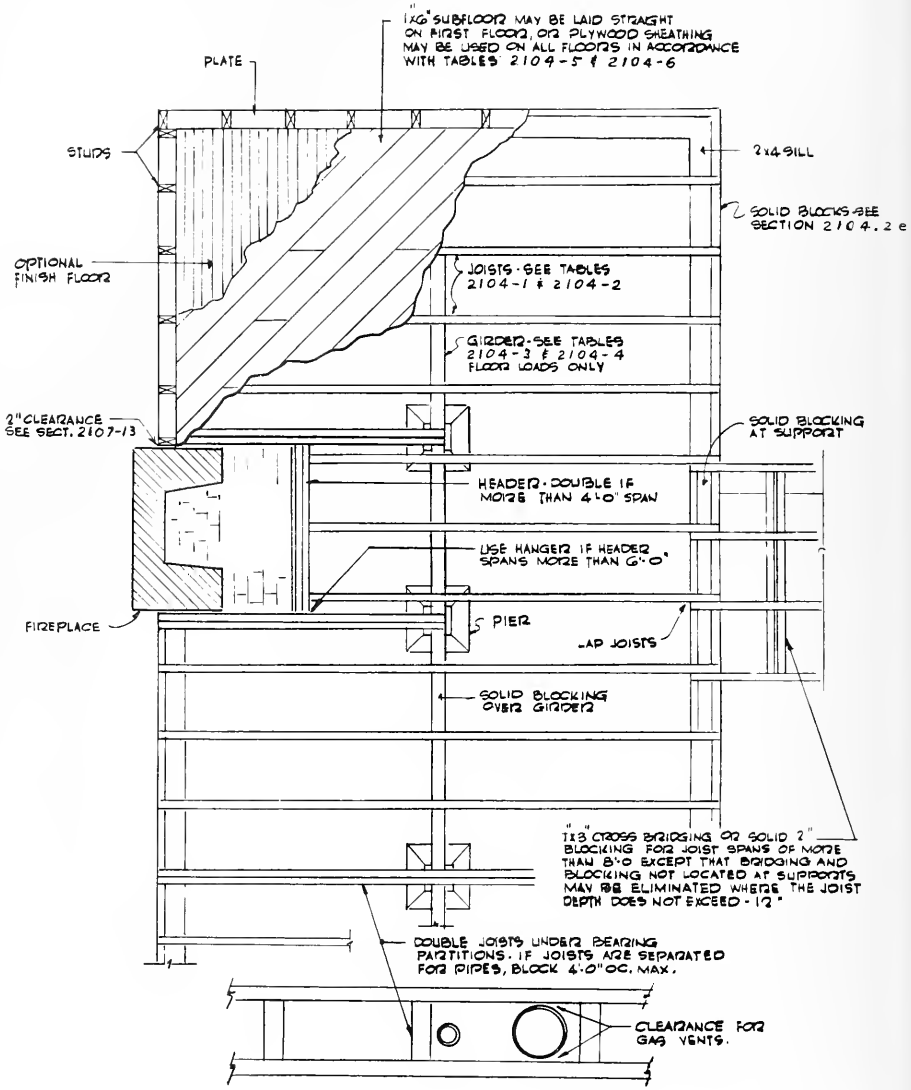
Note 1: Applicable to Underlayment Grade, C-C (plugged) and sanded exterior type plywood. Unsupported edges shall be T&G or blocked except where one-quarter (¼) inch thick underlayment or twenty-five/thirty-seconds (25/32) inch finish floor is used. Allowable uniform load based on deflection of one-three hundred sixtieth (1/360) of span is one hundred twenty-five (125) pounds per square foot.

Note 2: See Reference Standard RS-21-7.

TABLE 2104-7 MINIMUM THICKNESS OF FLOOR SHEATHING

Joist Spacing (Inches)	Minimum Net Thickness (Inches)	
	Perpendicular to Joist	Diagonal to Joist
24	11/16	3/4
16	5/8	5/8

FIGURE 2104-1 FLOOR CONSTRUCTION DETAILS



FLOOR CONSTRUCTION

forth in Tables 2104-4 and 2104-5. Exceptions shall be allowed as provided in section 2104-2.

Aluminum structural elements in floors shall be constructed of materials and designed in accordance with Reference Standard RS-21-5.

2104.5 PARTICLEBOARD: Particleboard floor underlayment shall conform to Type 1-B-1 of the standards set forth in standard RS-21-5. Underlayment shall be not less than three-quarter (3/4) inch in thickness and shall be identified by the grade mark of an approved inspection agency. Underlayment shall be installed in accordance with this code and as recommended by the manufacturer.

SECTION 2105.0 ROOF-CEILING CONSTRUCTION

2105.1 GENERAL: Roofs shall be constructed in accordance with Figures 2102-1, 2102-3, 2102-4, 2102-5, 2105-1, 2107-1, and nailed in accordance with Table 2102-1.

Conformity with the applicable material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2105.2 WOOD:

a) IDENTIFICATION: All load-bearing lumber, plywood and particleboard shall conform to applicable standards or grading rules and be identified by a grade mark, or certificate of inspection issued by an approved lumber grading or inspection bureau or agency. The grade mark for such load-bearing lumber shall provide adequate information to determine "F_b" the allowable stress in bending and "E" the modulus of elasticity.

b) GRADE: All rafters and ceiling joists shall be of No. 3 or Standard Grade lumber or equivalent. Blocking and sheathing may be of No. 4 or Utility Grade lumber or equivalent.

c) ALLOWABLE SPANS: The unsupported spans of rafters and ceiling joists shall not exceed the values set forth in Tables 2105-1, 2105-2, 2105-3, 2105-4, 2105-5, 2105-6, 2105-7, 2105-8, 2105-9, 2105-10, 2105-11, 2105-12, 2105-13, 2105-14, 2105-15, 2105-16, 2105-17, 2105-18, 2105-19, and 2105-20. The modulus of elasticity "E" and the actual stress in bending "F_b" shown in these tables shall not exceed the values as required by Section 2104.1. The values for "F_b" (engineered use) may be increased fifteen (15) percent for repetitive framing members spaced not more than twenty-four (24) inches o.c.

The allowable spans and minimum grades for plywood roof sheathing shall not exceed the values set forth in Table 2104-5. The allowable span for board type roof sheathing

shall not exceed twenty-four (24) inches and shall be five-eighths (5/8) inch minimum net thickness for solid sheathing and three-quarter (3/4) inch minimum net thickness for spaced sheathing.

d) GENERAL: The framing details required in this section apply to roofs having a minimum pitch of three (3) in twelve (12) or greater. When the roof pitch is less than three (3) in twelve (12) members supporting rafters and ceiling joists such as ridge boards, hips and valleys shall be designed as beams.

Rafters shall be framed directly opposite each other at the ridge. There shall be a ridge board at least one (1) inch nominal thickness at all ridges and not less in depth than the cut end of the rafter. At all valleys and hips there shall be a single valley or hip rafter not less than two (2) inches nominal thickness and not less in depth than the cut end of the rafter.

For the pupose of this section the tables, "Working Stresses for Joists and Rafters" issued by the National Forest Products Association, may be used to identify those stress graded woods which meet the requirements of the tables incorporated in Section 2105.0.

2105.3 METAL: Steel structural elements in roof-ceiling construction may be either hot-rolled structural steel shapes or members cold formed to shape from steel sheet strip or plate or a fabricated combination thereof. Members shall be straight and free of any defects which would significantly affect their structural performance. Steel girders, trusses or beams in roof-ceiling construction shall be designed in accordance with the application standards in this article.

Aluminum structural elements in roof-ceiling systems shall be constructed of materials and designed in accordance with the applicable reference standard of this article.

2105.4 CEILING FINISHES: Ceilings shall be installed in accordance with the requirements in Section 2104.0.

2105.5 VENTILATION: Where determined necessary by the building official due to atmospheric or climatic conditions, enclosed attics and enclosed rafter spaces formed where ceilings are applied direct to the underside of roof rafters, shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain and snow. The net free ventilating area shall be not less than one-one hundred fiftieth (1/150) of the area of the space ventilated, except that the area may be one-three hundredth (1/300) provided at least fifty (50) percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least three (3) feet above eave or cornice vents with the balance of the required ventilation

TABLE 2105-1 ALLOWABLE SPANS FOR CEILING JOISTS

20 Lbs. Per Sq. Ft. Live Load
(Limited attic storage where development of future rooms is not possible)
(Plaster Ceiling)

DESIGN CRITERIA:
Deflection - for 20 lbs. per sq. ft. live load. Limited to span in inches divided by 360.
Strength - Live losd of 20 lbs. per sq. ft. plus dead load of 10 lbs. per sq. ft. determines fiber stress value shown.

HOW TO USE TABLES: Enter Table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

JOIST SIZE	SPACING (IN)	Modulus of Elasticity, "E", in 1,000,000 psi																		
		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4
2x4	12.0	5-5 430	5-10 500	6-2 560	6-6 630	6-10 680	7-1 740	7-4 790	7-7 850	7-10 900	8-0 950	8-3 990	8-5 1040	8-7 1090	8-9 1130	8-11 1170	9-1 1220	9-3 1260	9-7 1340	9-10 1420
	13.7	5-2 450	5-7 520	5-11 590	6-3 650	6-6 720	6-9 770	7-0 830	7-3 880	7-6 940	7-8 990	7-10 1040	8-1 1090	8-3 1140	8-5 1180	8-7 1230	8-8 1270	8-10 1320	9-2 1400	9-5 1490
	16.0	4-11 470	5-4 550	5-8 620	5-11 690	6-2 750	6-5 810	6-8 870	6-11 930	7-1 990	7-3 1040	7-6 1090	7-8 1140	7-10 1200	8-0 1240	8-1 1290	8-3 1340	8-5 1390	8-8 1480	8-11 1570
	19.2	4-8 500	5-0 580	5-4 660	5-7 730	5-10 800	6-1 870	6-3 930	6-6 990	6-8 1050	6-10 1110	7-0 1160	7-2 1220	7-4 1270	7-6 1320	7-8 1370	7-9 1420	7-11 1470	8-2 1570	8-5 1660
	24.0	4-4 540	4-8 630	4-11 710	5-2 790	5-5 860	5-8 930	5-10 1000	6-0 1070	6-2 1130	6-4 1190	6-6 1250	6-8 1310	6-10 1370	7-0 1420	7-1 1480	7-3 1530	7-4 1590	7-7 1690	7-10 1790
2x6	12.0	8-6 430	9-2 500	9-9 560	10-3 630	10-9 680	11-2 740	11-7 790	11-11 850	12-3 900	12-7 950	12-11 990	13-3 1040	13-6 1090	13-9 1130	14-1 1170	14-4 1220	14-7 1260	15-0 1340	15-6 1420
	13.7	8-2 450	8-9 520	9-4 590	9-10 650	10-3 720	10-8 770	11-1 830	11-5 880	11-9 940	12-1 990	12-4 1040	12-8 1090	12-11 1140	13-2 1180	13-5 1230	13-8 1270	13-11 1320	14-4 1400	14-9 1490
	16.0	7-9 470	8-4 550	8-10 520	9-4 690	9-9 750	10-2 810	10-6 870	10-10 930	11-2 990	11-5 1040	11-9 1090	12-0 1140	12-3 1200	12-6 1240	12-9 1290	13-0 1340	13-3 1390	13-8 1480	14-1 1570
	19.2	7-3 500	7-10 580	8-4 660	8-9 730	9-2 800	9-6 870	9-10 930	10-2 990	10-6 1050	10-9 1110	11-1 1160	11-4 1220	11-7 1270	11-9 1320	12-0 1370	12-3 1420	12-5 1470	12-10 1570	13-3 1660
	24.0	6-9 540	7-3 630	7-9 710	8-2 790	8-6 860	8-10 930	9-2 1000	9-6 1070	9-9 1130	10-0 1190	10-3 1250	10-6 1310	10-9 1370	10-11 1420	11-2 1480	11-4 1530	11-7 1590	11-11 1690	12-3 1790
2x8	12.0	11-3 430	12-1 500	12-10 560	13-6 630	14-2 680	14-8 740	15-3 790	15-9 850	16-2 900	16-7 950	17-0 990	17-5 1040	17-10 1090	18-2 1130	18-6 1170	18-10 1220	19-2 1260	19-10 1340	20-5 1420
	13.7	10-9 450	11-7 520	12-3 590	12-11 650	13-6 720	14-1 770	14-7 830	15-0 880	15-6 940	15-11 990	16-3 1040	16-8 1090	17-0 1140	17-5 1180	17-9 1230	18-0 1270	18-4 1320	18-11 1400	19-6 1490
	16.0	10-7 470	11-0 550	11-8 620	12-3 690	12-10 750	13-4 810	13-10 870	14-3 930	14-8 990	15-1 1040	15-6 1090	15-10 1140	16-2 1200	16-6 1240	16-10 1290	17-2 1340	17-5 1390	18-0 1480	18-6 1570
	19.2	9-7 500	10-4 580	11-0 660	11-7 730	12-1 800	12-7 870	13-0 930	13-5 990	13-10 1050	14-2 1110	14-7 1160	14-11 1220	15-3 1270	15-6 1320	15-10 1370	16-1 1420	16-5 1470	16-11 1570	17-5 1660
	24.0	8-11 540	9-7 630	10-2 710	10-9 790	11-3 860	11-8 930	12-1 1000	12-6 1070	12-10 1130	13-2 1190	13-6 1250	13-10 1310	14-2 1370	14-5 1420	14-8 1480	15-0 1530	15-3 1590	15-9 1690	16-2 1790
2x10	12.0	14-4 430	15-5 500	16-5 560	17-3 630	18-0 680	18-9 740	19-5 790	20-1 850	20-8 900	21-2 950	21-9 990	22-3 1040	22-9 1090	23-2 1130	23-6 1170	24-1 1220	24-6 1260	25-3 1340	26-0 1420
	13.7	13-8 450	14-9 520	15-8 590	16-6 650	17-3 720	17-11 770	18-7 830	19-2 880	19-9 940	20-3 990	20-9 1040	21-3 1090	21-9 1140	22-2 1180	22-7 1230	23-0 1270	23-5 1320	24-2 1400	24-10 1490
	16.0	13-0 470	14-0 550	14-11 620	15-8 690	16-5 750	17-0 810	17-8 870	18-3 930	18-9 990	19-3 1040	19-9 1090	20-2 1140	20-8 1200	21-1 1240	21-6 1290	21-10 1340	22-3 1390	22-11 1480	23-8 1570
	19.2	12-3 500	13-2 580	14-0 660	14-9 730	15-5 800	16-0 870	16-7 930	17-2 990	17-8 1050	18-1 1110	18-7 1160	19-0 1220	19-5 1270	19-10 1320	20-2 1370	20-7 1420	20-11 1470	21-7 1570	22-3 1660
	24.0	11-4 540	12-3 630	13-0 710	13-8 790	14-4 860	14-11 930	15-5 1000	15-11 1070	16-5 1130	16-10 1190	17-3 1250	17-8 1310	18-0 1370	18-5 1420	18-9 1480	19-1 1530	19-5 1590	20-1 1690	20-8 1790

NOTE: The extreme fiber stress in bending, "F_b", in pounds per square inch is shown below each span.

TABLE 2105-2 ALLOWABLE SPANS FOR CEILING JOISTS

20 Lbs. Per Sq. Ft. Live Load
(Limited attic storage where development of future rooms is not possible)
(Gypsum Ceiling)

DESIGN CRITERIA:
Deflection - For 20 lbs. per sq. ft. live load. Limited to span in inches divided by 240.
Strength - Live load of 20 lbs. per sq. ft. plua dead load of 10 lbs. per sq. ft. determines fiber stress value.

HOW TO USE TABLES: Enter Table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

JOIST SIZE	SPACING (IN)	Modulus of Elasticity, "E", in 1,000,000 psi																		
		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4
2x4	12.0	6-2 560	6-8 660	7-1 740	7-6 820	7-10 900	8-1 970	8-5 1040	8-8 1110	8-11 1170	9-2 1240	9-5 1300	9-8 1360	9-10 1420	10-0 1480	10-3 1540	10-5 1600	10-7 1650	10-11 1760	11-3 1860
	13.7	5-11 590	6-5 690	6-9 770	7-2 860	7-6 940	7-9 1010	8-1 1090	8-4 1160	8-7 1230	8-9 1300	9-0 1360	9-3 1420	9-5 1490	9-7 1550	9-9 1610	10-0 1670	10-2 1730	10-6 1840	10-9 1950
	16.0	5-8 620	6-1 720	6-5 810	6-9 900	7-1 990	7-5 1070	7-8 1140	7-11 1220	8-1 1290	8-4 1360	8-7 1430	8-9 1500	8-11 1570	9-1 1630	9-4 1690	9-6 1760	9-8 1820	9-11 1940	10-3 2050
	19.2	5-4 660	5-9 770	6-1 870	6-5 960	6-8 1050	6-11 1130	7-2 1220	7-5 1300	7-8 1370	7-10 1450	8-1 1520	8-3 1590	8-5 1660	8-7 1730	8-9 1800	8-11 1870	9-1 1930	9-4 2060	9-8 2180
	24.0	4-11 710	5-4 830	5-8 930	5-11 1030	6-2 1130	6-5 1220	6-8 1310	6-11 1400	7-1 1480	7-3 1560	7-6 1640	7-8 1720	7-10 1790	8-0 1870	8-1 1940	8-3 2010	8-5 2080	8-8 2220	8-11 2350
2x6	12.0	9-9 560	10-6 660	11-2 740	11-9 820	12-3 900	12-9 970	13-3 1040	13-8 1110	14-1 1170	14-5 1240	14-9 1300	15-2 1360	15-6 1420	15-9 1480	16-1 1540	16-4 1600	16-8 1650	17-2 1760	17-8 1860
	13.7	9-4 590	10-0 690	10-8 770	11-3 860	11-9 940	12-3 1010	12-8 1090	13-1 1160	13-5 1230	13-10 1300	14-2 1360	14-6 1420	14-9 1490	15-1 1550	15-5 1610	15-8 1670	15-11 1730	16-5 1840	16-11 1950
	16.0	8-10 620	9-6 720	10-2 810	10-8 900	11-2 990	11-7 1070	12-0 1140	12-5 1220	12-9 1290	13-1 1360	13-5 1430	13-9 1500	14-1 1570	14-4 1630	14-7 1690	14-11 1760	15-2 1820	15-7 1940	16-1 2050
	19.2	8-4 660	9-0 770	9-6 870	10-0 960	10-6 1050	10-11 1130	11-4 1220	11-8 1300	12-0 1370	12-4 1450	12-8 1520	12-11 1590	13-3 1660	13-6 1730	13-9 1800	14-0 1870	14-3 1930	14-8 2060	15-2 2180
	24.0	7-9 710	8-4 830	8-10 930	9-4 1030	9-9 1130	10-2 1220	10-6 1310	10-10 1400	11-2 1480	11-5 1560	11-9 1640	12-0 1720	12-3 1790	12-6 1870	12-9 1940	13-0 2010	13-3 2080	13-8 2220	14-1 2350
2x8	12.0	12-10 560	13-10 660	14-8 740	15-6 820	16-2 900	16-10 970	17-5 1040	18-0 1110	18-6 1170	19-0 1240	19-6 1300	19-11 1360	20-5 1420	20-10 1480	21-2 1540	21-7 1600	21-11 1650	22-8 1760	23-4 1860
	13.7	12-3 590	13-3 690	14-1 770	14-10 860	15-6 940	16-1 1010	16-8 1090	17-2 1160	17-9 1230	18-2 1300	18-8 1360	19-1 1420	19-6 1490	19-11 1550	20-3 1610	20-8 1670	21-0 1730	21-8 1840	22-4 1950
	16.0	11-8 620	12-7 720	13-4 810	14-1 900	14-8 990	15-3 1070	15-10 1140	16-4 1220	16-10 1290	17-3 1360	17-9 1430	18-2 1500	18-6 1570	18-11 1630	19-3 1690	19-7 1760	19-11 1820	20-7 1940	21-2 2050
	19.2	11-0 660	11-10 770	12-7 870	13-3 960	13-10 1050	14-5 1130	14-11 1220	15-5 1300	15-10 1370	16-3 1450	16-8 1520	17-1 1590	17-5 1660	17-9 1730	18-2 1800	18-5 1870	18-9 1930	19-5 2060	19-11 2180
	24.0	10-2 710	11-0 830	11-8 930	12-3 1030	12-10 1130	13-4 1220	13-10 1310	14-3 1400	14-8 1480	15-1 1560	15-6 1640	15-10 1720	16-2 1790	16-6 1870	16-10 1940	17-2 2010	17-5 2080	18-0 2220	18-6 2350
2x10	12.0	16-5 560	17-8 660	18-9 740	19-9 820	20-8 900	21-6 970	22-3 1040	22-11 1110	23-8 1170	24-3 1240	24-10 1300	25-5 1360	26-0 1420	26-6 1480	27-1 1540	27-6 1600	28-0 1650	28-11 1760	29-9 1860
	13.7	15-8 590	16-11 690	17-11 770	18-11 860	19-9 940	20-6 1010	21-3 1090	21-11 1160	22-7 1230	23-3 1300	23-9 1360	24-4 1420	24-10 1490	25-5 1550	25-10 1610	26-4 1670	26-10 1730	27-8 1840	28-6 1950
	16.0	14-11 620	16-0 720	17-0 810	17-11 900	18-9 990	19-6 1070	20-2 1140	20-10 1220	21-6 1290	22-1 1360	22-7 1430	23-2 1500	23-8 1570	24-1 1630	24-7 1690	25-0 1760	25-5 1820	26-3 1940	27-1 2050
	19.2	14-0 660	15-1 770	16-0 870	16-11 960	17-8 1050	18-4 1130	19-0 1220	19-7 1300	20-2 1370	20-8 1450	21-3 1520	21-9 1590	22-3 1660	22-8 1730	23-2 1800	23-7 1870	23-11 1930	24-9 2060	25-5 2180
	24.0	13-0 710	14-0 830	14-11 930	15-8 1030	16-5 1130	17-0 1220	17-8 1310	18-3 1400	18-9 1480	19-3 1560	19-9 1640	20-2 1720	20-8 1790	21-1 1870	21-6 1940	21-10 2010	22-3 2080	22-11 2220	23-8 2350

Note: The extreme fiber stress in bending, "F_b", in pounds per square inch is shown below each span.

TABLE 2105-3 ALLOWABLE SPAN FOR CEILING JOISTS

10 Lbs. Per Sq. Ft. Live Load
(No attic storage and roof slope not steeper than 3 in 12)
(Plaster Ceiling)

DESIGN CRITERIA:
Deflection - For 10 lbs. per sq. ft. live load Limited to span in inches divided by 360.
Strength - Live load of 10 lbs. per sq. ft. plus dead load of 5 lbs. per sq. ft. determines fiber stress value.

HOW TO USE TABLES: Enter Table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

JOIST SIZE	SPACING (IN)	Modulus of Elasticity, "E", in 1,000,000 psi																		
		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4
2x4	12.0	6-10 340	7-4 400	7-10 450	8-3 500	8-7 540	8-11 590	9-3 630	9-7 670	9-10 710	10-1 750	10-4 790	10-7 830	10-10 860	11-1 900	11-3 930	11-6 970	11-8 1000	12-1 1070	12-5 1130
	13.7	6-6 360	7-0 410	7-6 470	7-10 520	8-3 570	8-7 610	8-10 660	9-2 700	9-5 740	9-8 780	9-11 820	10-2 860	10-4 900	10-7 940	10-9 970	11-0 1010	11-2 1050	11-6 1110	11-10 1180
	16.0	6-2 380	6-8 440	7-1 490	7-6 550	7-10 600	8-1 650	8-5 690	8-8 740	8-11 780	9-2 830	9-5 870	9-8 910	9-10 950	10-0 990	10-3 1030	10-5 1060	10-7 1100	10-11 1170	11-3 1240
	19.2	5-10 400	6-3 460	6-8 520	7-0 580	7-4 630	7-8 690	7-11 740	8-2 790	8-5 830	8-8 880	8-10 920	9-1 970	9-3 1010	9-5 1050	9-8 1090	9-10 1130	10-0 1170	10-4 1250	10-7 1320
	24.0	5-5 430	5-10 500	6-2 560	6-6 630	6-10 680	7-1 740	7-4 790	7-7 850	7-10 900	8-0 950	8-3 990	8-5 1040	8-7 1090	8-9 1130	8-11 1170	9-1 1220	9-3 1260	9-7 1340	9-10 1420
2x6	12.0	10-9 340	11-7 400	12-3 450	12-11 500	13-6 540	14-1 590	14-7 630	15-0 670	15-6 710	15-11 750	16-3 790	16-8 830	17-0 850	17-4 900	17-8 930	18-0 970	18-4 1000	18-11 1070	19-6 1130
	13.7	10-3 360	11-1 410	11-9 470	12-4 520	12-11 570	13-5 610	13-11 660	14-4 700	14-9 740	15-2 780	15-7 820	15-11 860	16-3 900	16-7 940	16-11 970	17-3 1010	17-6 1050	18-1 1110	18-8 1180
	16.0	9-9 380	10-6 440	11-2 490	11-9 550	12-3 600	12-9 650	13-3 690	13-8 740	14-1 780	14-5 830	14-9 870	15-2 910	15-6 950	15-9 990	16-1 1030	16-4 1060	16-8 1100	17-2 1170	17-8 1240
	19.2	9-2 400	9-10 460	10-6 520	11-1 580	11-7 630	12-0 690	12-5 740	12-10 790	13-3 830	13-7 880	13-11 920	14-3 970	14-7 1010	14-10 1050	15-2 1090	15-5 1130	15-8 1170	16-2 1250	16-8 1320
	24.0	8-6 430	9-2 500	9-9 560	10-3 630	10-9 680	11-2 740	11-7 790	11-11 850	12-3 900	12-7 950	12-11 990	13-3 1040	13-6 1090	13-9 1130	14-1 1170	14-4 1220	14-7 1260	15-0 1340	15-6 1420
2x8	12.0	14-2 340	15-3 400	16-2 450	17-0 500	17-10 540	18-6 590	19-2 630	19-10 670	20-5 710	20-11 750	21-5 790	21-11 830	22-5 860	22-11 900	23-4 930	23-9 970	24-2 1000	24-11 1070	25-8 1130
	13.7	13-6 360	14-7 410	15-6 470	16-3 520	17-0 570	17-9 610	18-4 660	18-11 700	19-6 740	20-0 780	20-6 820	21-0 860	21-5 900	21-11 940	22-4 970	22-9 1010	23-1 1050	23-10 1110	24-7 1180
	16.0	12-10 380	13-10 440	14-8 490	15-6 550	16-2 600	16-10 650	17-5 690	18-0 740	18-6 780	19-0 830	19-6 870	19-11 910	20-5 950	20-10 990	21-2 1030	21-7 1060	21-11 1100	22-8 1170	23-4 1240
	19.2	12-1 400	13-0 460	13-10 520	14-7 580	15-3 630	15-10 690	16-5 740	16-11 790	17-5 830	17-11 880	18-4 920	18-9 970	19-2 1010	19-7 1050	19-11 1090	20-4 1130	20-8 1170	21-4 1250	21-11 1320
	24.0	11-3 430	12-1 500	12-10 560	13-6 630	14-2 680	14-8 740	15-3 790	15-9 850	16-2 900	16-7 950	17-0 990	17-5 1040	17-10 1090	18-2 1130	18-6 1170	18-10 1220	19-2 1260	19-10 1340	20-5 1420
2x10	12.0	18-0 340	19-5 400	20-8 450	21-9 500	22-9 540	23-8 590	24-6 630	25-3 670	26-0 710	26-9 750	27-5 790	28-0 830	28-7 860	29-2 900	29-9 930	30-4 970	30-10 1000	31-10 1070	32-9 1130
	13.7	17-3 360	18-7 410	19-9 470	20-9 520	21-9 570	22-7 610	23-5 660	24-2 700	24-10 740	25-7 780	26-2 820	26-10 860	27-5 900	27-11 940	28-6 970	29-0 1010	29-6 1050	30-5 1110	31-4 1180
	16.0	16-5 380	17-8 440	18-8 490	19-9 550	20-8 600	21-6 650	22-3 690	22-11 740	23-8 780	24-3 830	24-10 870	25-5 910	26-0 950	26-6 990	27-1 1030	27-6 1060	28-0 1100	28-11 1170	29-9 1240
	19.2	15-5 400	16-7 460	17-8 520	18-7 580	19-5 630	20-2 690	20-11 740	21-7 790	22-3 830	22-10 880	23-5 920	23-11 970	24-6 1010	25-0 1050	25-5 1090	25-11 1130	26-4 1170	27-3 1250	28-0 1320
	24.0	14-4 430	15-5 500	16-5 560	17-3 630	18-0 680	18-9 740	19-5 790	20-1 850	20-8 900	21-2 950	21-9 990	22-3 1040	22-9 1090	23-2 1130	23-8 1170	24-1 1220	24-6 1260	25-3 1340	26-0 1420

Note: The extreme fiber stress in bending, "F_b", in pounds per square inch is shown below each span.

TABLE 2105-4 ALLOWABLE SPANS FOR CEILING JOISTS

10 Lbs. Per Sq. Ft. Live Load
(No attic storage and roof slope not steeper than 3 in 12)
(Gypsum Ceiling)

DESIGN CRITERIA:
Deflection - For 10 lbs. per sq. ft. live load. Limited to span in inches divided by 240.
Strength - Live load of 10 lbs. per sq. ft. plus dead load of 5 lbs. per sq. ft. determines fiber stress value.

HOW TO USE TABLES: Enter Table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

JOIST SIZE	SPACING (IN)	Modulus of Elasticity, "E", in 1,000,000 psi																		
		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4
2x4	12.0	7-10 450	8-5 520	8-11 590	9-5 650	9-10 710	10-3 770	10-7 830	10-11 880	11-3 930	11-7 980	11-10 1030	12-2 1080	12-5 1130	12-8 1180	12-11 1220	13-2 1270	13-4 1310	13-9 1400	14-2 1480
	13.7	7-6 470	8-1 540	8-7 610	9-0 680	9-5 740	9-8 800	10-2 860	10-6 920	10-9 970	11-1 1030	11-4 1080	11-7 1130	11-10 1180	12-1 1230	12-4 1280	12-7 1320	12-9 1370	13-2 1460	13-7 1550
	16.0	7-1 490	7-8 570	8-1 650	8-7 720	8-11 780	9-4 850	9-8 910	9-11 970	10-3 1030	10-6 1080	10-9 1140	11-0 1190	11-3 1240	11-6 1290	11-9 1340	11-11 1390	12-2 1440	12-6 1540	12-11 1630
	19.2	6-8 520	7-2 610	7-8 690	8-1 760	8-5 830	8-9 900	9-1 970	9-4 1030	9-8 1090	8-11 1150	10-2 1210	10-4 1270	10-7 1320	10-10 1380	11-0 1430	11-3 1480	11-5 1530	11-9 1630	12-2 1730
	24.0	6-2 560	6-8 660	7-1 740	7-6 820	7-10 900	8-1 970	8-5 1040	8-8 1110	8-11 1170	9-2 1240	9-5 1300	9-8 1360	9-10 1420	10-0 1480	10-3 1540	10-5 1600	10-7 1650	10-11 1760	11-3 1860
2x6	12.0	12-3 450	13-3 520	14-1 590	14-9 650	15-6 710	16-1 770	16-8 830	17-2 880	17-8 930	18-2 980	18-8 1030	19-1 1080	19-6 1130	19-11 1180	20-3 1220	20-8 1270	21-0 1310	21-8 1400	22-4 1480
	13.7	11-9 470	12-8 540	13-5 610	14-2 680	14-9 740	15-5 800	15-11 860	16-5 920	16-11 970	17-5 1030	17-10 1080	18-3 1130	18-8 1180	19-0 1230	19-5 1280	19-9 1320	20-1 1370	20-9 1460	21-4 1550
	16.0	11-2 490	12-0 570	12-9 650	13-5 720	14-1 780	14-7 850	15-2 910	15-7 970	16-1 1030	16-6 1080	16-11 1140	17-4 1190	17-8 1240	18-1 1290	18-5 1340	18-9 1390	19-1 1440	19-8 1540	20-3 1630
	19.2	10-6 520	11-4 610	12-0 690	12-8 760	13-3 830	13-9 900	14-3 970	14-8 1030	15-2 1090	15-7 1150	15-11 1210	16-4 1270	16-8 1320	17-0 1380	17-4 1430	17-8 1480	17-11 1530	18-6 1630	19-1 1730
	24.0	9-8 560	10-6 660	11-2 740	11-9 820	12-3 900	12-9 970	13-3 1040	13-8 1110	14-1 1170	14-5 1240	14-9 1300	15-2 1360	15-6 1420	15-9 1480	16-1 1540	16-4 1600	16-8 1650	17-2 1760	17-8 1860
2x8	12.0	16-2 450	17-5 520	18-6 590	19-6 650	20-5 710	21-2 770	21-11 830	22-8 880	23-4 930	24-0 980	24-7 1030	25-2 1080	25-8 1130	26-2 1180	26-9 1220	27-2 1270	27-8 1310	28-7 1400	29-5 1480
	13.7	15-6 470	16-8 540	17-9 610	18-8 680	19-6 740	20-3 800	21-0 860	21-8 920	22-4 970	22-11 1030	23-6 1080	24-0 1130	24-7 1180	25-1 1230	25-7 1280	26-0 1320	26-6 1370	27-4 1460	28-1 1550
	16.0	14-8 490	15-10 570	16-10 650	17-9 720	18-6 780	19-3 850	19-11 910	20-7 970	21-2 1030	21-9 1080	22-4 1140	22-10 1190	23-4 1240	23-10 1290	24-3 1340	24-8 1390	25-2 1440	25-11 1540	26-9 1630
	19.2	13-10 520	14-11 610	15-10 690	16-8 760	17-5 830	18-2 900	18-9 970	19-5 1030	19-11 1090	20-6 1150	21-0 1210	21-6 1270	21-11 1320	22-5 1380	22-10 1430	23-3 1480	23-8 1530	24-5 1630	25-2 1730
	24.0	12-10 560	13-10 660	14-8 740	15-6 820	16-2 900	16-10 970	17-5 1040	18-0 1110	18-6 1170	19-0 1240	19-6 1300	19-11 1360	20-5 1420	20-10 1480	21-2 1540	21-7 1600	21-11 1650	22-8 1760	23-4 1860
2x10	12.0	20-8 450	22-3 520	23-8 590	24-10 650	26-0 710	27-1 770	28-0 830	28-11 880	29-9 930	30-7 980	31-4 1030	32-1 1080	32-9 1130	33-5 1180	34-1 1220	34-8 1270	35-4 1310	36-5 1400	37-6 1480
	13.7	19-9 470	21-3 540	22-7 610	23-9 680	24-10 740	25-10 800	26-10 860	27-8 920	28-6 970	29-3 1030	30-0 1080	30-8 1130	31-4 1180	32-0 1230	32-7 1280	33-2 1320	33-9 1370	34-10 1460	35-10 1550
	16.0	18-9 490	20-2 570	21-6 650	22-7 720	23-8 780	24-7 850	25-5 910	26-3 970	27-1 1030	27-9 1080	28-6 1140	29-2 1190	29-9 1240	30-5 1290	31-0 1340	31-6 1390	32-1 1440	33-1 1540	34-1 1630
	19.2	17-8 520	19-0 810	20-2 690	21-3 760	22-3 830	23-2 900	23-11 970	24-9 1030	25-5 1090	26-2 1150	26-10 1210	27-5 1270	28-0 1320	28-7 1380	29-2 1430	29-8 1480	30-2 1530	31-2 1630	32-1 1730
	24.0	16-5 560	17-8 660	18-9 740	19-9 820	20-8 900	21-6 970	22-3 1040	22-11 1110	23-8 1170	24-3 1240	24-10 1300	25-5 1360	26-0 1420	26-6 1480	27-1 1540	27-6 1600	28-0 1650	28-11 1760	29-9 1860

Note: The extreme fiber stress in bending, "F_b", in pounds per square inch is shown below each span.

TABLE 2105-5 · ALLOWABLE SPANS FOR LOW OR HIGH SLOPE RAFTERS

20 Lbs. Per Sq. Ft. Live Load
(Supporting Gypsum Ceiling)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 20 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 20 lbs. per sq. ft. live load. Limited to span in inches divided by 240.

HOW TO USE TABLES: Enter Table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi). 300	400	500	600	700	800	900	1000	1100	1200	1300
2x6	12.0	6-7 0.12	7-7 0.19	8-6 0.26	9-4 0.35	10-0 0.44	10-9 0.54	11-5 0.64	12-0 0.75	12-7 0.86	13-2 0.98	13-8 1.11
	13.7	6-2 0.12	7-1 0.18	7-11 0.25	8-8 0.33	9-5 0.41	10-0 0.50	10-8 0.60	11-3 0.70	11-9 0.81	12-4 0.92	12-10 1.04
	16.0	5-8 0.11	6-7 0.16	7-4 0.23	8-1 0.30	8-8 0.38	9-4 0.46	9-10 0.55	10-5 0.65	10-11 0.75	11-5 0.85	11-10 0.96
	19.2	5-2 0.10	6-0 0.15	6-9 0.21	7-4 0.27	7-11 0.35	8-6 0.42	9-0 0.51	9-6 0.59	9-11 0.68	10-5 0.78	10-10 0.88
	24.0	4-8 0.09	5-4 0.13	6-0 0.19	6-7 0.25	7-1 0.31	7-7 0.38	8-1 0.45	8-6 0.53	8-11 0.61	9-4 0.70	9-8 0.78
2x8	12.0	8-8 0.12	10-0 0.19	11-2 0.26	12-3 0.35	13-3 0.44	14-2 0.54	15-0 0.64	15-10 0.75	16-7 0.86	17-4 0.98	18-0 1.11
	13.7	8-1 0.12	9-4 0.18	10-6 0.25	11-6 0.33	12-5 0.41	13-3 0.50	14-0 0.60	14-10 0.70	15-6 0.81	16-3 0.92	16-10 1.04
	16.0	7-6 0.11	8-8 0.16	9-8 0.23	10-7 0.30	11-6 0.38	12-3 0.46	13-0 0.55	13-8 0.65	14-4 0.75	15-0 0.85	15-7 0.96
	19.2	6-10 0.10	7-11 0.15	8-10 0.21	9-8 0.27	10-6 0.35	11-2 0.42	11-10 0.51	12-6 0.59	13-1 0.68	13-8 0.78	14-3 0.88
	24.0	6-2 0.09	7-1 0.13	7-11 0.19	8-8 0.25	9-4 0.31	10-0 0.38	10-7 0.45	11-2 0.53	11-9 0.61	12-3 0.70	12-9 0.78
2x10	12.0	11-1 0.12	12-9 0.19	14-3 0.26	15-8 0.35	16-11 0.44	18-1 0.54	19-2 0.64	20-2 0.75	21-2 0.86	22-1 0.98	23-0 1.11
	13.7	10-4 0.12	11-11 0.18	13-4 0.25	14-8 0.33	15-10 0.41	16-11 0.50	17-11 0.60	18-11 0.70	19-10 0.81	20-8 0.92	21-6 1.04
	16.0	9-7 0.11	11-1 0.16	12-4 0.23	13-6 0.30	14-8 0.38	15-8 0.46	16-7 0.55	17-6 0.65	18-4 0.75	19-2 0.85	19-11 0.96
	19.2	8-9 0.10	10-1 0.15	11-3 0.21	12-4 0.27	13-4 0.35	14-3 0.42	15-2 0.51	15-11 0.59	16-9 0.68	17-6 0.78	18-2 0.88
	24.0	7-10 0.09	9-0 0.13	10-1 0.19	11-1 0.25	11-11 0.31	12-9 0.38	13-6 0.45	14-3 0.53	15-0 0.61	15-8 0.70	16-3 0.78
2x12	12.0	13-5 0.12	15-6 0.19	17-4 0.26	19-0 0.35	20-6 0.44	21-11 0.54	23-3 0.64	24-7 0.75	25-9 0.86	26-11 0.98	28-0 1.11
	13.7	12-7 0.12	14-6 0.18	16-3 0.25	17-9 0.33	19-3 0.41	20-6 0.50	21-9 0.60	23-0 0.70	24-1 0.81	25-2 0.92	26-2 1.04
	16.0	11-8 0.11	13-5 0.16	15-0 0.23	16-6 0.30	17-9 0.38	19-0 0.46	20-2 0.55	21-3 0.65	22-4 0.75	23-3 0.85	24-3 0.96
	19.2	10-8 0.10	12-3 0.15	13-9 0.21	15-0 0.27	16-3 0.35	17-4 0.42	18-5 0.51	19-5 0.59	20-4 0.68	21-3 0.78	22-2 0.88
	24.0	9-6 0.09	11-0 0.13	12-3 0.19	13-5 0.25	14-6 0.31	15-6 0.38	16-6 0.45	17-4 0.53	18-2 0.61	19-0 0.70	19-10 0.78

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-5 (continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700		
14-2 1.24	14-8 1.37	15-2 1.51	15-8 1.66	16-1 1.81	16-7 1.96	17-0 2.12	17-5 2.28	17-10 2.44			12.0	
13-3 1.16	13-9 1.29	14-2 1.42	14-8 1.55	15-1 1.69	15-6 1.83	15-11 1.98	16-3 2.13	16-8 2.28	17-5 2.60		13.7	
12-4 1.07	12-9 1.19	13-2 1.31	13-7 1.44	13-11 1.56	14-4 1.70	14-8 1.83	15-1 1.97	15-5 2.11	16-1 2.41		16.0	2x6
11-3 0.98	11-7 1.09	12-0 1.20	12-4 1.31	12-9 1.43	13-1 1.55	13-5 1.67	13-9 1.80	14-1 1.93	14-8 2.20		19.2	
10-0 0.88	10-5 0.97	10-9 1.07	11-1 1.17	11-5 1.28	11-8 1.39	12-0 1.50	12-4 1.61	12-7 1.73	13-2 1.97	13-11 2.35	24.0	
18-9 1.24	19-5 1.37	20-0 1.51	20-8 1.66	21-3 1.81	21-10 1.96	22-4 2.12	22-11 2.28	23-6 2.44			12.0	
17-6 1.16	18-2 1.29	18-9 1.42	19-4 1.55	19-10 1.69	20-5 1.83	20-11 1.98	21-5 2.13	21-11 2.28	22-11 2.60		13.7	
16-3 1.07	16-9 1.19	17-4 1.31	17-10 1.44	18-5 1.56	18-11 1.70	19-5 1.83	19-10 1.97	20-4 2.11	21-3 2.41		16.0	2x8
14-10 0.98	15-4 1.09	15-10 1.20	16-4 1.31	16-9 1.43	17-3 1.55	17-8 1.67	18-2 1.80	18-7 1.93	19-5 2.20		19.2	
13-3 0.88	13-8 0.97	14-2 1.07	14-7 1.17	15-0 1.28	15-5 1.39	15-10 1.50	16-3 1.61	16-7 1.73	17-4 1.97	18-5 2.35	24.0	
23-11 1.24	24-9 1.37	25-6 1.51	26-4 1.66	27-1 1.81	27-10 1.96	28-7 2.12	29-3 2.28	29-11 2.44			12.0	
22-4 1.16	23-2 1.29	23-11 1.42	24-7 1.55	25-4 1.69	26-0 1.83	26-8 1.98	27-4 2.13	28-0 2.28	29-3 2.60		13.7	
20-8 1.07	21-5 1.19	22-1 1.31	22-10 1.44	23-5 1.56	24-1 1.70	24-9 1.83	25-4 1.97	25-11 2.11	27-1 2.41		16.0	2x10
18-11 0.98	19-7 1.09	20-2 1.20	20-10 1.31	21-5 1.43	22-0 1.55	22-7 1.67	23-2 1.80	23-8 1.93	24-9 2.20		19.2	
16-11 0.88	17-6 0.97	18-1 1.07	18-7 1.17	19-2 1.28	19-8 1.39	20-2 1.50	20-8 1.61	21-2 1.73	22-1 1.97	23-5 2.35	24.0	
29-1 1.24	30-1 1.37	31-1 1.51	32-0 1.66	32-11 1.81	33-10 1.96	34-9 2.12	35-7 2.28	36-5 2.44			12.0	
27-2 1.16	28-2 1.29	29-1 1.42	29-11 1.55	30-10 1.69	31-8 1.83	32-6 1.98	33-3 2.13	34-1 2.28	35-7 2.60		13.7	
25-2 1.07	26-0 1.19	26-11 1.31	27-9 1.44	28-6 1.56	29-4 1.70	30-1 1.83	30-10 1.97	31-6 2.11	32-11 2.41		16.0	2x12
23-0 0.98	23-9 1.09	24-7 1.20	25-4 1.31	26-0 1.43	26-9 1.55	27-5 1.67	28-2 1.80	28-9 1.93	30-1 2.20		19.2	
20-6 0.88	21-3 0.97	21-11 1.07	22-8 1.17	23-3 1.28	23-11 1.39	24-7 1.50	25-2 1.61	25-9 1.73	26-11 1.97	28-6 2.35	24.0	

NOTE: The modulus of elasticity, "E," in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-6 ALLOWABLE SPAN FOR LOW OR HIGH SLOPE RAFTERS

30 Lbs. Per Sq. Ft. Live Load
(Supporting Gypsum Ceiling)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 30 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 30 lbs. per sq. ft. live load. Limited to span in inches divided by 240.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).										
		300	400	500	600	700	800	900	1000	1100	1200	1300
2x6	12.0	5-10 0.13	6-8 0.19	7-6 0.27	8-2 0.36	8-10 0.45	9-6 0.55	10-0 0.66	10-7 0.77	11-1 0.89	11-7 1.01	12-1 1.14
	13.7	5-5 0.12	6-3 0.18	7-0 0.25	7-8 0.33	8-3 0.42	8-10 0.52	9-5 0.61	9-11 0.72	10-5 0.83	10-10 0.95	11-3 1.07
	16.0	5-0 0.11	5-10 0.17	6-6 0.24	7-1 0.31	7-8 0.39	8-2 0.48	8-8 0.57	9-2 0.67	9-7 0.77	10-0 0.88	10-5 0.99
	19.2	4-7 0.10	5-4 0.15	5-11 0.22	6-6 0.28	7-0 0.36	7-6 0.44	7-11 0.52	8-4 0.61	8-9 0.70	9-2 0.80	9-6 0.90
	24.0	4-1 0.09	4-9 0.14	5-4 0.19	5-10 0.25	6-3 0.32	6-8 0.39	7-1 0.46	7-6 0.54	7-10 0.63	8-2 0.72	8-6 0.81
2x8	12.0	7-8 0.13	8-10 0.19	9-10 0.27	10-10 0.36	11-8 0.45	12-6 0.55	13-3 0.66	13-11 0.77	14-8 0.89	15-3 1.01	15-11 1.14
	13.7	7-2 0.12	8-3 0.18	9-3 0.25	10-1 0.33	10-11 0.42	11-8 0.52	12-5 0.61	13-1 0.72	13-8 0.83	14-4 0.95	14-11 1.07
	16.0	6-7 0.11	7-8 0.17	8-7 0.24	9-4 0.31	10-1 0.39	10-10 0.48	11-6 0.57	12-1 0.67	12-8 0.77	13-3 0.88	13-9 0.99
	19.2	6-1 0.10	7-0 0.15	7-10 0.22	8-7 0.28	9-3 0.36	9-10 0.44	10-6 0.52	11-0 0.61	11-7 0.70	12-1 0.80	12-7 0.90
	24.0	5-5 0.09	6-3 0.14	7-0 0.19	7-8 0.25	8-3 0.32	8-10 0.39	9-4 0.46	9-10 0.54	10-4 0.63	10-10 0.72	11-3 0.81
2x10	12.0	9-9 0.13	11-3 0.19	12-7 0.27	13-9 0.36	14-11 0.45	15-11 0.55	16-11 0.66	17-10 0.77	18-8 0.89	19-6 1.01	20-4 1.14
	13.7	9-1 0.12	10-6 0.18	11-9 0.25	12-11 0.33	13-11 0.42	14-11 0.52	15-10 0.61	16-8 0.72	17-6 0.83	18-3 0.95	19-0 1.07
	16.0	8-5 0.11	9-9 0.17	10-11 0.24	11-11 0.31	12-11 0.39	13-9 0.48	14-8 0.57	15-5 0.67	16-2 0.77	16-11 0.88	17-7 0.99
	19.2	7-8 0.10	8-11 0.15	9-11 0.22	10-11 0.28	11-9 0.36	12-7 0.44	13-4 0.52	14-1 0.61	14-9 0.70	15-5 0.80	16-1 0.90
	24.0	6-11 0.09	8-0 0.14	8-11 0.19	9-9 0.25	10-6 0.32	11-3 0.39	11-11 0.46	12-7 0.54	13-2 0.63	13-9 0.72	14-4 0.81
2x12	12.0	11-10 0.13	13-8 0.19	15-4 0.27	16-9 0.36	18-1 0.45	19-4 0.55	20-6 0.66	21-8 0.77	22-8 0.89	23-9 1.01	24-8 1.14
	13.7	11-1 0.12	12-10 0.18	14-4 0.25	15-8 0.33	16-11 0.42	18-1 0.52	19-3 0.61	20-3 0.72	21-3 0.83	22-2 0.95	23-1 1.07
	16.0	10-3 0.11	11-10 0.17	13-3 0.24	14-6 0.31	15-8 0.39	16-9 0.48	17-9 0.57	18-9 0.67	19-8 0.77	20-6 0.88	21-5 0.99
	19.2	9-5 0.10	10-10 0.15	12-1 0.22	13-3 0.28	14-4 0.36	15-4 0.44	16-3 0.52	17-1 0.61	17-11 0.70	18-9 0.80	19-6 0.90
	24.0	8-5 0.09	9-8 0.14	10-10 0.19	11-10 0.25	12-10 0.32	13-8 0.39	14-6 0.46	15-4 0.54	16-1 0.63	16-9 0.72	17-5 0.81

NOTE: The modulus of elasticity, "E," in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-6 (continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700		
12-6 1.28	13-0 1.41	13-5 1.56	13-10 1.71	14-2 1.86	14-7 2.02	15-0 2.18	15-4 2.34	15-8 2.51			12.0	
11-9 1.19	12-2 1.32	12-6 1.46	12-11 1.60	13-3 1.74	13-8 1.89	14-0 2.04	14-4 2.19	14-8 2.35			13.7	
10-10 1.10	11-3 1.22	11-7 1.35	11-11 1.48	12-4 1.61	12-8 1.75	13-0 1.89	13-3 2.03	13-7 2.18	14-2 2.48		16.0	2x6
9-11 1.01	10-3 1.12	10-7 1.23	10-11 1.35	11-3 1.47	11-6 1.59	11-10 1.72	12-2 1.85	12-5 1.99	13-0 2.26		19.2	
8-10 0.90	9-2 1.00	9-6 1.10	9-9 1.21	10-0 1.31	10-4 1.43	10-7 1.54	10-10 1.66	11-1 1.78	11-7 2.02	12-4 2.41	24.0	
16-6 1.28	17-1 1.41	17-8 1.56	18-2 1.71	18-9 1.86	19-3 2.02	19-9 2.18	20-3 2.34	20-8 2.51			12.0	
15-5 1.19	16-0 1.32	16-6 1.46	17-0 1.60	17-6 1.74	18-0 1.89	18-5 2.04	18-11 2.19	19-4 2.35			13.7	
14-4 1.10	14-10 1.22	15-3 1.35	15-9 1.48	16-3 1.61	16-8 1.75	17-1 1.89	17-6 2.03	17-11 2.18	18-9 2.48		16.0	2x8
13-1 1.01	13-6 1.12	13-11 1.23	14-5 1.35	14-10 1.47	15-2 1.59	15-7 1.72	16-0 1.85	16-4 1.99	17-1 2.26		19.2	
1 -8 0.90	12-1 1.00	12-6 1.10	12-10 1.21	13-3 1.31	13-7 1.43	13-11 1.54	14-4 1.66	14-8 1.78	15-3 2.02	16-3 2.41	24.0	
21-1 1.28	21-10 1.41	22-6 1.56	23-3 1.71	23-11 1.86	24-6 2.02	25-2 2.18	25-10 2.34	26-5 2.51			12.0	
19-8 1.19	20-5 1.32	21-1 1.46	21-9 1.60	22-4 1.74	22-11 1.89	23-7 2.04	24-2 2.19	24-8 2.35			13.7	
18-3 1.10	18-11 1.22	19-6 1.35	20-1 1.48	20-8 1.61	21-3 1.75	21-10 1.89	22-4 2.03	22-10 2.18	23-11 2.48		16.0	2x10
16-8 1.01	17-3 1.12	17-10 1.23	18-4 1.35	18-11 1.47	19-5 1.59	19-11 1.72	20-5 1.85	20-10 1.99	21-10 2.26		19.2	
14-11 0.90	15-5 1.00	15-11 1.10	16-5 1.21	16-11 1.31	17-4 1.43	17-10 1.54	18-3 1.66	18-8 1.78	19-6 2.02	20-8 2.41	24.0	
25-7 1.28	26-6 1.41	27-5 1.56	28-3 1.71	29-1 1.86	29-10 2.02	30-7 2.18	31-4 2.34	32-1 2.51			12.0	
24-0 1.19	24-10 1.32	25-7 1.46	26-5 1.60	27-2 1.74	27-11 1.89	28-8 2.04	29-4 2.19	30-0 2.35			13.7	
22-2 1.10	23-0 1.22	23-9 1.35	24-5 1.48	25-2 1.61	25-10 1.75	26-6 1.89	27-2 2.03	27-10 2.18	29-1 2.48		16.0	2x12
20-3 1.01	21-0 1.12	21-8 1.23	22-4 1.35	23-0 1.47	23-7 1.59	24-2 1.72	24-10 1.85	25-5 1.99	26-6 2.26		19.2	
18-1 0.90	18-9 1.00	19-4 1.10	20-0 1.21	20-6 1.31	21-1 1.43	21-8 1.54	22-2 1.66	22-8 1.78	23-9 2.02	25-2 2.41	24.0	

Note: The required modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-7 ALLOWABLE SPAN FOR LOW OR HIGH SLOPE RAFTERS

40 Lbs. Per Sq. Ft. Live Load
(Supporting Gypsum Ceiling)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 40 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 40 lbs per sq. ft. live load. Limited to span in inches divided by 240.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE (IN)	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi). 300	400	500	600	700	800	900	1000	1100	1200	1300
2x6	12.0	5-3 0.12	6-1 0.19	6-9 0.27	7-5 0.35	8-0 0.44	8-7 0.54	9-1 0.65	9-7 0.76	10-0 0.88	10-6 1.00	10-11 1.13
	13.7	4-11 0.12	5-8 0.18	6-4 0.25	6-11 0.33	7-6 0.42	8-0 0.51	8-6 0.61	8-11 0.71	9-5 0.82	9-10 0.93	10-3 1.05
	16.0	4-6 0.11	5-3 0.17	5-10 0.23	6-5 0.31	6-11 0.39	7-5 0.47	7-10 0.56	8-3 0.66	8-8 0.76	9-1 0.86	9-5 0.98
	19.2	4-2 0.10	4-9 0.15	5-4 0.21	5-10 0.28	6-4 0.35	6-9 0.43	7-2 0.51	7-7 0.60	7-11 0.69	8-3 0.79	8-8 0.89
	24.0	3-8 0.09	4-3 0.14	4-9 0.19	5-3 0.25	5-8 0.31	6-1 0.38	6-5 0.46	6-9 0.54	7-1 0.62	7-5 0.71	7-9 0.80
2x8	12.0	6-11 0.12	8-0 0.19	8-11 0.27	9-9 0.35	10-7 0.44	11-3 0.54	12-0 0.65	12-7 0.76	13-3 0.88	13-10 1.00	14-5 1.13
	13.7	6-6 0.12	7-6 0.18	8-4 0.25	9-2 0.33	9-11 0.42	10-7 0.51	11-2 0.61	11-10 0.71	12-5 0.82	12-11 0.93	13-6 1.05
	16.0	6-0 0.11	6-11 0.17	7-9 0.23	8-6 0.31	9-2 0.39	9-9 0.47	10-4 0.56	10-11 0.66	11-6 0.76	12-0 0.86	12-6 0.98
	19.2	5-6 0.10	6-4 0.15	7-1 0.21	7-9 0.28	8-4 0.35	8-11 0.43	9-6 0.51	10-0 0.60	10-6 0.69	10-11 0.79	11-5 0.89
	24.0	4-11 0.09	5-8 0.14	6-4 0.19	6-11 0.25	7-6 0.31	8-0 0.38	8-6 0.46	8-11 0.54	9-4 0.62	9-9 0.71	10-2 0.80
2x10	12.0	8-10 0.12	10-2 0.19	11-5 0.27	12-6 0.35	13-6 0.44	14-5 0.54	15-3 0.65	16-1 0.76	16-11 0.88	17-8 1.00	18-4 1.13
	13.7	8-3 0.12	9-6 0.18	10-8 0.25	11-8 0.33	12-7 0.42	13-6 0.51	14-3 0.61	15-1 0.71	15-10 0.82	16-6 0.93	17-2 1.05
	16.0	7-8 0.11	8-10 0.17	9-10 0.23	10-10 0.31	11-8 0.39	12-6 0.47	13-3 0.56	13-11 0.66	14-8 0.76	15-3 0.86	15-11 0.98
	19.2	7-0 0.10	8-1 0.15	9-0 0.21	9-10 0.28	10-8 0.35	11-5 0.43	12-1 0.51	12-9 0.60	13-4 0.69	13-11 0.79	14-6 0.89
	24.0	6-3 0.09	7-2 0.14	8-1 0.19	8-10 0.25	9-6 0.31	10-2 0.38	10-10 0.46	11-5 0.54	11-11 0.62	12-6 0.71	13-0 0.80
2x12	12.0	10-9 0.12	12-5 0.19	13-10 0.27	15-2 0.35	16-5 0.44	17-6 0.54	18-7 0.65	19-7 0.76	20-6 0.88	21-5 1.00	22-4 1.13
	13.7	10-0 0.12	11-7 0.18	12-11 0.25	14-2 0.33	15-4 0.42	16-5 0.51	17-5 0.61	18-4 0.71	19-3 0.82	20-1 0.93	20-11 1.05
	16.0	9-3 0.11	10-9 0.17	12-0 0.23	13-2 0.31	14-2 0.39	15-2 0.47	16-1 0.56	17-0 0.66	17-9 0.76	18-7 0.86	19-4 0.98
	19.2	8-6 0.10	9-10 0.15	10-11 0.21	12-0 0.28	12-11 0.35	13-10 0.43	14-8 0.51	15-6 0.60	16-3 0.69	17-0 0.79	17-8 0.89
	24.0	7-7 0.09	8-9 0.14	9-10 0.19	10-9 0.25	11-7 0.31	12-5 0.38	13-2 0.46	13-10 0.54	14-6 0.62	15-2 0.71	15-9 0.80

Note: The required modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-7 (continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700		
11-4 1.26	11-9 1.40	12-1 1.54	12-6 1.68	12-10 1.83	13-2 1.99	13-6 2.15	13-10 2.31	14-2 2.48			12.0	
10-7 1.18	11-0 1.31	11-4 1.44	11-8 1.57	12-0 1.72	12-4 1.86	12-8 2.01	13-0 2.16	13-3 2.32			13.7	
9-10 1.09	10-2 1.21	10-6 1.33	10-10 1.46	11-1 1.59	11-5 1.72	11-9 1.86	12-0 2.00	12-4 2.15	12-10 2.45		16.0	2x6
8-11 0.99	9-3 1.10	9-7 1.22	9-10 1.33	10-2 1.45	10-5 1.57	10-8 1.70	11-0 1.83	11-3 1.96	11-9 2.23		19.2	
8-0 0.89	8-3 0.99	8-7 1.09	8-10 1.19	9-1 1.30	9-4 1.41	9-7 1.52	9-10 1.63	10-0 1.75	10-6 2.00	11-1 2.38	24.0	
14-11 1.26	15-5 1.40	16-0 1.54	16-5 1.68	16-11 1.83	17-5 1.99	17-10 2.15	18-3 2.31	18-9 2.48			12.0	
14-0 1.18	14-6 1.31	14-11 1.44	15-5 1.57	15-10 1.72	16-3 1.86	16-8 2.01	17-1 2.16	17-6 2.32			13.7	
12-11 1.09	13-5 1.21	13-10 1.33	14-3 1.46	14-8 1.59	15-1 1.72	15-5 1.86	15-10 2.00	16-3 2.15	16-11 2.45		16.0	2x8
11-10 0.99	12-3 1.10	12-7 1.22	13-0 1.33	13-5 1.45	13-9 1.57	14-1 1.70	14-6 1.83	14-10 1.96	15-5 2.23		19.2	
10-7 0.89	10-11 0.99	11-3 1.09	11-8 1.19	12-0 1.30	12-4 1.41	12-7 1.52	12-11 1.63	13-3 1.75	13-10 2.00	14-8 2.38	24.0	
19-1 1.26	19-9 1.40	20-4 1.54	21-0 1.68	21-7 1.83	22-2 1.99	22-9 2.15	23-4 2.31	23-11 2.48			12.0	
17-10 1.18	18-5 1.31	19-1 1.44	19-8 1.57	20-2 1.72	20-9 1.86	21-4 2.01	21-10 2.16	22-4 2.32			13.7	
16-6 1.09	17-1 1.21	17-8 1.33	18-2 1.46	18-9 1.59	19-3 1.72	19-9 1.86	20-2 2.00	20-8 2.15	21-7 2.45		16.0	2x10
15-1 0.99	15-7 1.10	16-1 1.22	16-7 1.33	17-1 1.45	17-7 1.57	18-0 1.70	18-5 1.83	18-11 1.96	19-9 2.23		19.2	
13-6 0.89	13-11 0.99	14-5 1.09	14-10 1.19	15-3 1.30	15-8 1.41	16-1 1.52	16-6 1.63	16-11 1.75	17-8 2.00	18-9 2.38	24.0	
23-2 1.26	24-0 1.40	24-9 1.54	25-6 1.68	26-3 1.83	27-0 1.99	27-8 2.15	28-5 2.31	29-1 2.48			12.0	
21-8 1.18	22-5 1.31	23-2 1.44	23-11 1.57	24-7 1.72	25-3 1.86	25-11 2.01	26-7 2.16	27-2 2.32			13.7	
20-1 1.09	20-9 1.21	21-5 1.33	22-1 1.46	22-9 1.59	23-5 1.72	24-0 1.86	24-7 2.00	25-2 2.15	26-3 2.45		16.0	2x12
18-4 0.99	19-0 1.10	19-7 1.22	20-2 1.33	20-9 1.45	21-4 1.57	21-11 1.70	22-5 1.83	23-0 1.96	24-0 2.23		19.2	
16-5 0.89	17-0 0.99	17-6 1.09	18-1 1.19	18-7 1.30	19-1 1.41	19-7 1.52	20-1 1.63	20-6 1.75	21-5 2.00	22-9 2.38	24.0	

NOTE: The modulus of elasticity, "E," in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-8 ALLOWABLE SPANS FOR LOW OR HIGH SLOPE RAFTERS

20 Lbs. Per Sq. Ft. Live Load
(Supporting Plaster Ceiling)

DESIGN CRITERIA:

Strength - 15 lbs. per sq. ft. dead load 20 lbs. per sq. ft. live load determines fiber stress.

Deflection - For 20 lbs. per sq. ft. live load. Limited to span in inches divided by 360.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE (IN)	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).									
		300	400	500	600	700	800	900	1000	1100	1200
2x6	12.0	6-7 0.18	7-7 0.28	8-6 0.40	9-4 0.52	10-0 0.66	10-9 0.80	11-5 0.96	12-0 1.12	12-7 1.29	13-2 1.48
	13.7	6-2 0.17	7-1 0.27	7-11 0.37	8-8 0.49	9-5 0.61	10-0 0.75	10-8 0.90	11-3 1.05	11-9 1.21	12-4 1.38
	16.0	5-8 0.16	6-7 0.25	7-4 0.34	8-1 0.45	8-8 0.57	9-4 0.70	9-10 0.83	10-5 0.97	10-11 1.12	11-5 1.28
	19.2	5-2 0.15	6-0 0.22	6-9 0.31	7-4 0.41	7-11 0.52	8-6 0.63	9-0 0.76	9-6 0.89	9-11 1.02	10-5 1.17
	24.0	4-8 0.13	5-4 0.20	6-0 0.28	6-7 0.37	7-1 0.46	7-7 0.57	8-1 0.68	8-6 0.79	8-11 0.92	9-4 1.04
2x8	12.0	8-8 0.18	10-0 0.28	11-2 0.40	12-3 0.52	13-3 0.66	14-2 0.80	15-0 0.96	15-10 1.12	16-7 1.29	17-4 1.48
	13.7	8-1 0.17	9-4 0.27	10-6 0.37	11-6 0.49	12-5 0.61	13-3 0.75	14-0 0.90	14-10 1.05	15-6 1.21	16-3 1.38
	16.0	7-6 0.16	8-8 0.25	9-8 0.34	10-7 0.45	11-6 0.57	12-3 0.70	13-0 0.83	13-8 0.97	14-4 1.12	15-0 1.28
	19.2	6-10 0.15	7-11 0.22	8-10 0.31	9-8 0.41	10-6 0.52	11-2 0.63	11-10 0.76	12-6 0.89	13-1 1.02	13-8 1.17
	24.0	6-2 0.13	7-1 0.20	7-11 0.28	8-8 0.37	9-4 0.46	10-0 0.57	10-7 0.68	11-2 0.79	11-9 0.92	12-3 1.04
2x10	12.0	11-1 0.18	12-9 0.28	14-3 0.40	15-8 0.52	16-11 0.66	18-1 0.80	19-2 0.96	20-2 1.12	21-2 1.29	22-1 1.48
	13.7	10-4 0.17	11-11 0.27	13-4 0.37	14-8 0.49	15-10 0.61	16-11 0.75	17-11 0.90	18-11 1.05	19-10 1.21	20-8 1.38
	16.0	9-7 0.16	11-1 0.25	12-4 0.34	13-6 0.45	14-8 0.57	15-8 0.70	16-7 0.83	17-6 0.97	18-4 1.12	19-2 1.28
	19.2	8-9 0.15	10-1 0.22	11-3 0.31	12-4 0.41	13-4 0.52	14-3 0.63	15-2 0.76	15-11 0.89	16-9 1.02	17-6 1.17
	24.0	7-10 0.13	9-0 0.20	10-1 0.28	11-1 0.37	11-11 0.46	12-9 0.57	13-6 0.68	14-3 0.79	15-0 0.92	15-8 1.04
2x12	12.0	13-5 0.18	15-6 0.28	17-4 0.40	19-0 0.52	20-6 0.66	21-11 0.80	23-3 0.96	24-7 1.12	25-9 1.29	26-11 1.48
	13.7	12-7 0.17	14-6 0.27	16-3 0.37	17-9 0.49	19-3 0.61	20-6 0.75	21-9 0.90	23-0 1.05	24-1 1.21	25-2 1.38
	16.0	11-8 0.16	13-5 0.25	15-0 0.34	16-6 0.45	17-9 0.57	19-0 0.70	20-2 0.83	21-3 0.97	22-4 1.12	23-3 1.28
	19.2	10-8 0.15	12-3 0.22	13-9 0.31	15-0 0.41	16-3 0.52	17-4 0.63	18-5 0.76	19-5 0.89	20-4 1.02	21-3 1.17
	24.0	9-6 0.13	11-0 0.20	12-3 0.28	13-5 0.37	14-6 0.46	15-6 0.57	16-6 0.68	17-4 0.79	18-2 0.92	19-0 1.04

NOTE: The modulus of elasticity, "E," in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-8 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be us

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).									RAFTER SPACING (IN)	SIZE (IN)
1300	1400	1500	1600	1700	1800	1900	2000	2100		
13-8 1.66	14-2 1.86	14-8 2.06	15-2 2.27	15-8 2.49					12.0	
12-10 1.56	13-3 1.74	13-9 1.93	14-2 2.12	14-8 2.33	15-1 2.54				13.7	
11-10 1.44	12-4 1.61	12-9 1.79	13-2 1.97	13-7 2.15	13-11 2.35	14-4 2.55			16.0	2x6
10-10 1.32	11-3 1.47	11-7 1.63	12-0 1.80	12-4 1.97	12-9 2.14	13-1 2.32	13-5 2.51		19.2	
9-8 1.18	10-0 1.31	10-5 1.46	10-9 1.61	11-1 1.76	11-5 1.92	11-8 2.08	12-0 2.24	12-4 2.41	24.0	
18-0 1.66	18-9 1.86	19-5 2.06	20-0 2.27	20-8 2.49					12.0	
16-10 1.56	17-6 1.74	18-2 1.93	18-9 2.12	19-4 2.33	19-10 2.54				13.7	
15-7 1.44	16-3 1.61	16-9 1.79	17-4 1.97	17-10 2.15	18-5 2.35	18-11 2.55			16.0	2x8
14-3 1.32	14-10 1.47	15-4 1.63	15-10 1.80	16-4 1.97	16-9 2.14	17-3 2.32	17-8 2.51		19.2	
12-9 1.18	13-3 1.31	13-8 1.46	14-2 1.61	14-7 1.76	15-0 1.92	15-5 2.08	15-10 2.24	16-3 2.41	24.0	
23-0 1.66	23-11 1.86	24-9 2.06	25-6 2.27	26-4 2.49					12.0	
21-6 1.56	22-4 1.74	23-2 1.93	23-11 2.12	24-7 2.33	25-4 2.54				13.7	
19-11 1.44	20-8 1.61	21-5 1.79	22-1 1.97	22-10 2.15	23-5 2.35	24-1 2.55			16.0	2x10
18-2 1.32	18-11 1.47	19-7 1.63	20-2 1.80	20-10 1.97	21-5 2.14	22-0 2.32	22-7 2.51		19.2	
16-3 1.18	16-11 1.31	17-6 1.46	18-1 1.61	18-7 1.76	19-2 1.92	19-8 2.08	20-2 2.24	20-8 2.41	24.0	
28-0 1.66	29-1 1.86	30-1 2.06	31-1 2.27	32-0 2.49					12.0	
26-2 1.56	27-2 1.74	28-2 1.93	29-1 2.12	29-11 2.33	30-10 2.54				13.7	
24-3 1.44	25-2 1.61	26-0 1.79	26-11 1.97	27-9 2.15	28-6 2.35	29-4 2.55			16.0	2x12
22-2 1.32	23-0 1.47	23-9 1.63	24-7 1.80	25-4 1.97	26-0 2.14	26-9 2.32	27-5 2.51		19.2	
19-10 1.18	20-6 1.31	21-3 1.46	21-11 1.61	22-8 1.76	23-3 1.92	23-11 2.08	24-7 2.24	25-2 2.41	24.0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-9 ALLOWABLE SPAN FOR LOW OR HIGH SLOPE RAFTERS

30 Lbs. Per Sq. Ft. Live Load
(Supporting Plaster Ceiling)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 30 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 30 lbs. per sq. ft. live load. Limited to span in inches divided by 360.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).									
		300	400	500	600	700	890	900	1000	1100	1200
2x6	12.0	5-10 0.19	6-8 0.29	7-6 0.41	8-2 0.54	8-10 0.68	9-6 0.83	10-0 0.99	10-7 1.15	11-1 1.33	11-7 1.52
	13.7	5-5 0.18	6-3 0.27	7-0 0.38	7-8 0.50	8-3 0.63	8-10 0.77	9-5 0.92	9-11 1.08	10-5 1.25	10-10 1.42
	16.0	5-0 0.16	5-10 0.25	6-6 0.35	7-1 0.46	7-8 0.59	8-2 0.72	8-8 0.85	9-2 1.00	9-7 1.15	10-0 1.31
	19.2	4-7 0.15	5-4 0.23	5-11 0.32	6-6 0.42	7-0 0.53	7-6 0.65	7-11 0.78	8-4 0.91	8-9 1.05	9-2 1.20
	24.0	4-1 0.13	4-9 0.21	5-4 0.29	5-10 0.38	6-3 0.48	6-8 0.58	7-1 0.70	7-6 0.82	7-10 0.94	8-2 1.07
2x8	12.0	7-8 0.19	8-10 0.29	9-10 0.41	10-10 0.54	11-8 0.68	12-6 0.83	13-3 0.99	13-11 1.15	14-8 1.33	15-3 1.52
	13.7	7-2 0.18	8-3 0.27	9-3 0.38	10-1 0.50	10-11 0.63	11-8 0.77	12-5 0.92	13-1 1.08	13-8 1.25	14-4 1.42
	16.0	6-7 0.16	7-8 0.25	8-7 0.35	9-4 0.46	10-1 0.59	10-10 0.72	11-6 0.85	12-1 1.00	12-8 1.15	13-3 1.31
	19.2	6-1 0.15	7-0 0.23	7-10 0.32	8-7 0.42	9-3 0.53	9-10 0.65	10-6 0.78	11-0 0.91	11-7 1.05	12-1 1.20
	24.0	5-5 0.13	6-3 0.21	7-0 0.29	7-8 0.38	8-3 0.48	8-10 0.58	9-4 0.70	9-10 0.82	10-4 0.94	10-10 1.07
2x10	12.0	9-9 0.19	11-3 0.29	12-7 0.41	13-9 0.54	14-11 0.68	15-11 0.83	16-11 0.99	17-10 1.15	18-8 1.33	19-6 1.52
	13.7	9-1 0.18	10-6 0.27	11-9 0.38	12-11 0.50	13-11 0.63	14-11 0.77	15-10 0.92	16-8 1.08	17-6 1.25	18-3 1.42
	16.0	8-5 0.16	9-9 0.25	10-11 0.35	11-11 0.46	12-11 0.59	13-9 0.72	14-8 0.85	15-5 1.00	16-2 1.15	16-11 1.31
	19.2	7-8 0.15	8-11 0.23	9-11 0.32	10-11 0.42	11-9 0.53	12-7 0.65	13-4 0.78	14-1 0.91	14-9 1.05	15-5 1.20
	24.0	6-11 0.13	8-0 0.21	8-11 0.29	9-9 0.38	10-6 0.48	11-3 0.58	11-11 0.70	12-7 0.82	13-2 0.94	13-9 1.07
2x12	12.0	11-10 0.19	13-8 0.29	15-4 0.41	16-9 0.54	18-1 0.68	19-4 0.83	20-6 0.99	21-8 1.15	22-8 1.33	23-9 1.52
	13.7	11-1 0.18	12-10 0.27	14-4 0.38	15-8 0.50	16-11 0.63	18-1 0.77	19-3 0.92	20-3 1.08	21-3 1.25	22-2 1.42
	16.0	10-3 0.16	11-10 0.25	13-3 0.35	14-6 0.46	15-8 0.59	16-9 0.72	17-9 0.85	18-9 1.00	19-8 1.15	20-6 1.31
	19.2	9-5 0.15	10-10 0.23	12-1 0.32	13-3 0.42	14-4 0.53	15-4 0.65	16-3 0.78	17-1 0.91	17-11 1.05	18-9 1.20
	24.0	8-5 0.13	9-8 0.21	10-10 0.29	11-10 0.38	12-10 0.48	13-8 0.58	14-6 0.70	15-4 0.82	16-1 0.94	16-9 1.07

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-9 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).									RAFTER SPACING (IN)	SIZE (IN)
1300	1400	1500	1600	1700	1800	1900	2000	2100		
12-1 1.71	12-6 1.91	13-0 2.12	13-5 2.34	13-10 2.56					12.0	
11-3 1.60	11-9 1.79	12-2 1.98	12-6 2.19	12-11 2.39					13.7	
10-5 1.48	10-10 1.66	11-3 1.84	11-7 2.02	11-11 2.22	12-4 2.41				16.0	2x6
9-6 1.35	9-11 1.51	10-3 1.68	10-7 1.85	10-11 2.02	11-3 2.20	11-6 2.39	11-10 2.58		19.2	
8-6 1.21	8-10 1.35	9-2 1.50	9-6 1.65	9-9 1.81	10-0 1.97	10-4 2.14	10-7 2.31	10-10 2.48	24.0	
15-11 1.71	16-6 1.91	17-1 2.12	17-8 2.34	18-2 2.56					12.0	
14-11 1.60	15-5 1.79	16-0 1.98	16-6 2.19	17-0 2.39					13.7	
13-9 1.48	14-4 1.66	14-10 1.84	15-3 2.02	15-9 2.22	16-3 2.41				16.0	2x8
12-7 1.35	13-1 1.51	13-6 1.68	13-11 1.85	14-5 2.02	14-10 2.20	15-2 2.39	15-7 2.58		19.2	
11-3 1.21	11-8 1.35	12-1 1.50	12-6 1.65	12-10 1.81	13-3 1.97	13-7 2.14	13-11 2.31	14-4 2.48	24.0	
20-4 1.71	21-1 1.91	21-10 2.12	22-6 2.34	23-3 2.56					12.0	
19-0 1.60	19-8 1.79	20-5 1.98	21-1 2.19	21-9 2.39					13.7	
17-7 1.48	18-3 1.66	18-11 1.84	19-6 2.02	20-1 2.22	20-8 2.41				16.0	2x10
16-1 1.35	16-8 1.51	17-3 1.68	17-10 1.85	18-4 2.02	18-11 2.20	19-5 2.39	19-11 2.58		19.2	
14-4 1.21	14-11 1.35	15-5 1.50	15-11 1.65	16-5 1.81	16-11 1.97	17-4 2.14	17-10 2.31	18-3 2.48	24.0	
24-8 1.71	25-7 1.91	26-6 2.12	27-5 2.34	28-3 2.56					12.0	
23-1 1.60	24-0 1.79	24-10 1.98	25-7 2.19	26-5 2.39					13.7	
21-5 1.48	22-2 1.66	23-0 1.84	23-9 2.02	24-5 2.22	25-2 2.41				16.0	2x12
19-6 1.35	20-3 1.51	21-0 1.68	21-8 1.85	22-4 2.02	23-0 2.20	23-7 2.39	24-2 2.58		19.2	
17-5 1.21	18-1 1.35	18-9 1.50	19-4 1.65	20-0 1.81	20-6 1.97	21-1 2.14	21-8 2.31	22-2 2.48	24.0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-10 ALLOWABLE SPAN FOR LOW OR HIGH SLOPE RAFTERS

40 Lbs. Per Sq. Ft. Live Load
(Supporting Plaster Ceiling)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 40 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 40 lbs. per sq. ft. live load. Limited to span in inches divided by 360.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).									
		300	400	500	600	700	800	900	1000	1100	1200
2x6	12.0	5-3 0.19	6-1 0.29	6-9 0.40	7-5 0.53	8-0 0.67	8-7 0.82	9-1 0.97	9-7 1.14	10-0 1.31	10-6 1.50
	13.7	4-11 0.18	5-8 0.27	6-4 0.38	6-11 0.50	7-6 0.62	8-0 0.76	8-6 0.91	8-11 1.07	9-5 1.23	9-10 1.40
	16.0	4-6 0.16	5-3 0.25	5-10 0.35	6-5 0.46	6-11 0.58	7-5 0.71	7-10 0.84	8-3 0.99	8-8 1.14	9-1 1.30
	19.2	4-2 0.15	4-9 0.23	5-4 0.32	5-10 0.42	6-4 0.53	6-9 0.64	7-2 0.77	7-7 0.90	7-11 1.04	8-3 1.18
	24.0	3-8 0.13	4-3 0.20	4-9 0.28	5-3 0.37	5-8 0.47	6-1 0.58	6-5 0.69	6-9 0.81	7-1 0.93	7-5 1.06
2x8	12.0	6-11 0.19	8-0 0.29	8-11 0.40	9-9 0.53	10-7 0.67	11-3 0.82	12-0 0.97	12-7 1.14	13-3 1.31	13-10 1.50
	13.7	6-6 0.18	7-6 0.27	8-4 0.38	9-2 0.50	9-11 0.62	10-7 0.76	11-2 0.91	11-10 1.07	12-5 1.23	12-11 1.40
	16.0	6-0 0.16	6-11 0.25	7-9 0.35	8-6 0.46	9-2 0.58	9-9 0.71	10-4 0.84	10-11 0.99	11-6 1.14	12-0 1.30
	19.2	5-6 0.15	6-4 0.23	7-1 0.32	7-9 0.42	8-4 0.53	8-11 0.64	9-6 0.77	10-0 0.90	10-6 1.04	10-11 1.18
	24.0	4-11 0.13	5-8 0.20	6-4 0.28	6-11 0.37	7-6 0.47	8-0 0.58	8-6 0.69	8-11 0.81	9-4 0.93	9-9 1.06
2x10	12.0	8-10 0.19	10-2 0.29	11-5 0.40	12-6 0.53	13-6 0.67	14-5 0.82	15-3 0.97	16-1 1.14	16-11 1.31	17-8 1.50
	13.7	8-3 0.18	9-6 0.27	10-8 0.38	11-8 0.50	12-7 0.62	13-6 0.76	14-3 0.91	15-1 1.07	15-10 1.23	16-6 1.40
	16.0	7-8 0.16	8-10 0.25	9-10 0.35	10-10 0.46	11-8 0.58	12-6 0.71	13-3 0.84	13-11 0.99	14-8 1.14	15-3 1.30
	19.2	7-0 0.15	8-1 0.23	9-0 0.32	9-10 0.42	10-8 0.53	11-5 0.64	12-1 0.77	12-9 0.90	13-4 1.04	13-11 1.18
	24.0	6-3 0.13	7-2 0.20	8-1 0.28	8-10 0.37	9-6 0.47	10-2 0.58	10-10 0.69	11-5 0.81	11-11 0.93	12-6 1.06
2x12	12.0	10-9 0.19	12-5 0.29	13-10 0.40	15-2 0.53	16-5 0.67	17-6 0.82	18-7 0.97	19-7 1.14	20-6 1.31	21-5 1.50
	13.7	10-0 0.18	11-7 0.27	12-11 0.38	14-2 0.50	15-4 0.62	16-5 0.76	17-5 0.91	18-4 1.07	19-3 1.23	20-1 1.40
	16.0	9-3 0.16	10-9 0.25	12-0 0.35	13-2 0.46	14-2 0.58	15-2 0.71	16-1 0.84	17-0 0.99	17-9 1.14	18-7 1.30
	19.2	8-6 0.15	9-10 0.23	10-11 0.32	12-0 0.42	12-11 0.53	13-10 0.64	14-8 0.77	15-6 0.90	16-3 1.04	17-0 1.18
	24.0	7-7 0.13	8-9 0.20	9-10 0.28	10-9 0.37	11-7 0.47	12-5 0 58	13-2 0.69	13-10 0.81	14-6 0.93	15-2 1.06

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-10 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).									RAFTER SPACING (IN)	SIZE (IN)
1300	1400	1500	1600	1700	1800	1900	2000	2100		
10-11 1.69	11-4 1.89	11-9 2.09	12-1 2.31	12-6 2.53					12.0	
10-3 1.58	10-7 1.77	11-0 1.96	11-4 2.16	11-8 2.36	12-0 2.57				13.7	
9-5 1.46	9-10 1.63	10-2 1.81	10-6 2.00	10-10 2.19	11-1 2.38	11-5 2.58			16.0	2x6
8-8 1.34	8-11 1.49	9-3 1.65	9-7 1.82	9-10 2.00	10-2 2.18	10-5 2.36	10-8 2.55		19.2	
7-9 1.19	8-0 1.33	8-3 1.48	8-7 1.63	8-10 1.79	9-1 1.95	9-4 2.11	9-7 2.28	9-10 2.45	24.0	
14-5 1.69	14-11 1.89	15-5 2.09	16-0 2.31	16-5 2.53					12.0	
13-6 1.58	14-0 1.77	14-6 1.96	14-11 2.16	15-5 2.36	15-10 2.57				13.7	
12-6 1.46	12-11 1.63	13-5 1.81	13-10 2.00	14-3 2.19	14-8 2.38	15-1 2.58			16.0	2x8
11-5 1.34	11-10 1.49	12-3 1.65	12-7 1.82	13-0 2.00	13-5 2.18	13-9 2.36	14-1 2.55		19.2	
10-2 1.19	10-7 1.33	10-11 1.48	11-3 1.63	11-8 1.79	12-0 1.95	12-4 2.11	12-7 2.28	12-11 2.45	24.0	
18-4 1.69	19-1 1.89	19-9 2.09	20-4 2.31	21-0 2.53					12.0	
17-2 1.58	17-10 1.77	18-5 1.96	19-1 2.16	19-8 2.36	20-2 2.57				13.7	
15-11 1.46	16-6 1.63	17-1 1.81	17-8 2.00	18-2 2.19	18-9 2.38	19-3 2.58			16.0	2x10
14-6 1.34	15-1 1.49	15-7 1.65	16-1 1.82	16-7 2.00	17-1 2.18	17-7 2.36	18-0 2.55		19.2	
13-0 1.19	13-6 1.33	13-11 1.48	14-5 1.63	14-10 1.79	15-3 1.95	15-8 2.11	16-1 2.28	16-6 2.45	24.0	
22-4 1.69	23-2 1.89	24-0 2.09	24-9 2.31	25-6 2.53					12.0	
20-11 1.58	21-8 1.77	22-5 1.96	23-2 2.16	23-11 2.36	24-7 2.57				13.7	
19-4 1.46	20-1 1.63	20-9 1.81	21-5 2.00	22-1 2.19	22-9 2.38	23-5 2.58			16.0	2x12
17-8 1.34	18-4 1.49	19-0 1.65	19-7 1.82	20-2 2.00	20-9 2.18	21-4 2.36	21-11 2.55		19.2	
15-9 1.19	16-5 1.33	17-0 1.48	17-6 1.63	18-1 1.79	18-7 1.95	19-1 2.11	19-7 2.28	20-1 2.45	24.0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-11 ALLOWABLE SPAN FOR LOW SLOPE RAFTERS

Slope 3 in 12 or less - 20 Lbs. Per Sq. Ft. Live Load
(No Finished Ceiling)

DESIGN CRITERIA:
Strength - 10 lbs. per sq. ft. dead load plus 20 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 20 lbs. per sq. ft. live load. Limited to span in inches divided by 240.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).										
		300	400	500	600	700	800	900	1000	1100	1200	1300
2x6	12.0	7-1 0.15	8-2 0.24	9-2 0.33	10-0 0.44	10-10 0.55	11-7 0.67	12-4 0.80	13-0 0.94	13-7 1.09	14-2 1.24	14-9 1.40
	13.7	6-8 0.14	7-8 0.22	8-7 0.31	9-5 0.41	10-2 0.52	10-10 0.63	11-6 0.75	12-2 0.88	12-9 1.02	13-3 1.16	13-10 1.31
	16.0	6-2 0.13	7-1 0.21	7-11 0.29	8-8 0.38	9-5 0.48	10-0 0.58	10-8 0.70	11-3 0.82	11-9 0.94	12-4 1.07	12-10 1.21
	19.2	5-7 0.12	6-6 0.19	7-3 0.26	7-11 0.35	8-7 0.44	9-2 0.53	9-9 0.64	10-3 0.75	10-9 0.86	11-3 0.98	11-8 1.10
	24.0	5-0 0.11	5-10 0.17	6-6 0.24	7-1 0.31	7-8 0.39	8-2 0.48	8-8 0.57	9-2 0.67	9-7 0.77	10-0 0.88	10-5 0.99
2x8	12.0	9-4 0.15	10-10 0.24	12-1 0.33	13-3 0.44	14-4 0.55	15-3 0.67	16-3 0.80	17-1 0.94	17-11 1.09	18-9 1.24	19-6 1.40
	13.7	8-9 0.14	10-1 0.22	11-4 0.31	12-5 0.41	13-4 0.52	14-4 0.63	15-2 0.75	16-0 0.88	16-9 1.02	17-6 1.16	18-3 1.31
	16.0	8-1 0.13	9-4 0.21	10-6 0.29	11-6 0.38	12-5 0.48	13-3 0.58	14-0 0.70	14-10 0.82	15-6 0.94	16-3 1.07	16-10 1.21
	19.2	7-5 0.12	8-7 0.19	9-7 0.26	10-6 0.35	11-4 0.44	12-1 0.53	12-10 0.64	13-6 0.75	14-2 0.86	14-10 0.98	15-5 1.10
	24.0	6-7 0.11	7-8 0.17	8-7 0.24	9-4 0.31	10-1 0.39	10-10 0.48	11-6 0.57	12-1 0.67	12-8 0.77	13-3 0.88	13-9 0.99
2x10	12.0	11-11 0.15	13-9 0.24	15-5 0.33	16-11 0.44	18-3 0.55	19-6 0.67	20-8 0.80	21-10 0.94	22-10 1.09	23-11 1.24	24-10 1.40
	13.7	11-2 0.14	12-11 0.22	14-5 0.31	15-10 0.41	17-1 0.52	18-3 0.63	19-4 0.75	20-5 0.88	21-5 1.02	22-4 1.16	23-3 1.31
	16.0	10-4 0.13	11-11 0.21	13-4 0.29	14-8 0.38	15-10 0.48	16-11 0.58	17-11 0.70	18-11 0.82	19-10 0.94	20-8 1.07	21-6 1.21
	19.2	9-5 0.12	10-11 0.19	12-2 0.26	13-4 0.35	14-5 0.44	15-5 0.53	16-4 0.64	17-3 0.75	18-1 0.86	18-11 0.98	19-8 1.10
	24.0	8-5 0.11	9-9 0.17	10-11 0.24	11-11 0.31	12-11 0.39	13-9 0.48	14-8 0.57	15-5 0.67	16-2 0.77	16-11 0.88	17-7 0.99
2x12	12.0	14-6 0.15	16-9 0.24	18-9 0.33	20-6 0.44	22-2 0.55	23-9 0.67	25-2 0.80	26-6 0.94	27-10 1.09	29-1 1.24	30-3 1.40
	13.7	13-7 0.14	15-8 0.22	17-6 0.31	19-3 0.41	20-9 0.52	22-2 0.63	23-6 0.75	24-10 0.88	26-0 1.02	27-2 1.16	28-3 1.31
	16.0	12-7 0.13	14-6 0.21	16-3 0.29	17-9 0.38	19-3 0.48	20-6 0.58	21-9 0.70	23-0 0.82	24-1 0.94	25-2 1.07	26-2 1.21
	19.2	11-6 0.12	13-3 0.19	14-10 0.26	16-3 0.35	17-6 0.44	18-9 0.53	19-11 0.64	21-0 0.75	22-0 0.86	23-0 0.98	23-11 1.10
	24.0	10-3 0.11	11-10 0.17	13-3 0.24	14-6 0.31	15-8 0.39	16-9 0.48	17-9 0.57	18-9 0.67	19-8 0.77	20-6 0.88	21-5 0.99

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-11 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).										RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400		
15-4 1.56	15-11 1.73	16-5 1.91	16-11 2.09	17-5 2.28	17-10 2.47					12.0	
14-4 1.46	14-10 1.62	15-4 1.78	15-10 1.95	16-3 2.13	16-9 2.31	17-2 2.49				13.7	
13-3 1.35	13-9 1.50	14-2 1.65	14-8 1.81	15-1 1.97	15-6 2.14	15-11 2.31	16-3 2.48			16.0	2x6
12-2 1.23	12-7 1.37	13-0 1.51	13-4 1.65	13-9 1.80	14-2 1.95	14-6 2.11	14-10 2.27	15-2 2.43		19.2	
10-10 1.10	11-3 1.22	11-7 1.35	11-11 1.48	12-4 1.61	12-8 1.75	13-0 1.89	13-3 2.03	13-7 2.18	14-2 2.48	24.0	
20-3 1.56	20-11 1.73	21-7 1.91	22-3 2.09	22-11 2.28	23-7 2.47					12.0	
18-11 1.46	19-7 1.62	20-3 1.78	20-10 1.95	21-5 2.13	22-0 2.31	22-7 2.49				13.7	
17-6 1.35	18-2 1.50	18-9 1.65	19-4 1.81	19-10 1.97	20-5 2.14	20-11 2.31	21-5 2.48			16.0	2x8
16-0 1.23	16-7 1.37	17-1 1.51	17-7 1.65	18-2 1.80	18-7 1.95	19-1 2.11	19-7 2.27	20-0 2.43		19.2	
14-4 1.10	14-10 1.22	15-3 1.35	15-9 1.48	16-3 1.61	16-8 1.75	17-1 1.89	17-6 2.03	17-11 2.18	18-9 2.48	24.0	
25-10 1.56	26-8 1.73	27-7 1.91	28-5 2.09	29-3 2.28	30-1 2.47					12.0	
24-2 1.46	25-0 1.62	25-10 1.78	26-7 1.95	27-4 2.13	28-1 2.31	28-10 2.49				13.7	
22-4 1.35	23-2 1.50	23-11 1.65	24-7 1.81	25-4 1.97	26-0 2.14	26-8 2.31	27-4 2.48			16.0	2x10
20-5 1.23	21-1 1.37	21-10 1.51	22-6 1.65	23-2 1.80	23-9 1.95	24-5 2.11	25-0 2.27	25-7 2.43		19.2	
18-3 1.10	18-11 1.22	19-6 1.35	20-1 1.48	20-8 1.61	21-3 1.75	21-10 1.89	22-4 2.03	22-10 2.18	23-11 2.48	24.0	
31-4 1.56	32-6 1.73	33-6 1.91	34-7 2.09	35-7 2.28	36-7 2.47					12.0	
29-4 1.46	30-5 1.62	31-4 1.78	32-4 1.95	33-3 2.13	34-2 2.31	35-1 2.49				13.7	
27-2 1.35	28-2 1.50	29-1 1.65	29-11 1.81	30-10 1.97	31-8 2.14	32-6 2.31	33-3 2.48			16.0	2x12
24-10 1.23	25-8 1.37	26-6 1.51	27-4 1.65	28-2 1.80	28-11 1.95	29-8 2.11	30-5 2.27	31-1 2.43		19.2	
22-2 1.10	23-0 1.22	23-9 1.35	24-5 1.48	25-2 1.61	25-10 1.75	26-6 1.89	27-2 2.03	27-10 2.18	29-1 2.48	24.0	

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-12 ALLOWABLE SPAN FOR LOW SLOPE RAFTERS

Slope 3 in 12 or less - 30 Lbs. Per Sq. Ft. Live Load
(No Finished Ceiling)

DESIGN CRITERIA:
Strength - 10 lbs. per sq. ft. dead load plus 30 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 30 lbs. per sq. ft. live load Limited to span in inches divided by 240.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress In Bending, "F_b" (psi).										
		300	400	500	600	700	800	900	1000	1100	1200	1300
2x6	12.0	6-2 0.15	7-1 0.23	7-11 0.32	8-8 0.43	9-5 0.54	10-0 0.66	10-8 0.78	11-3 0.92	11-9 1.06	12-4 1.21	12-10 1.36
	13.7	5-9 0.14	6-8 0.22	7-5 0.30	8-2 0.40	8-9 0.50	9-5 0.61	10-0 0.73	10-6 0.86	11-0 0.99	11-6 1.13	12-0 1.27
	16.0	5-4 0.13	6-2 0.20	6-11 0.28	7-6 0.37	8-2 0.47	8-8 0.57	9-3 0.68	9-9 0.80	10-2 0.92	10-8 1.05	11-1 1.18
	19.2	4-10 0.12	5-7 0.18	6-3 0.26	6-11 0.34	7-5 0.43	7-11 0.52	8-5 0.62	8-11 0.73	9-4 0.84	9-9 0.95	10-1 1.08
	24.0	4-4 0.11	5-0 0.16	5-7 0.23	6-2 0.30	6-8 0.38	7-1 0.46	7-6 0.55	7-11 0.65	8-4 0.75	8-8 0.85	9-1 0.96
2x8	12.0	8-1 0.15	9-4 0.23	10-6 0.32	11-6 0.43	12-5 0.54	13-3 0.66	14-0 0.78	14-10 0.92	15-6 1.06	16-3 1.21	16-10 1.36
	13.7	7-7 0.14	8-9 0.22	9-9 0.30	10-9 0.40	11-7 0.50	12-5 0.61	13-2 0.73	13-10 0.86	14-6 0.99	15-2 1.13	15-9 1.27
	16.0	7-0 0.13	8-1 0.20	9-1 0.28	9-11 0.37	10-9 0.47	11-6 0.57	12-2 0.68	12-10 0.80	13-5 0.92	14-0 1.05	14-7 1.18
	19.2	6-5 0.12	7-5 0.18	8-3 0.26	9-1 0.34	9-9 0.43	10-6 0.52	11-1 0.62	11-8 0.73	12-3 0.84	12-10 0.95	13-4 1.08
	24.0	5-9 0.11	6-7 0.16	7-5 0.23	8-1 0.30	8-9 0.38	9-4 0.46	9-11 0.55	10-6 0.65	11-0 0.75	11-6 0.85	11-11 0.96
2x10	12.0	10-4 0.15	11-11 0.23	13-4 0.32	14-8 0.43	15-10 0.54	16-11 0.66	17-11 0.78	18-11 0.92	19-10 1.06	20-8 1.21	21-6 1.36
	13.7	9-8 0.14	11-2 0.22	12-6 0.30	13-8 0.40	14-9 0.50	15-10 0.61	16-9 0.73	17-8 0.86	18-6 0.99	19-4 1.13	20-2 1.27
	16.0	8-11 0.13	10-4 0.20	11-7 0.28	12-8 0.37	13-8 0.47	14-8 0.57	15-6 0.68	16-4 0.80	17-2 0.92	17-11 1.05	18-8 1.18
	19.2	8-2 0.12	9-5 0.18	10-7 0.26	11-7 0.34	12-6 0.43	13-4 0.52	14-2 0.62	14-11 0.73	15-8 0.84	16-4 0.95	17-0 1.08
	24.0	7-4 0.11	8-5 0.16	9-5 0.23	10-4 0.30	11-2 0.38	11-11 0.46	12-8 0.55	13-4 0.65	14-0 0.75	14-8 0.85	15-3 0.96
2x12	12.0	12-7 0.15	14-6 0.23	16-3 0.32	17-9 0.43	19-3 0.54	20-6 0.66	21-9 0.78	23-0 0.92	24-1 1.06	25-2 1.21	26-2 1.36
	13.7	11-9 0.14	13-7 0.22	15-2 0.30	16-8 0.40	18-0 0.50	19-3 0.61	20-5 0.73	21-6 0.86	22-6 0.99	23-6 1.13	24-6 1.27
	16.0	10-11 0.13	12-7 0.20	14-1 0.28	15-5 0.37	16-8 0.47	17-9 0.57	18-10 0.68	19-11 0.80	20-10 0.92	21-9 1.05	22-8 1.18
	19.2	9-11 0.12	11-6 0.18	12-10 0.26	14-1 0.34	15-2 0.43	16-3 0.52	17-3 0.62	18-2 0.73	19-0 0.84	19-11 0.95	20-8 1.08
	24.0	8-11 0.11	10-3 0.16	11-6 0.23	12-7 0.30	13-7 0.38	14-6 0.46	15-5 0.55	16-3 0.65	17-0 0.75	17-9 0.85	18-6 0.96

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-12 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).										RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400		
13-3 1.52	13-9 1 69	14-2 1.86	14-8 2.04	15-1 2.22	15-6 2.41	15-11 2.60				12.0	
12-5 1.42	12-10 1.58	13-3 1.74	13-8 1.90	14-1 2.08	14-6 2.25	14-10 2.43				13.7	
11-6 1.32	11-11 1.46	12-4 1.61	12-8 1.76	13-1 1.92	13-5 2.08	13-9 2.25	14-1 2.42	14-5 2.60		16.0	2x6
10-6 1.20	10-10 1.33	11-3 1.47	11-7 1.61	11-11 1.75	12-3 1.90	12-7 2.05	12-10 2.21	13-2 2.37		19.2	
9-5 1.08	9-9 1.19	10-0 1.31	10-4 1.44	10-8 1.57	10-11 1.70	11-3 1.84	11-6 1.98	11-9 2.12	12-4 2.41	24.0	
17-6 1.52	18-2 1.69	18-9 1.86	19-4 2.04	19-10 2.22	20-5 2.41	20-11 2.60				12.0	
16-5 1.42	16-11 1.58	17-6 1.74	18-1 1.90	18-7 2.08	19-1 2.25	19-7 2.43				13.7	
15-2 1.32	15-8 1.46	16-3 1.61	16-9 1.76	17-2 1.92	17-8 2.08	18-2 2.25	18-7 2.42	19-0 2.60		16.0	2x8
13-10 1.20	14-4 1.33	14-10 1.47	15-3 1.61	15-8 1.75	16-2 1.90	16-7 2.05	16-11 2.21	17-4 2.37		19.2	
12-5 1.08	12-10 1.19	13-3 1.31	13-8 1.44	14-0 1.57	14-5 1.70	14-10 1.84	15-2 1.98	15-6 2.12	16-3 2.41	24.0	
22-4 1.52	23-2 1.69	23-11 1.86	24-7 2.04	25-4 2.22	26-0 2.41	26-8 2.60				12.0	
20-11 1.42	21-8 1.58	22-4 1.74	23-0 1.90	23-8 2.08	24-4 2.25	25-0 2.43				13.7	
19-4 1.32	20-0 1.46	20-8 1.61	21-4 1.76	21-11 1.92	22-6 2.08	23-2 2.25	23-8 2.42	24-3 2.60		16.0	2x10
17-8 1.20	18-3 1.33	18-11 1.47	19-6 1.61	20-0 1.75	20-7 1.90	21-1 2.05	21-8 2.21	22-2 2.37		19.2	
15-10 1.08	16-4 1.19	16-11 1.31	17-5 1.44	17-11 1.57	18-5 1.70	18-11 1.84	19-4 1.98	19-10 2.12	20-8 2.41	24.0	
27-2 1.52	28-2 1.69	29-1 1.86	29-11 2.04	30-10 2.22	31-8 2.41	32-6 2.60				12.0	
25-5 1.42	26-4 1.58	27-2 1.74	28-0 1.90	28-10 2.08	29-7 2.25	30-5 2.43				13.7	
23-6 1.32	24-4 1.46	25-2 1.61	25-11 1.76	26-8 1.92	27-5 2.08	28-2 2.25	28-10 2.42	29-6 2.60		16.0	2x12
21-6 1.20	22-3 1.33	23-0 1.47	23-8 1.61	24-4 1.75	25-0 1.90	25-8 2.05	26-4 2.21	26-11 2.37		19.2	
19-3 1.08	19-11 1.19	20-6 1.31	21-2 1.44	21-9 1.57	22-5 1.70	23-0 1.84	23-6 1.98	24-1 2.12	25-2 2.41	24.0	

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-13 ALLOWABLE SPAN FOR LOW SLOPE RAFTERS

Slope 3 in 12 or less - Lbs. Per Sq. Ft. Live Load
(No Finished Ceiling)

DESIGN CRITERIA:
Strength - 10 lbs. per sq. ft. dead load plus 40 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 40 lbs. per sq. ft. live load. Limited to span in inches divided by 240.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).										
		300	400	500	600	700	800	900	1000	1100	1200	1300
2x6	12.0	5-6 0.14	6-4 0.22	7-1 0.31	7-9 0.41	8-5 0.51	9-0 0.63	9-6 0.75	10-0 0.88	10-6 1.01	11-0 1.15	11-5 1.30
	13.7	5-2 0.13	5-11 0.21	6-8 0.29	7-3 0.38	7-10 0.48	8-5 0.59	8-11 0.70	9-5 0.82	9-10 0.95	10-3 1.08	10-9 1.22
	16.0	4-9 0.12	5-6 0.19	6-2 0.27	6-9 0.35	7-3 0.44	7-9 0.54	8-3 0.65	8-8 0.76	9-1 0.88	9-6 1.00	9-11 1.12
	19.2	4-4 0.11	5-0 0.18	5-7 0.24	6-2 0.32	6-8 0.41	7-1 0.50	7-6 0.59	7-11 0.69	8-4 0.80	8-8 0.91	9-1 1.03
	24.0	3-11 0.10	4-6 0.16	5-0 0.22	5-6 0.29	5-11 0.36	6-4 0.44	6-9 0.53	7-1 0.62	7-5 0.71	7-9 0.81	8-1 0.92
2x8	12.0	7-3 0.14	8-4 0.22	9-4 0.31	10-3 0.41	11-1 0.51	11-10 0.63	12-7 0.75	13-3 0.88	13-11 1.01	14-6 1.15	15-1 1.30
	13.7	6-9 0.13	7-10 0.21	8-9 0.29	9-7 0.38	10-4 0.48	11-1 0.59	11-9 0.70	12-5 0.82	13-0 0.95	13-7 1.08	14-1 1.22
	16.0	6-3 0.12	7-3 0.19	8-1 0.27	8-11 0.35	9-7 0.44	10-3 0.54	10-11 0.65	11-6 0.76	12-0 0.88	12-7 1.00	13-1 1.12
	19.2	5-9 0.11	6-7 0.18	7-5 0.24	8-1 0.32	8-9 0.41	9-4 0.50	9-11 0.59	10-6 0.69	11-0 0.80	11-6 0.91	11-11 1.03
	24.0	5-2 0.10	5-11 0.16	6-7 0.22	7-3 0.29	7-10 0.36	8-4 0.44	8-11 0.53	9-4 0.62	9-10 0.71	10-3 0.81	10-8 0.92
2x10	12.0	9-3 0.14	10-8 0.22	11-11 0.31	13-1 0.41	14-2 0.51	15-1 0.63	16-0 0.75	16-11 0.88	17-9 1.01	18-6 1.15	19-3 1.30
	13.7	8-8 0.13	10-0 0.21	11-2 0.29	12-3 0.38	13-3 0.48	14-2 0.59	15-0 0.70	15-10 0.82	16-7 0.95	17-4 1.08	18-0 1.22
	16.0	8-0 0.12	9-3 0.19	10-4 0.27	11-4 0.35	12-3 0.44	13-1 0.54	13-11 0.65	14-8 0.76	15-4 0.88	16-0 1.00	16-8 1.12
	19.2	7-4 0.11	8-5 0.18	9-5 0.24	10-4 0.32	11-2 0.41	11-11 0.50	12-8 0.59	13-4 0.69	14-0 0.80	14-8 0.91	15-3 1.03
	24.0	6-6 0.10	7-7 0.16	8-5 0.22	9-3 0.29	10-0 0.36	10-8 0.44	11-4 0.53	11-11 0.62	12-6 0.71	13-1 0.81	13-7 0.92
2x12	12.0	11-3 0.14	13-0 0.22	14-6 0.31	15-11 0.41	17-2 0.51	18-4 0.63	19-6 0.75	20-6 0.88	21-7 1.01	22-6 1.15	23-5 1.30
	13.7	10-6 0.13	12-2 0.21	13-7 0.29	14-11 0.38	16-1 0.48	17-2 0.59	18-3 0.70	19-3 0.82	20-2 0.95	21-1 1.08	21-11 1.22
	16.0	9-9 0.12	11-3 0.19	12-7 0.27	13-9 0.35	14-11 0.44	15-11 0.54	16-11 0.65	17-9 0.76	18-8 0.88	19-6 1.00	20-3 1.12
	19.2	8-11 0.11	10-3 0.18	11-6 0.24	12-7 0.32	13-7 0.41	14-6 0.50	15-5 0.59	16-3 0.69	17-0 0.80	17-9 0.91	18-6 1.03
	24.0	7-11 0.10	9-2 0.16	10-3 0.22	11-3 0.29	12-2 0.36	13-0 0.44	13-9 0.53	14-6 0.62	15-3 0.71	15-11 0.81	16-7 0.92

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-13 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).										RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400		
11-11 1.45	12-4 1.61	12-8 1.77	13-1 1.94	13-6 2.12	13-10 2.30	14-2 2.48				12.0	
11-1 1.36	11-6 1.51	11-11 1.66	12-3 1.82	12-7 1.98	12-11 2.15	13-3 2.32	13-7 2.49			13.7	
10-3 1.26	10-8 1.39	11-0 1.54	11-4 1.68	11-8 1.83	12-0 1.99	12-4 2.15	12-7 2.31	12-11 2.48		16.0	2x6
9-5 1.15	9-9 1.27	10-0 1.40	10-4 1.54	10-8 1.67	10-11 1.81	11-3 1.96	11-6 2.11	11-9 2.26	12-4 2.58	19.2	
8-5 1.03	8-8 1.14	9-0 ~1.25	9-3 1.37	9-6 1.50	9-9 1.62	10-0 1.75	10-3 1.89	10-6 2.02	11-0 2.30	24.0	
15-8 1.45	16-3 1.61	16-9 1.77	17-3 1.94	17-9 2.12	18-3 2.30	18-9 2.48				12.0	
14-8 1.36	15-2 1.51	15-8 1.66	16-2 1.82	16-7 1.98	17-1 2.15	17-6 2.32	17-11 2.49			13.7	
13-7 1.26	14-0 1.39	14-6 1.54	14-11 1.68	15-5 1.83	15-10 1.99	16-3 2.15	16-7 2.31	17-0 2.48		16.0	2x8
12-5 1.15	12-10 1.27	13-3 1.40	13-8 1.54	14-0 1.67	14-5 1.81	14-10 1.96	15-2 2.11	15-6 2.26	16-3 2.58	19.2	
11-1 1.03	11-6 1.14	11-10 1.25	12-2 1.37	12-7 1.50	12-11 1.62	13-3 1.75	13-7 1.89	13-11 2.02	14-6 2.30	24.0	
20-0 1.45	20-8 1.61	21-4 1.77	22-0 1.94	22-8 2.12	23-3 2.30	23-11 2.48				12.0	
18-8 1.36	19-4 1.51	20-0 1.66	20-7 1.82	21-2 1.98	21-9 2.15	22-4 2.32	22-11 2.49			13.7	
17-4 1.26	17-11 1.39	18-6 1.54	19-1 1.68	19-7 1.83	20-2 1.99	20-8 2.15	21-2 2.31	21-8 2.48		16.0	2x10
15-10 1.15	16-4 1.27	16-11 1.40	17-5 1.54	17-11 1.67	18-5 1.81	18-11 1.96	19-4 2.11	19-10 2.26	20-8 2.58	19.2	
14-2 1.03	14-8 1.14	15-1 1.25	15-7 1.37	16-0 1.50	16-6 1.62	16-11 1.75	17-4 1.89	17-9 2.02	18-6 2.30	24.0	
24-4 1.45	25-2 1.61	26-0 1.77	26-9 1.94	27-7 2.12	28-4 2.30	29-1 2.48				12.0	
22-9 1.36	23-6 1.51	24-4 1.66	25-1 1.82	25-9 1.98	26-6 2.15	27-2 2.32	27-10 2.49			13.7	
21-1 1.26	21-9 1.39	22-6 1.54	23-2 1.68	23-10 1.83	24-6 1.99	25-2 2.15	25-9 2.31	26-5 2.48		16.0	2x12
19-3 1.15	19-11 1.27	20-6 1.40	21-2 1.54	21-9 1.67	22-5 1.81	23-0 1.96	23-6 2.11	24-1 2.26	25-2 2.58	19.2	
17-2 1.03	17-9 1.14	18-4 1.25	18-11 1.37	19-6 1.50	20-0 1.62	20-6 1.75	21-1 1.89	21-7 2.02	22-6 2.30	24.0	

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-14 ALLOWABLE SPAN FOR HIGH SLOPE RAFTERS

Slope over 3 in 12 - 20 Lbs. Per Sq. Ft. Live Load
(Heavy Roof Covering)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 20 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 20 lbs. per sq. ft. live load. Limited to span in inches divided by 180.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											
		200	300	400	500	600	700	800	900	1000	1100	1200	1300
2x4	12.0	3-5 0.05	4-2 0.09	4-10 0.14	5-5 0.20	5-11 0.26	6-5 0.33	6-10 0.40	7-3 0.48	7-8 0.56	8-0 0.65	8-4 0.74	8-8 0.83
	13.7	3-2 0.05	3-11 0.09	4-6 0.13	5-1 0.19	5-6 0.24	6-0 0.31	6-5 0.38	6-9 0.45	7-2 0.52	7-6 0.61	7-10 0.69	8-2 0.78
	16.0	2-11 0.04	3-7 0.08	4-2 0.12	4-8 0.17	5-1 0.23	5-6 0.28	5-11 0.35	6-3 0.41	6-7 0.49	6-11 0.56	7-3 0.64	7-6 0.72
	19.2	2-8 0.04	3-4 0.07	3-10 0.11	4-3 0.16	4-8 0.21	5-1 0.26	5-5 0.32	5-9 0.38	6-0 0.44	6-4 0.51	6-7 0.58	6-11 0.66
	24.0	2-5 0.04	2-11 0.07	3-5 0.10	3-10 0.14	4-2 0.18	4-6 0.23	4-10 0.28	5-1 0.34	5-5 0.40	5-8 0.46	5-11 0.52	6-2 0.59
2x6	12.0	5-4 0.05	6-7 0.09	7-7 0.14	8-6 0.20	9-4 0.26	10-0 0.33	10-9 0.40	11-5 0.48	12-0 0.56	12-7 0.65	13-2 0.74	13-8 0.83
	13.7	5-0 0.05	6-2 0.09	7-1 0.13	7-11 0.19	8-8 0.24	9-5 0.31	10-0 0.38	10-8 0.45	11-3 0.52	11-9 0.61	12-4 0.69	12-10 0.78
	16.0	4-8 0.04	5-8 0.08	6-7 0.12	7-4 0.17	8-1 0.23	8-8 0.28	9-4 0.35	9-10 0.41	10-5 0.49	10-11 0.56	11-5 0.64	11-10 0.72
	19.2	4-3 0.04	5-2 0.07	6-0 0.11	6-9 0.16	7-4 0.21	7-11 0.26	8-6 0.32	9-0 0.38	9-6 0.44	9-11 0.51	10-5 0.58	10-10 0.66
	24.0	3-10 0.04	4-8 0.07	5-4 0.10	6-0 0.14	6-7 0.18	7-1 0.23	7-7 0.28	8-1 0.34	8-6 0.40	8-11 0.46	9-4 0.52	9-8 0.59
2x8	12.0	7-1 0.05	8-8 0.09	10-0 0.14	11-2 0.20	12-3 0.26	13-3 0.33	14-2 0.40	15-0 0.48	15-10 0.56	16-7 0.65	17-4 0.74	18-0 0.83
	13.7	6-7 0.05	8-1 0.09	9-4 0.13	10-6 0.19	11-6 0.24	12-5 0.31	13-3 0.38	14-0 0.45	14-10 0.52	15-6 0.61	16-3 0.69	16-10 0.78
	16.0	6-2 0.04	7-6 0.08	8-8 0.12	9-8 0.17	10-7 0.23	11-6 0.28	12-3 0.35	13-0 0.41	13-8 0.49	14-4 0.56	15-0 0.64	15-7 0.72
	19.2	5-7 0.04	6-10 0.07	7-11 0.11	8-10 0.16	9-8 0.21	10-6 0.26	11-2 0.32	11-10 0.38	12-6 0.44	13-1 0.51	13-8 0.58	14-3 0.66
	24.0	5-0 0.04	6-2 0.07	7-1 0.10	7-11 0.14	8-8 0.18	9-4 0.23	10-0 0.28	10-7 0.34	11-2 0.40	11-9 0.46	12-3 0.52	12-9 0.59
2x10	12.0	9-0 0.05	11-1 0.09	12-9 0.14	14-3 0.20	15-8 0.26	16-11 0.33	18-1 0.40	19-2 0.48	20-2 0.56	21-2 0.65	22-1 0.74	23-0 0.83
	13.7	8-5 0.05	10-4 0.09	11-11 0.13	13-4 0.19	14-8 0.24	15-10 0.31	16-11 0.38	17-11 0.45	18-11 0.52	19-10 0.61	20-8 0.69	21-6 0.78
	16.0	7-10 0.04	9-7 0.08	11-1 0.12	12-4 0.17	13-6 0.23	14-8 0.28	15-8 0.35	16-7 0.41	17-6 0.49	18-4 0.56	19-2 0.64	19-11 0.72
	19.2	7-2 0.04	8-9 0.07	10-1 0.11	11-3 0.16	12-4 0.21	13-4 0.26	14-3 0.32	15-2 0.38	15-11 0.44	16-9 0.51	17-6 0.58	18-2 0.66
	24.0	6-5 0.04	7-10 0.07	9-0 0.10	10-1 0.14	11-1 0.18	11-11 0.23	12-9 0.28	13-6 0.34	14-3 0.40	15-0 0.46	15-8 0.52	16-3 0.59

NOTE: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-14 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).												RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700	3000		
9-0 0.93	9-4 1.03	9-8 1 14	9-11 1.24	10-3 1.36	10-6 1.47	10-10 1.59	11-1 1.71	11-4 1.83	11-10 2.09	12-7 2.49		12.0	
8-5 0.87	8-9 0.96	9-0 1.06	9-4 1.16	9-7 1.27	9-10 1.37	10-1 1.48	10-4 1.60	10-7 1.71	11-1 1.95	11-9 2.33		13.7	
7-10 0.80	8-1 0.89	8-4 0.98	8-7 1.08	8-10 1.17	9-1 1.27	9-4 1.37	9-7 1.48	9-10 1.59	10-3 1.81	10-10 2.16	11-5 2.53	16.0	2x4
7-2 0.73	7-5 0.81	7-8 0.90	7-10 0.98	8-1 1.07	8-4 1.16	8-6 1.25	8-9 1.35	8-11 1.45	9-4 1.65	9-11 1.97	10-5 2.31	19.2	
6-5 0.66	6-7 0.73	6-10 0.80	7-0 0.88	7-3 0.96	7-5 1.04	7-8 1.12	7-10 1.21	8-0 1.29	8-4 1.48	8-10 1.76	9-4 2.06	24.0	
14-2 0.93	14-8 1.03	15-2 1.14	15-8 1.24	16-1 1.36	16-7 1.47	17-0 1.59	17-5 1.71	17-10 1.83	18-7 2.09	19-9 2.49		12.0	
13-3 0.87	13-9 0.96	14-2 1.06	14-8 1.16	15-1 1.27	15-6 1.37	15-11 1.48	16-3 1.60	16-8 1.71	17-5 1.95	18-5 2.33		13.7	
12-4 0.80	12-9 0.89	13-2 0.98	13-7 1.08	13-11 1.17	14-4 1.27	14-8 1.37	15-1 1.48	15-5 1.59	16-1 1.81	17-1 2.16	18-0 2.53	16.0	2x6
11-3 0.73	11-7 0.81	12-0 0.90	12-4 0.98	12-9 1.07	13-1 1.16	13-5 1.25	13-9 1.35	14-1 1.45	14-8 1.65	15-7 1.97	16-5 2.31	19.2	
10-0 0.66	10-5 0.73	10-9 0.80	11-1 0.88	11-5 0.96	11-8 1.04	12-0 1.12	12-4 1.21	12-7 1.29	13-2 1.48	13-11 1.76	14-8 2.06	24.0	
18-9 0.93	19-5 1.03	20-0 1.14	20-8 1.24	21-3 1.36	21-10 1.47	22-4 1.59	22-11 1.71	23-6 1.83	24-6 2.09	26-0 2.49		12.0	
17-6 0.87	18-2 0.96	18-9 1.06	19-4 1.16	19-10 1.27	20-5 1.37	20-11 1.48	21-5 1.60	21-11 1.71	22-11 1.95	24-4 2.33		13.7	
16-3 0.80	16-9 0.89	17-4 0.98	17-10 1.08	18-5 1.17	18-11 1.27	19-5 1.37	19-10 1.48	20-4 1.59	21-3 1.81	22-6 2.16	23-9 2.53	16.0	2x8
14-10 0.73	15-4 0.81	15-10 0.90	16-4 0.98	16-9 1.07	17-3 1.16	17-8 1.25	18-2 1.35	18-7 1.45	19-5 1.65	20-7 1.97	21-8 2.31	19.2	
13-3 0.66	13-8 0.73	14-2 0.80	14-7 0.88	15-0 0.96	15-5 1.04	15-10 1.12	16-3 1.21	16-7 1.29	17-4 1.48	18-5 1.76	19-5 2.06	24.0	
23-11 0.93	24-9 1.03	25-6 1.14	26-4 1.24	27-1 1.36	27-10 1.47	28-7 1.59	29-3 1.71	29-11 1.83	31-3 2.09	33-2 2.49		12.0	
22-4 0.87	23-2 0.96	23-11 1.06	24-7 1.16	25-4 1.27	26-0 1.37	26-8 1.48	27-4 1.60	28-0 1.71	29-3 1.95	31-0 2.33		13.7	
20-8 0.80	21-5 0.89	22-1 0.98	22-10 1.08	23-5 1.17	24-1 1.27	24-9 1.37	25-4 1.48	25-11 1.59	27-1 1.81	28-9 2.16	30-3 2.53	16.0	2x10
18-11 0 73	19-7 0.81	20-2 0.90	20-10 0.98	21-5 1.07	22-0 1.16	22-7 1.25	23-2 1.35	23-8 1.45	24-9 1.65	26-3 1.97	27-8 2.31	19.2	
16-11 0.66	17-6 0.73	18-1 0.80	18-7 0.88	19-2 0.96	19-8 1.04	20-2 1.12	20-8 1.21	21-2 1.29	22-1 1.48	23-5 1.76	24-9 2.06	24.0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-15

ALLOWABLE SPAN FOR HIGH SLOPE RAFTERS

Slope over 3 in 12 - 30 Lbs. Per Sq. Ft. Live Load
(Heavy Roof Covering)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 30 lbs. per. sq. ft. live load determines fiber stress.
Deflection - For 30 lbs. per sq. ft. live load. Limited to span in inches divided by 180.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											
		200	300	400	500	600	700	800	900	1000	1100	1200	1300
2x4	12.0	3-0 0.05	3-8 0.09	4-3 0.15	4-9 0.20	5-3 0.27	5-8 0.34	6-0 0.41	6-5 0.49	6-9 0.58	7-1 0.67	7-5 0.76	7-8 0.86
	13.7	2-10 0.05	3-5 0.09	4-0 0.14	4-5 0.19	4-11 0.25	5-3 0.32	5-8 0.39	6-0 0.46	6-4 0.54	6-7 0.62	6-11 0.71	7-2 0.80
	16.0	2-7 0.04	3-2 0.08	3-8 0.13	4-1 0.18	4-6 0.23	4-11 0.29	5-3 0.36	5-6 0.43	5-10 0.50	6-1 0.58	6-5 0.66	6-8 0.74
	19.2	2-5 0.04	2-11 0.08	3-4 0.12	3-9 0.16	4-1 0.21	4-5 0.27	4-9 0.33	5-1 0.39	5-4 0.46	5-7 0.53	5-10 0.60	6-1 0.68
	24.0	2-2 0.04	2-7 0.07	3-0 0.10	3-4 0.14	3-8 0.19	4-0 0.24	4-3 0.29	4-6 0.35	4-9 0.41	5-0 0.47	5-3 0.54	5-5 0.61
2x6	12.0	4-9 0.05	5-10 0.09	6-8 0.15	7-6 0.20	8-2 0.27	8-10 0.34	9-6 0.41	10-0 0.49	10-7 0.58	11-1 0.67	11-7 0.76	12-1 0.86
	13.7	4-5 0.05	5-5 0.09	6-3 0.14	7-0 0.19	7-8 0.25	8-3 0.32	8-10 0.39	9-5 0.46	9-11 0.54	10-5 0.62	10-10 0.71	11-3 0.80
	16.0	4-1 0.04	5-0 0.08	5-10 0.13	6-6 0.18	7-1 0.23	7-8 0.29	8-2 0.36	8-8 0.43	9-2 0.50	9-7 0.58	10-0 0.66	10-5 0.74
	19.2	3-9 0.04	4-7 0.08	5-4 0.12	5-11 0.16	6-6 0.21	7-0 0.27	7-6 0.33	7-11 0.39	8-4 0.46	8-9 0.53	9-2 0.60	9-6 0.68
	24.0	3-4 0.04	4-1 0.07	4-9 0.10	5-4 0.14	5-10 0.19	6-3 0.24	6-8 0.29	7-1 0.35	7-6 0.41	7-10 0.47	8-2 0.54	8-6 0.61
2x8	12.0	6-3 0.05	7-8 0.09	8-10 0.15	9-10 0.20	10-10 0.27	11-8 0.34	12-6 0.41	13-3 0.49	13-11 0.58	14-8 0.67	15-3 0.76	15-11 0.86
	13.7	5-10 0.05	7-2 0.09	8-3 0.14	9-3 0.19	10-1 0.25	10-11 0.32	11-8 0.39	12-5 0.46	13-1 0.54	13-8 0.62	14-4 0.71	14-11 0.80
	16.0	5-5 0.04	6-7 0.08	7-8 0.13	8-7 0.18	9-4 0.23	10-1 0.29	10-10 0.36	11-6 0.43	12-1 0.50	12-8 0.58	13-3 0.66	13-9 0.74
	19.2	4-11 0.04	6-1 0.08	7-0 0.12	7-10 0.16	8-7 0.21	9-3 0.27	9-10 0.33	10-6 0.39	11-0 0.46	11-7 0.53	12-1 0.60	12-7 0.68
	24.0	4-5 0.04	5-5 0.07	6-3 0.10	7-0 0.14	7-8 0.19	8-3 0.24	8-10 0.29	9-4 0.35	9-10 0.41	10-4 0.47	10-10 0.54	11-3 0.61
2x10	12.0	8-0 0.05	9-9 0.09	11-3 0.15	12-7 0.20	13-9 0.27	14-11 0.34	15-11 0.41	16-11 0.49	17-10 0.58	18-8 0.67	19-6 0.76	20-4 0.86
	13.7	7-5 0.05	9-1 0.09	10-6 0.14	11-9 0.19	12-11 0.25	13-11 0.32	14-11 0.39	15-10 0.46	16-8 0.54	17-6 0.62	18-3 0.71	19-0 0.80
	16.0	6-11 0.04	8-5 0.08	9-9 0.13	10-11 0.18	11-11 0.23	12-11 0.29	13-9 0.36	14-8 0.43	15-5 0.50	16-2 0.58	16-11 0.66	17-7 0.74
	19.2	6-4 0.04	7-8 0.08	8-11 0.12	9-11 0.16	10-11 0.21	11-9 0.27	12-7 0.33	13-4 0.39	14-1 0.46	14-9 0.53	15-5 0.60	16-1 0.68
	24.0	5-8 0.04	6-11 0.07	8-0 0.10	8-11 0.14	9-9 0.19	10-6 0.24	11-3 0.29	11-11 0.35	12-7 0.41	13-2 0.47	13-9 0.54	14-4 0.61

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-15 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).												RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700	3000		
8-0 0.96	8-3 1.06	8-6 1.17	8-9 1.28	9-0 1.39	9-3 1.51	9-6 1.63	9-9 1.76	10-0 1.88	10-5 2.15	11-1 2.56		12.0	
7-5 0.89	7-9 0.99	8-0 1.09	8-3 1.20	8-5 1.30	8-8 1.41	8-11 1.53	9-2 1.64	9-4 1.76	9-9 2.01	10-4 2.40		13.7	
6-11 0.83	7-2 0.92	7-5 1.01	7-7 1.11	7-10 1.21	8-0 1.31	8-3 1.41	8-5 1.52	8-8 1.63	9-0 1.86	9-7 2.22	10-1 2.60	16.0	2x4
6-4 0.76	6-6 0.84	6-9 0.92	6-11 1.01	7-2 1.10	7-4 1.20	7-6 1.29	7-9 1.39	7-11 1.49	8-3 1.70	8-9 2.03	9-3 2.37	19.2	
5-8 0.68	5-10 0.75	6-0 0.83	6-3 0.90	6-5 0.99	6-7 1.07	6-9 1.15	6-11 1.24	7-1 1.33	7-5 1.52	7-10 1.81	8-3 2.12	24.0	
12-6 0.96	13-0 1.06	13-5 1.17	13-10 1.28	14-2 1.39	14-7 1.51	15-0 1.63	15-4 1.76	15-8 1.88	16-5 2.15	17-5 2.56		12.0	
11-9 0.89	12-2 0.99	12-6 1.09	12-11 1.20	13-3 1.30	13-8 1.41	14-0 1.53	14-4 1.64	14-8 1.76	15-4 2.01	16-3 2.40		13.7	
10-10 0.83	11-3 0.92	11-7 1.01	11-11 1.11	12-4 1.21	12-8 1.31	13-0 1.41	13-3 1.52	13-7 1.63	14-2 1.86	15-1 2.22	15-11 2.60	16.0	2x6
9-11 0.76	10-3 0.84	10-7 0.92	10-11 1.01	11-3 1.10	11-6 1.20	11-10 1.29	12-2 1.39	12-5 1.49	13-0 1.70	13-9 2.03	14-6 2.37	19.2	
8-10 0.68	9-2 0.75	9-6 0.83	9-9 0.90	10-0 0.99	10-4 1.07	10-7 1.15	10-10 1.24	11-1 1.33	11-7 1.52	12-4 1.81	13-0 2.12	24.0	
16-6 0.96	17-1 1.06	17-8 1.17	18-2 1.28	18-9 1.39	19-3 1.51	19-9 1.63	20-3 1.76	20-8 1.88	21-7 2.15	22-11 2.56		12.0	
15-5 0.89	16-0 0.99	16-6 1.09	17-0 1.20	17-6 1.30	18-0 1.41	18-5 1.53	18-11 1.64	19-4 1.76	20-3 2.01	21-5 2.40		13.7	
14-4 0.83	14-10 0.92	15-3 1.01	15-9 1.11	16-3 1.21	16-8 1.31	17-1 1.41	17-6 1.52	17-11 1.63	18-9 1.86	19-10 2.22	20-11 2.60	16.0	2x8
13-1 0.76	13-6 0.84	13-11 0.92	14-5 1.01	14-10 1.10	15-2 1.20	15-7 1.29	16-0 1.39	16-4 1.49	17-1 1.70	18-2 2.03	19-1 2.37	19.2	
11-8 0.68	12-1 0.75	12-6 0.83	12-10 0.90	13-3 0.99	13-7 1.07	13-11 1.15	14-4 1.24	14-8 1.33	15-3 1.52	16-3 1.81	17-1 2.12	24.0	
21-1 0.96	21-10 1.06	22-6 1.17	23-3 1.28	23-11 1.39	24-6 1.51	25-2 1.63	25-10 1.76	26-5 1.88	27-7 2.15	29-3 2.56		12.0	
19-8 0.89	20-5 0.99	21-1 1.09	21-9 1.20	22-4 1.30	22-11 1.41	23-7 1.53	24-2 1.64	24-8 1.76	25-10 2.01	27-4 2.40		13.7	
18-3 0.83	18-11 0.92	19-6 1.01	20-1 1.11	20-8 1.21	21-3 1.31	21-10 1.41	22-4 1.52	22-10 1.63	23-11 1.86	25-4 2.22	26-8 2.60	16.0	2x10
16-8 0.76	17-3 0.84	17-10 0.92	18-4 1.01	18-11 1.10	19-5 1.20	19-11 1.29	20-5 1.39	20-10 1.49	21-10 1.70	23-2 2.03	24-5 2.37	19.2	
14-11 0.68	15-5 0.75	15-11 0.83	16-5 0.90	16-11 0.99	17-4 1.07	17-10 1.15	18-3 1.24	18-8 1.33	19-6 1.52	20-8 1.81	21-10 2.12	24.0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-16

ALLOWABLE SPAN FOR HIGH SLOPE RAFTERS

Slope over 3 in 12 - 40 Lbs. Per Sq. Ft. Live Load
(Heavy Roof Covering)

DESIGN CRITERIA:
Strength - 15 lbs. per sq. ft. dead load plus 40 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 40 lbs. per sq. ft. live load. Limited to span in inches divided by 180.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											
		200	300	400	500	600	700	800	900	1000	1100	1200	1300
2x4	12.0	2-9 0.05	3-4 0.09	3-10 0.14	4-4 0.20	4-9 0.26	5-1 0.33	5-5 0.41	5-9 0.49	6-1 0.57	6-5 0.66	6-8 0.75	6-11 0.84
	13.7	2-7 0.05	3-1 0.09	3-7 0.13	4-0 0.19	4-5 0.25	4-9 0.31	5-1 0.38	5-5 0.46	5-8 0.53	6-0 0.61	6-3 0.70	6-6 0.79
	16.0	2-4 0.04	2-11 0.08	3-4 0.12	3-9 0.17	4-1 0.23	4-5 0.29	4-9 0.35	5-0 0.42	5-3 0.49	5-6 0.57	5-9 0.65	6-0 0.73
	19.2	2-2 0.04	2-8 0.07	3-1 0.11	3-5 0.16	3-9 0.21	4-0 0.26	4-4 0.32	4-7 0.38	4-10 0.45	5-1 0.52	5-3 0.59	5-6 0.67
	24.0	1-11 0.04	2-4 0.07	2-9 0.10	3-1 0.14	3-4 0.19	3-7 0.24	3-10 0.29	4-1 0.34	4-4 0.40	4-6 0.46	4-9 0.53	4-11 0.60
2x6	12.0	4-3 0.05	5-3 0.09	6-1 0.14	6-9 0.20	7-5 0.26	8-0 0.33	8-7 0.41	9-1 0.49	9-7 0.57	10-0 0.66	10-6 0.75	10-11 0.84
	13.7	4-0 0.05	4-11 0.09	5-8 0.13	6-4 0.19	6-11 0.25	7-6 0.31	8-0 0.38	8-6 0.46	8-11 0.53	9-5 0.61	9-10 0.70	10-3 0.79
	16.0	3-8 0.04	4-6 0.08	5-3 0.12	5-10 0.17	6-5 0.23	6-11 0.29	7-5 0.35	7-10 0.42	8-3 0.49	8-8 0.57	9-1 0.65	9-5 0.73
	19.2	3-5 0.04	4-2 0.07	4-9 0.11	5-4 0.16	5-10 0.21	6-4 0.26	6-9 0.32	7-2 0.38	7-7 0.45	7-11 0.52	8-3 0.59	8-8 0.67
	24.0	3-0 0.04	3-8 0.07	4-3 0.10	4-9 0.14	5-3 0.19	5-8 0.24	6-1 0.29	6-5 0.34	6-9 0.40	7-1 0.46	7-5 0.53	7-9 0.60
2x8	12.0	5-8 0.05	6-11 0.09	8-0 0.14	8-11 0.20	9-9 0.26	10-7 0.33	11-3 0.41	12-0 0.49	12-7 0.57	13-3 0.66	13-10 0.75	14-5 0.84
	13.7	5-3 0.05	6-6 0.09	7-6 0.13	8-4 0.19	9-2 0.25	9-11 0.31	10-7 0.28	11-2 0.46	11-10 0.53	12-5 0.61	12-11 0.70	13-6 0.79
	16.0	4-11 0.04	6-0 0.08	6-11 0.12	7-9 0.17	8-6 0.23	9-2 0.29	9-9 0.35	10-4 0.42	10-11 0.49	11-6 0.57	12-0 0.65	12-6 0.73
	19.2	4-6 0.04	5-6 0.07	6-4 0.11	7-1 0.16	7-9 0.21	8-4 0.26	8-11 0.32	9-6 0.38	10-0 0.45	10-6 0.52	10-11 0.59	11-5 0.67
	24.0	4-0 0.04	4-11 0.07	5-8 0.10	6-4 0.14	6-11 0.19	7-6 0.24	8-0 0.29	8-6 0.34	8-11 0.40	9-4 0.46	9-9 0.53	10-2 0.60
2x10	12.0	7-2 0.05	8-10 0.09	10-2 0.14	11-5 0.20	12-6 0.26	13-6 0.33	14-5 0.41	15-3 0.49	16-1 0.57	16-11 0.66	17-8 0.75	18-4 0.84
	13.7	6-9 0.05	8-3 0.09	9-6 0.13	10-8 0.19	11-8 0.25	12-7 0.31	13-6 0.38	14-3 0.46	15-1 0.53	15-10 0.61	16-6 0.70	17-2 0.79
	16.0	6-3 0.04	7-8 0.08	8-10 0.12	9-10 0.17	10-10 0.23	11-8 0.29	12-6 0.35	13-3 0.42	13-11 0.49	14-8 0.57	15-3 0.65	15-11 0.73
	19.2	5-8 0.04	7-0 0.07	8-1 0.11	9-0 0.16	9-10 0.21	10-8 0.26	11-5 0.32	12-1 0.38	12-9 0.45	13-4 0.52	13-11 0.59	14-6 0.67
	24.0	5-1 0.04	6-3 0.07	7-2 0.10	8-1 0.14	8-10 0.19	9-6 0.24	10-2 0.29	10-10 0.34	11-5 0.40	11-11 0.46	12-6 0.53	13-0 0.60

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-16 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).												RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700	3000		
7·3 0.94	7·6 1.05	7·8 1.15	7·11 1.26	8·2 1.38	8·5 1.49	8·7 1.61	8·10 1.73	9·0 1.86	9·5 2.12	10·0 2.53		12.0	
6·9 0.88	7·0 0.98	7·3 1.08	7·5 1.18	7·8 1.29	7·10 1.40	8·1 1.51	8·3 1.62	8·5 1.74	8·10 1.98	9·4 2.36		13.7	
6·3 0.82	6·6 0.91	6·8 1.00	6·11 1.09	7·1 1.19	7·3 1.29	7·6 1.40	7·8 1.50	7·10 1.61	8·2 1.83	8·8 2.19	9·2 2.56	16.0	2x4
5·8 0.75	5·11 0.83	6·1 0.91	6·3 1.00	6·6 1.09	6·8 1.18	6·10 1.27	7·0 1.37	7·2 1 47	7·6 1.67	7·11 2.00	8·4 2.34	19.2	
5·1 0.67	5·3 0.74	5·5 0.82	5·7 0.89	5·9 0.97	5·11 1.06	6·1 1.14	6·3 1 23	6·5 1.31	6·8 1.50	7·1 1.79	7·6 2.09	24.0	
11·4 0.94	11·9 1.05	12·1 1.15	12·6 1.26	12·10 1.38	13·2 1.49	13·6 1.61	13·10 1 73	14·2 1.86	14·10 2.12	15·9 2.53		12.0	
10·7 0.88	11·0 0.98	11·4 1.08	11·8 1.18	12·0 1.29	12·4 1.40	12 8 1.51	13·0 1.62	13·3 1 74	13 10 1.98	14·9 2.36		13.7	
9·10 0.82	10·2 0.91	10·6 1.00	10·10 1.09	11·1 1.19	11·5 1.29	11·9 1.40	12·0 1 50	12·4 1.61	12 10 1.83	13·7 2.19	14·4 2.56	16.0	2x6
8·11 0.75	9·3 0.83	9·7 0.91	9·10 1.00	10·2 1.09	10·5 1.18	10·8 1.27	11·0 1.37	11·3 1.47	11 9 1.67	12·5 2 00	13·1 2.34	19 2	
8·0 0.67	8·3 0.74	8·7 0.82	8·10 0.89	9·1 0.97	9·4 1.06	9 7 1.14	9·10 1 23	10·0 1.31	10 6 1.50	11·1 1.79	11 9 2.09	24.0	
14·11 0.94	15·5 1.05	16·0 1.15	16·5 1.26	16·11 1.38	17·5 1.49	17·10 1.61	18·3 1.73	18 9 1.86	19·7 2.12	20·9 2.53		12.0	
14·0 0.88	14·6 0.98	14·11 1.08	15·5 1.18	15·10 1.29	16·3 1.40	16·8 1.51	17·1 1.62	17·6 1.74	18·3 1.98	19·5 2.36		13.7	
12·11 0.82	13·5 0.91	13·10 1.00	14·3 1.09	14·8 1.19	15·1 1.29	15·5 1 40	15·10 1.50	16·3 1.61	16·11 1.83	18·0 2.19	18·11 2.56	16.0	2x8
11·10 0.75	12·3 0.83	12·7 0.91	13·0 1.00	13·5 1.09	13·9 1.18	14 1 1.27	14·6 1.37	14·10 1.47	15·5 1.67	16·5 2.00	17·3 2.34	19.2	
10·7 0.67	10·11 0.74	11·3 0.82	11·8 0.89	12·0 0.97	12·4 1.06	12 7 1 14	12·11 1.23	13 3 1.31	13 10 1 50	14·8 1 79	15·5 2.09	24.0	
19·1 0.94	19·9 1.05	20·4 1.15	21·0 1.26	21·7 1.38	22·2 1.49	22·9 1 61	23·4 1.73	23·11 1.86	24 11 2.12	26·6 2.53		12.0	
17·10 0.88	18·5 0.98	19·1 1.08	19·8 1.18	20·2 1.29	20·9 1.40	21·4 1.51	21·10 1.62	22 4 1.74	23·4 1.98	24·9 2.36		13.7	
16·6 0.82	17·1 0.91	17·8 1.00	18·2 1.09	18·9 1.19	19·3 1.29	19·9 1.40	20 2 1 50	20 8 1 61	21·7 1.83	22·11 2.19	24.2 2.56	16.0	2x10
15·1 0.75	15·7 0.83	16·1 0.91	16·7 1.00	17·1 1.09	17·7 1.18	18·0 1.27	18 5 1.37	18 11 1 47	19·9 1.67	20·11 2.00	22·1 2.34	19.2	
13·6 0.67	13·11 0.74	14·5 0.82	14·10 0.89	15·3 0.97	15·8 1.06	16 1 1.14	16 6 1.23	16·11 1.31	17·8 1 50	18·9 1.79	19·9 2.09	24.0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-17

ALLOWABLE SPAN FOR HIGH SLOPE RAFTERS

Slope over 3 in 12 - 20 Lbs. Per Sq. Ft. Live Load
(Light Roof Covering)

DESIGN CRITERIA:
Strength - 7 lbs. per sq. ft. dead load plus 20 lbs. per sq. ft. live load determines fiber stress
Deflection - For 20 lbs. per sq. ft. live load. Limited to span in inches divided by 180.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE (IN)	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											
		200	300	400	500	600	700	800	900	1000	1100	1200	1300
2x4	12.0	3-11 0.07	4-9 0.14	5-6 0.21	6-2 0.29	6-9 0.38	7-3 0.49	7-9 0.59	8-3 0.71	8-8 0.83	9-1 0.96	9-6 1.09	9-11 1.23
	13.7	3-8 0.07	4-5 0.13	5-2 0.20	5-9 0.27	6-4 0.36	6-10 0.45	7-3 0.55	7-9 0.66	8-2 0.77	8-6 0.89	8-11 1.02	9-3 1.15
	16.0	3-4 0.06	4-1 0 12	4-9 0.18	5-4 0.25	5-10 0.33	6-4 0.42	6-9 0.51	7-2 0.61	7-6 0.72	7-11 0.83	8-3 0.94	8-7 1.06
	19.2	3-1 0.06	3-9 0.11	4-4 0.17	4-10 0.23	5-4 0.30	5-9 0.38	6-2 0.47	6-6 0.56	6-10 0.65	7-3 0.76	7-6 0.86	7-10 0.97
	24.0	2-9 0.05	3-4 0 10	3-11 0.15	4-4 0.21	4 9 0.27	5-2 0.34	5-6 0.42	5-10 0.50	6-2 0.59	6-5 0.68	6-9 0.77	7-0 0.87
2x6	12.0	6-1 0.07	7-6 0.14	8-8 0.21	9-8 0.29	10-7 0.38	11-5 0.49	12-3 0.59	13-0 0.71	13-8 0 83	14-4 0.96	15-0 1.09	15-7 1.23
	13.7	5-9 0.07	7-0 0.13	8 1 0.20	9-0 0.27	9-11 0.36	10-8 0.45	11-5 0.55	12-2 0.66	12-9 0.77	13-5 0.89	14-0 1.02	14-7 1.15
	16.0	5-4 0.06	6-6 0.12	7-6 0.18	8-4 0.25	9-2 0.33	9-11 0.42	10-7 0.51	11-3 0.61	11-10 0.72	12-5 0.83	13-0 0.94	13-6 1.06
	19.2	4-10 0 06	5-11 0.11	6-10 0.17	7-8 0.23	8-4 0 30	9-0 0.38	9-8 0.47	10-3 0.56	10-10 0 65	11-4 0.76	11-10 0.86	12-4 0.97
	24.0	4-4 0.05	5-4 0.10	6-1 0.15	6-10 0.21	7-6 0.27	8-1 0.34	8-8 0.42	9-2 0 50	9-8 0.59	10-2 0.68	10-7 0.77	11-0 0.87
2x8	12.0	8-1 0.07	9-10 0.14	11-5 0.21	12 9 0.29	13-11 0.38	15-1 0.49	16-1 0.59	17-1 0.71	18-0 0.83	18-11 0.96	19-9 1.09	20-6 1.23
	13.7	7-6 0.07	9-3 0.13	10-8 0.20	11-11 0.27	13-1 0.36	14-1 0.45	15-1 0.55	16-0 0.66	16-10 0.77	17-8 0.89	18-5 1.02	19-3 1.15
	16.0	7-0 0.06	8-7 0.12	9-10 0.18	11-0 0.25	12-1 0.33	13-1 0.42	13-11 0.51	14-10 0.61	15-7 0.72	16-4 0.83	17-1 0.94	17-9 1.06
	19.2	6-4 0.06	7-10 0.11	9-0 0.17	10-1 0.23	11-0 0 30	11-11 0.38	12-9 0.47	13-6 0.56	14-3 0.65	14-11 0.76	15-7 0.86	16-3 0.97
	24 0	5-8 0.05	7-0 0.10	8-1 0.15	9 0 0.21	9-10 0 27	10-8 0.34	11 5 0.42	12-1 0.50	12-9 0.59	13-4 0.68	13-11 0.77	14-6 0.87
2x10	12.0	10-3 0.07	12-7 0.14	14-6 0.21	16 3 0.29	17 10 0 38	19-3 0.49	20-7 0.59	21-10 0 71	23-0 0.83	24 1 0.96	25-2 1.09	26-2 1.23
	13.7	9-7 0.07	11-9 0.13	13-7 0.20	15 2 0.27	16-8 0.36	18 0 0 45	19-3 0.55	20-5 0.66	21-6 0.77	22-7 0.89	23-7 1.02	24-6 1.15
	16.0	8-11 0 06	10-11 0.12	12-7 0 18	14 1 0 25	15 5 0 33	16 8 0 42	17-10 0.51	18-11 0.61	19-11 0 72	20-10 0 83	21-10 0.94	22-8 1.06
	19 2	8-2 0.06	9-11 0.11	11 6 0 17	12 10 0 23	14 1 0.30	15 2 0 38	16-3 0 47	17-3 0.56	18 2 0 65	19-1 0.76	19-11 0.86	20-9 0.97
	24 0	7-3 0 05	8-11 0 10	10 3 0 15	11 6 0 21	12-7 0 27	13 7 0 34	14 6 0 42	15 5 0 50	16-3 0.59	17-1 0 68	17-10 0 77	18-6 0.87

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-17 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square. Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700		
10·3 1.37	10·8 1.52	11·0 1.68	11·4 1 84	11·8 2 00	12·0 2.17	12·4 2 34	12·7 2 52				12.0	
9·7 1.28	10·0 1.42	10·3 1.57	10·7 1.72	10·11 1.87	11·3 2.03	11·6 2.19	11·9 2.36	12·1 2.53			13.7	
8·11 1.19	9·3 1.32	9·6 1.45	9·10 1.59	10·1 1.73	10·5 1.88	10·8 2.03	10·11 2.18	11·2 2.34			16.0	2x4
8·2 1.08	8·5 1.20	8·8 1.33	9·0 1.45	9·3 1.58	9·6 1.71	9·9 1 85	10·0 1.99	10·2 2.14	10·8 2 43		19.2	
7·3 0.97	7·6 1 08	7·9 1.19	8·0 1.30	8·3 1.41	8·6 1.53	8 8 1.66	8 11 1.78	9·1 1.91	9·6 2.18	10·1 2.60	24.0	
16·2 1 37	16·9 1.52	17·3 1.68	17·10 1.84	18·4 2.00	18·10 2.17	19·4 2.34	19·10 2.52				12.0	
15·1 1.28	15·8 1.42	16·2 1.57	16·8 1.72	17·2 1.87	17·7 2.03	18·1 2.19	18·6 2.36	19·0 2.53			13.7	
14·0 1.19	14·6 1.32	15·0 1.45	15·5 1.59	15·11 1.73	16·4 1.88	16·9 2 03	17·2 2.18	17 7 2.34			16.0	2x6
12·9 1.08	13·3 1.20	13·8 1.33	14·1 1 45	14·6 1.58	14·11 1.71	15·3 1.85	15·8 1.99	16·0 2.14	16·9 2.43		19.2	
11·5 0.97	11·10 1.08	12·3 1 19	12·7 1.30	13·0 1.41	13·4 1.53	13·8 1 66	14·0 1.78	14·4 1.91	15·0 2.18	15·11 2.60	24.0	
21·4 1.37	22·1 1.52	22·9 1.68	23·6 1 84	24·2 2.00	24·10 2.17	25·6 2.34	26·1 2.52				12.0	
19·11 1 28	20·8 1.42	21·4 1.57	22·0 1.72	22·7 1.87	23·3 2.03	23·10 2 19	24·5 2 36	25·0 2.53			13.7	
18·5 1.19	19·1 1.32	19·9 1.45	20·4 1.59	20·11 1.73	21·6 1.88	22·1 2 03	22·7 2.18	23·2 2.34			16.0	2x8
16·10 1.08	17·5 1.20	18·0 1.33	18·7 1 45	19 1 1.58	19·8 1.71	20·2 1.85	20 8 1 99	21·1 2.14	22·1 2.43		19.2	
15·1 0.97	15·7 1.08	16·1 1.19	16·7 1.30	17·1 1 41	17·7 1.53	18 0 1.66	18·5 1.78	18·11 1.91	19·9 2.18	20·11 2.60	24.0	
27·2 1.37	28·2 1.52	29·1 1.68	30·0 1.84	30 10 2.00	31·8 2.17	32 6 2.34	33·4 2.52				12.0	
25·5 1.28	26·4 1.42	27·2 1.57	28·0 1.72	28·10 1.87	29·8 2.03	30 5 2.19	31·2 2.36	31·11 2.53			13.7	
23 7 1.19	24·5 1.32	25·2 1.45	25·11 1.59	26·8 1.73	27·5 1 88	28 2 2 03	28·10 2.18	29·6 2.34			16.0	2x10
21·6 1.08	22·3 1.20	23·0 1.33	23·8 1 45	24·5 1.58	25·1 1.71	25·8 1.85	26·4 1.99	26·11 2.14	28·2 2.43		19 2	
19·3 0 97	19 11 1 08	20·7 1.19	21 2 1.30	21·10 1.41	22·5 1.53	23·0 1.66	23·7 1.78	24·1 1.91	25·2 2 18	26·8 2.60	24 0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-18

ALLOWABLE SPAN FOR HIGH SLOPE RAFTERS

Slope over 3 in 12 - 30 Lbs. Per sq. Ft. Live Load
(Light Roof Covering)

DESIGN CRITERIA:
Strength - 7 lbs. per sq. ft. dead load plus 30 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 30 lbs. per sq. ft. live load. Limited to span in inches divided by 180.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											
		200	300	400	500	600	700	800	900	1000	1100	1200	1300
2x4	12.0	3-4 0.07	4-1 0.13	4-8 0.20	5-3 0.27	5-9 0.36	6-3 0.45	6-8 0.55	7-1 0.66	7-5 0.77	7-9 0.89	8-2 1.02	8-6 1.15
	13.7	3-1 0.06	3-10 0.12	4-5 0.18	4-11 0.26	5-5 0.34	5-10 0.42	6-3 0.52	6-7 0.62	6-11 0.72	7-3 0.84	7-7 0.95	7-11 -1.07
	16.0	2-11 0.06	3-6 0.11	4-1 0.17	4-7 0.24	5-0 0.31	5-5 0.39	5-9 0.48	6-1 0.57	6-5 0.67	6-9 0.77	7-1 0.88	7-4 0.99
	19.2	2-8 0.05	3-3 0.10	3-9 0.15	4-2 0.22	4-7 0.28	4-11 0.36	5-3 0.44	5-7 0.52	5-10 0.61	6-2 0.71	6-5 0.80	6-8 0.91
	24.0	2-4 0.05	2-11 0.09	3-4 0.14	3-9 0.19	4-1 0.25	4-5 0.32	4-8 0.39	5-0 0.47	5-3 0.55	5-6 0.63	5-9 0.72	6-0 0.81
2x6	12.0	5-3 0.07	6-5 0.13	7-5 0.20	8-3 0.27	9-1 0.36	9-9 0.45	10-5 0.55	11-1 0.66	11-8 0.77	12-3 0.89	12-9 1.02	13-4 1.15
	13.7	4-11 0.06	6-0 0.12	6-11 0.18	7-9 0.26	8-5 0.34	9-2 0.42	9-9 0.52	10-4 0.62	10-11 0.72	11-5 0.84	12-0 0.95	12-5 1.07
	16.0	4-6 0.06	5-6 0.11	6-5 0.17	7-2 0.24	7-10 0.31	8-5 0.39	9-1 0.48	9-7 0.57	10-1 0.67	10-7 0.77	11-1 0.88	11-6 0.99
	19.2	4-2 0.05	5-1 0.10	5-10 0.15	6-6 0.22	7-2 0.28	7-9 0.36	8-3 0.44	8-9 0.52	9-3 0.61	9-8 0.71	10-1 0.80	10-6 0.91
	24.0	3-8 0.05	4-6 0.09	5-3 0.14	5-10 0.19	6-5 0.25	6-11 0.32	7-5 0.39	7-10 0.47	8-3 0.55	8-8 0.63	9-1 0.72	9-5 0.81
2x8	12.0	6-11 0.07	8-5 0.13	9-9 0.20	10-11 0.27	11-11 0.36	12-10 0.45	13-9 0.55	14-7 0.66	15-5 0.77	16-2 0.89	16-10 1.02	17-7 1.15
	13.7	6-5 0.06	7-11 0.12	9-1 0.18	10-2 0.26	11-2 0.34	12-1 0.42	12-10 0.52	13-8 0.62	14-5 0.72	15-1 0.84	15-9 0.95	16-5 1.07
	16.0	6-0 0.06	7-4 0.11	8-5 0.17	9-5 0.24	10-4 0.31	11-2 0.39	11-11 0.48	12-8 0.57	13-4 0.67	14-0 0.77	14-7 0.88	15-2 0.99
	19.2	5-5 0.05	6-8 0.10	7-8 0.15	8-7 0.22	9-5 0.28	10-2 0.36	10-11 0.44	11-6 0.52	12-2 0.61	12-9 0.71	13-4 0.80	13-10 0.91
	24.0	4-10 0.05	6-0 0.09	6-11 0.14	7-8 0.19	8-5 0.25	9-1 0.32	9-9 0.39	10-4 0.47	10-11 0.55	11-5 0.63	11-11 0.72	12-5 0.81
2x10	12.0	8-9 0.07	10-9 0.13	12-5 0.20	13-11 0.27	15-2 0.36	16-5 0.45	17-7 0.55	18-7 0.66	19-8 0.77	20-7 0.89	21-6 1.02	22-5 1.15
	13.7	8-3 0.06	10-1 0.12	11-7 0.18	13-0 0.26	14-3 0.34	15-4 0.42	16-5 0.52	17-5 0.62	18-4 0.72	19-3 0.84	20-1 0.95	20-11 1.07
	16.0	7-7 0.07	9-4 0.12	10-9 0.19	12-0 0.26	13-2 0.34	14-3 0.43	15-2 0.53	16-2 0.63	17-0 0.74	17-10 0.85	18-7 0.97	19-5 1.09
	19.2	6-11 0.05	8-6 0.10	9-10 0.15	11-0 0.22	12-0 0.28	13-0 0.36	13-11 0.44	14-9 0.52	15-6 0.61	16-3 0.71	17-0 0.80	17-8 0.91
	24.0	6-2 0.05	7-7 0.09	8-9 0.14	9-10 0.19	10-9 0.25	11-7 0.32	12-5 0.39	13-2 0.47	13-11 0.55	14-7 0.63	15-2 0.72	15-10 0.81

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-18 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											RAFTER SPACING (IN)	SIZE (IN)
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700		
8·9 1.28	9·1 1.42	9·5 1.57	9·8 1.72	10·0 1.87	10·3 2.03	10·6 2.19	10·9 2.36	11·0 2.53			12.0	
8·3 1.20	8·6 1.33	8·9 1.47	9·1 1.61	9·4 1.75	9·7 1.90	9·10 2.05	10·1 2.20	10·4 2.36			13.7	
7·7 1.11	7·11 1.23	8·2 1.36	8·5 1.49	8·8 1.62	8·10 1.76	9·1 1.90	9·4 2.04	9·7 2.19	10·0 2.49		16.0	2x4
6·11 1.01	7·2 1.12	7·5 1.24	7·8 1.36	7·11 1.48	8·1 1.60	8·4 1.73	8·6 1.86	8·9 2.00	9·1 2.28		19.2	
6·3 0.91	6·5 1.01	6·8 1.11	6·10 1.21	7·1 1.32	7·3 1.43	7·5 1.55	7·7 1.67	7·9 1.79	8·2 2.04	8·8 2.43	24.0	
13·10 1.28	14·4 1.42	14·9 1.57	15·3 1.72	15·8 1.87	16·1 2.03	16·6 2.19	16·11 2.36	17·4 2.53			12.0	
12·11 1.20	13·4 1.33	13·10 1.47	14·3 1.61	14·8 1.75	15·1 1.90	15·5 2.05	15·10 2.20	16·2 2.36			13.7	
12·0 1.11	12·5 1.23	12·9 1.36	13·2 1.49	13·7 1.62	13·11 1.76	14·4 1.90	14·8 2.04	15·0 2.19	15·8 2.49		16.0	2x6
10·11 1.01	11·4 1.12	11·8 1.24	12·0 1.36	12·5 1.48	12·9 1.60	13·1 1.73	13·4 1.86	13·8 2.00	14·4 2.28		19.2	
9·9 0.91	10·1 1.01	10·5 1.11	10·9 1.21	11·1 1.32	11·5 1.43	11·8 1.55	12·0 1.67	12·3 1.79	12·9 2.04	13·7 2.43	24.0	
18·2 1.28	18·10 1.42	19·6 1.57	20·1 1.72	20·8 1.87	21·3 2.03	21·9 2.19	22·4 2.36	22·10 2.53			12.0	
17·0 1.20	17·8 1.33	18·2 1.47	18·9 1.61	19·4 1.75	19·10 1.90	20·4 2.05	20·10 2.20	21·4 2.36			13.7	
15·9 1.11	16·4 1.23	16·10 1.36	17·4 1.49	17·11 1.62	18·4 1.76	18·10 1.90	19·4 2.04	19·9 2.19	20·8 2.49		16.0	2x8
14·5 1.01	14·11 1.12	15·5 1.24	15·10 1.36	16·4 1.48	16·9 1.60	17·2 1.73	17·8 1.86	18·1 2.00	18·10 2.28		19.2	
12·10 0.91	13·4 1.01	13·9 1.11	14·2 1.21	14·7 1.32	15·0 1.43	15·5 1.55	15·9 1.67	16·2 1.79	16·10 2.04	17·11 2.43	24.0	
23·3 1.28	24·1 1.42	24·10 1.57	25·7 1.72	26·4 1.87	27·1 2.03	27·9 2.19	28·5 2.36	29·1 2.53			12.0	
21·9 1.20	22·6 1.33	23·3 1.47	23·11 1.61	24·8 1.75	25·4 1.90	26·0 2.05	26·7 2.20	27·3 2.36			13.7	
20·1 1.22	20·10 1.35	21·6 1.49	22·2 1.63	22·10 1.78	23·5 1.93	24·1 2.08	24·8 2.24	25·3 2.40			16.0	2x10
18·4 1.01	19·0 1.12	19·8 1.24	20·3 1.36	20·10 1.48	21·5 1.60	21·11 1.73	22·6 1.86	23·0 2.00	24·1 2.28		19.2	
16·5 0.91	17·0 1.01	17·7 1.11	18·1 1.21	18·7 1.32	19·2 1.43	19·8 1.55	20·1 1.67	20·7 1.79	21·6 2.04	22·10 2.43	24.0	

Note: The modulus of elasticity , "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-19

ALLOWABLE SPAN FOR HIGH SLOPE RAFTERS

Slope over 3 in 12 - 40 Lbs. Per Sq. Ft. Live Load
(Light Roof Covering)

DESIGN CRITERIA:
Strength - 7 lbs. per sq. ft. dead load plus 40 lbs. per sq. ft. live load determines fiber stress.
Deflection - For 40 lbs. per sq. ft. live load. Limited to span in inches divided by 180.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

RAFTER SIZE	SPACING (IN)	Allowable Extreme Fiber Stress in Bending, "F_b" (psi).											
		200	300	400	500	600	700	800	900	1000	1100	1200	1300
2x4	12.0	2·11 0.06	3·7 0.12	4·2 0.18	4·8 0.25	5·1 0.34	5·6 0.42	5·11 0.52	6·3 0.62	6·7 0.72	6·11 0.83	7·3 0.95	7·6 1.07
	13.7	2·9 0.06	3·5 0.11	3·11 0.17	4·4 0.24	4·9 0.31	5·2 0.40	5·6 0.48	5·10 0.58	6·2 0.67	6·6 0.78	6·9 0.89	7·0 1.00
	16.0	2·7 0.06	3·2 0.10	3·7 0.16	4·0 0.22	4·5 0·29	4·9 0·37	5·1 0.45	5·5 0.53	5·8 0.62	6·0 0.72	6·3 0.82	6·6 0.93
	19.2	2·4 0.05	2·10 0.09	3·4 0.14	3·8 0.20	4·0 0.26	4·4 0.33	4·8 0.41	4·11 0.49	5·3 0.57	5·6 0.66	5·8 0.75	5·11 0.85
	24.0	2·1 0.05	2·7 0.08	2·11 0.13	3·4 0.18	3·7 0.24	3·11 0.30	4·2 0.36	4·5 0.44	4·8 0.51	4·11 0.59	5·1 0.67	5·4 0.76
2x6	12.0	4·8 0.06	5·8 0.12	6·7 0.18	7·4 0.25	8·0 0.34	8·8 0.42	9·3 0.52	9·10 0.62	10·4 0.72	10·10 0.83	11·4 0.95	11·10 1.07
	13.7	4·4 0.06	5·4 0.11	6·2 0.17	6·10 0.24	7·6 0.31	8·1 0·40	8·8 0.48	9·2 0.58	9·8 0.67	10·2 0.78	10·7 0·89	11·1 1.00
	16.0	4·0 0.06	4·11 0.10	5·8 0.16	6·4 0.22	6·11 0.29	7·6 0.37	8·0 0.45	8·6 0.53	9·0 0.62	9·5 0.72	9·10 0.82	10·3 0.93
	19.2	3·8 0·05	4·6 0.09	5·2 0·14	5·9 0.20	6·4 0.26	6·10 0.33	7·4 0.41	7·9 0.49	8·2 0.57	8·7 0.66	9·0 0.75	9·4 0.85
	24.0	3·3 0·05	4·0 0.08	4·8 0.13	5·2 0.18	5·8 0·24	6·2 0.30	6·7 0.36	6·11 0.44	7·4 0.51	7·8 0.59	8·0 0.67	8·4 0.76
2x8	12.0	6·1 0.06	7·6 0.12	8·8 0.18	9·8 0.25	10·7 0.34	11·5 0.42	12·3 0.52	12·11 0.62	13·8 0.72	14·4 0.83	14·11 0.95	15·7 1.07
	13.7	5·9 0.06	7·0 0.11	8·1 0.17	9·0 0.24	9·11 0.31	10·8 0.40	11·5 0.48	12·1 0.58	12·9 0.67	13·5 0.78	14·0 0.89	14·7 1.00
	16.0	5·3 0.06	6·6 0.10	7·6 0.16	8·4 0.22	9·2 0·29	9·11 0·37	10·7 0.45	11·3 0.53	11·10 0.62	12·5 0.72	12·11 0.82	13·6 0.93
	19.2	4·10 0.05	5·11 0.09	6·10 0.14	7·8 0.20	8·4 0·26	9·0 0·33	9·8 0.41	10·3 0·49	10·10 0.57	11·4 0.66	11·10 0.75	12·4 0.85
	24.0	4·4 0.05	5·3 0.08	6·1 0.13	6·10 0·18	7·6 0·24	8·1 0.30	8·8 0.36	9·2 0.44	9·8 0.51	10·2 0.59	10·7 0.67	11·0 0.76
2x10	12.0	7·9 0.06	9·6 0.12	11·0 0.18	12·4 0.25	13·6 0.34	14·7 0.42	15·7 0.52	16·6 0.62	17·5 0.72	18·3 0.83	19·1 0.95	19·10 1.07
	13.7	7·3 0.06	8·11 0.11	10·4 0·17	11·6 0.24	12·7 0.31	13·8 0.40	14·7 0.48	15·5 0.58	16·4 0.67	17·1 0.78	17·10 0.89	18·7 1.00
	16.0	6·9 0.06	8·3 0·10	9·6 0.16	10·8 0·22	11·8 0.29	12·7 0.37	13·6 0.45	14·4 0.53	15·1 0.62	15·10 0.72	16·6 0.82	17·2 0.93
	19.2	6·2 0.05	7·7 0.09	8·9 0.14	9·9 0.20	10·8 0.26	11·6 0.33	12·4 0.41	13·1 0.49	13·9 0.57	14·5 0.66	15·1 0.75	15·8 0.85
	24.0	5·6 0.05	6·9 0.08	7·9 0·13	8·9 0.18	9·6 0.24	10·4 0.30	11·0 0.36	11·8 0.44	12·4 0.51	12·11 0.59	13·6 0.67	14·1 0.76

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE 2105-19 (Continued)

RAFTERS: Spans are measured along the horizontal projection and loads are considered as applied on the horizontal projection.

HOW TO USE TABLES: Enter table with span of rafters (upper figure in each square). Determine size and spacing (first column) based on stress grade (top row) and modulus of elasticity (lower figure in each square) of lumber to be used.

Allowable Extreme Fiber Stress in Bending, "F_b" (psi)											RAFTER SPACING	SIZE
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700	(IN)	(IN)
7-10 1.13	8-1 1.32	8-4 1.45	8-7 1.60	8-10 1.74	9-1 1.89	9-4 2.04	9-7 2.19	9-9 2.35			12.0	
7-4 1.12	7-7 1.24	7-10 1.37	8-0 1.50	8-3 1.63	8-5 1.77	8-8 1.91	8-11 2.05	9-2 2.20	9-7 2.51		13.7	
6-8 1.03	7-0 1.15	7-3 1.26	7-5 1.38	7-8 1.51	7-10 1.64	8-1 1.77	8-3 1.90	8-6 2.04	8-10 2.32		16.0	2x4
6-2 0.94	6-5 1.05	6-7 1.15	6-10 1.25	7-0 1.38	7-2 1.49	7-4 1.61	7-7 1.74	7-9 1.86	8-1 2.12	8-7 2.53	19.2	
5-5 0.84	5-8 0.94	5-11 1.03	6-1 1.13	6-3 1.23	6-5 1.34	6-7 1.44	6-9 1.55	6-11 1.66	7-3 1.90	7-8 2.25	24.0	
12-3 1.13	12-8 1.32	13-1 1.45	13-6 1.60	13-11 1.74	14-3 1.89	14-8 2.04	15-0 2.19	15-4 2.35			12.0	
11-6 1.12	11-10 1.24	12-3 1.37	12-8 1.50	13-1 1.63	13-4 1.77	13-8 1.91	14-0 2.05	14-4 2.20	15-0 2.51		13.7	
10-7 1.03	11-0 1.15	11-4 1.26	11-8 1.38	12-0 1.51	12-4 1.64	12-8 1.77	13-0 1.90	13-4 2.04	13-11 2.32		16.0	2x6
9-8 0.94	10-0 1.05	10-4 1.15	10-8 1.25	11-0 1.38	11-3 1.49	11-7 1.61	11-10 1.74	12-2 1.86	12-8 2.12	13-8 2.53	19.2	
8-8 0.84	9-0 0.94	9-3 1.03	9-7 1.13	9-10 1.23	10-1 1.34	10-4 1.44	10-7 1.55	10-10 1.66	11-4 1.90	12-0 2.25	24.0	
16-2 1.13	16-8 1.32	17-3 1.45	17-10 1.60	18-4 1.74	18-10 1.89	19-4 2.04	19-9 2.19	20-3 2.35			12.0	
15-1 1.12	15-8 1.24	16-2 1.37	16-8 1.50	17-2 1.63	17-7 1.77	18-1 1.91	18-5 2.05	18-11 2.20	19-9 2.51		13.7	
14-0 1.03	14-6 1.15	14-11 1.26	15-5 1.38	15-10 1.51	16-4 1.64	16-9 1.77	17-2 1.90	17-6 2.04	18-4 2.32		16.0	2x8
12-9 0.94	13-3 1.05	13-8 1.15	14-1 1.25	14-6 1.38	14-11 1.49	15-3 1.61	15-8 1.74	16-0 1.86	16-9 2.12	17-9 2.53	19.2	
11-5 0.84	11-10 0.94	12-3 1.03	12-7 1.13	13-0 1.23	13-4 1.34	13-8 1.44	14-0 1.55	14-4 1.66	14-11 1.90	15-10 2.25	24.0	
20-7 1.13	21-4 1.32	22-0 1.45	22-8 1.60	23-4 1.74	24-0 1.89	24-8 2.04	25-3 2.19	25-10 2.35			12.0	
19-3 1.12	19-11 1.24	20-7 1.37	21-3 1.50	21-10 1.63	22-5 1.77	23-1 1.91	23-7 2.05	24-2 2.20	25-3 2.51		13.7	
17-10 1.03	18-5 1.15	19-1 1.26	19-8 1.38	20-3 1.51	20-10 1.64	21-4 1.77	21-10 1.90	22-4 2.04	23-4 2.32		16.0	2x10
16-4 0.94	16-10 1.05	17-5 1.15	17-11 1.25	18-5 1.38	18-10 1.49	19-5 1.61	19-11 1.74	20-5 1.86	21-4 2.12	22-6 2.53	19.2	
14-7 0.84	15-1 0.94	15-7 1.03	16-1 1.13	16-6 1.23	17-0 1.34	17-5 1.44	17-10 1.55	18-3 1.66	19-1 1.90	20-3 2.25	24.0	

Note: The modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

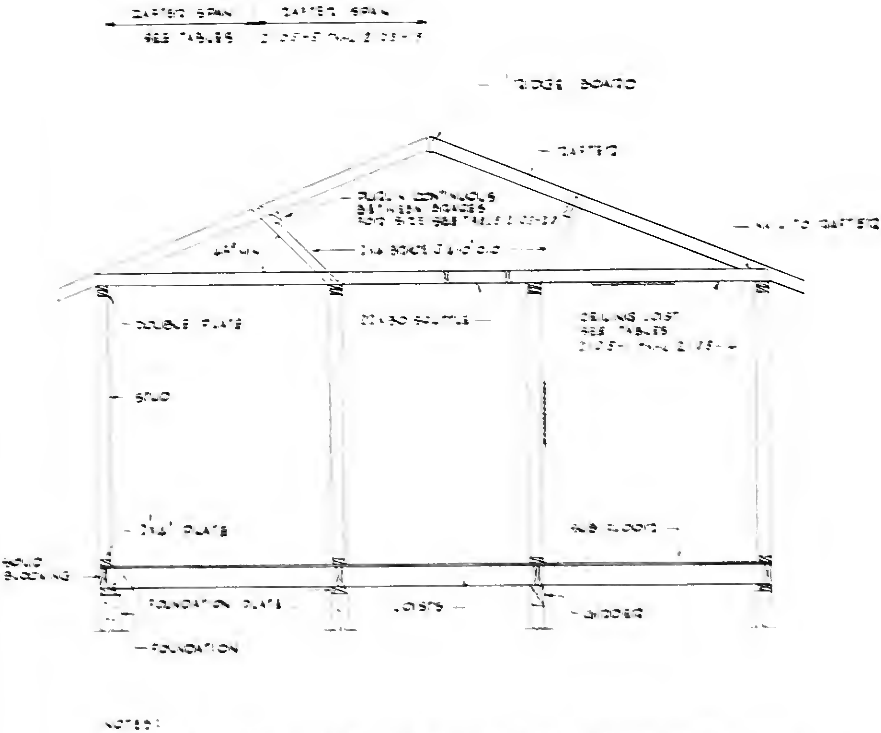
TABLE 2105-[illegible] REQUIRED PURLIN SIZE BASED ON RAFTER SPAN

Shown in Figure 2105-[illegible]

SIZE OF ROOF PURLIN BRACED @ 4' o.c.	MAXIMUM ALLOWABLE RAFTER SPAN[1]	
	30 pds. per sq. ft. L.L. & D.L.	40 pds. per sq. ft. L.L. & D.L.
2" X 4"	[illegible]	[illegible]
2" X 6"	11' - [illegible]	[illegible]

Note 1: Maximum Rafter Span is maximum distance between exterior or interior wall support and purlin, between ridge member and purlin or between purlins.

FIGURE 2105-1 ROOF AND SUPPORT FRAMING



NOTES:

1. TRUSSES MAY BE APPROVED FOR USE IN THE ROOF FRAMING SYSTEM PROVIDED THEIR DESIGN LIMITS OF A RATIONAL ANALYSIS IN ACCORDANCE WITH ESTABLISHED PRINCIPLES OF MECHANICS OR HAVE BEEN PROPERLY TESTED IN AN APPROVED MANNER.
2. WHERE CEILING JOISTS RUN PERPENDICULAR TO THE RAFTERS, 1x4 COLLAR TIES SHALL BE NAILED TO THE RAFTERS NEAR THE PLATE LINE AND SPACED NOT MORE THAN 4'-0" OC.

provided by eave or cornice vents.

2105.6 ATTIC ACCESS: A readily accessible attic access opening not less than twenty-two (22) inches by thirty (30) inches shall be provided to any attic area having a clear height of over twenty-four (24) inches.

SECTION 2106.0 ROOF COVERINGS

2106.1 GENERAL: Conformity with applicable material, test, constuction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

Roofs shall be covered with Class A, B, or C roof covering.

EXCEPTION: The roof coverings set forth in Sections 2106.3, 2106.8, 2106.9, 2106.10 may be used provided the building is located in areas designated by law as permitting their use and not less than ten (10) feet are provided between buildings.

The roofing materials set forth in Sections 2106.4, 2106.5, 2106.6 and 2106.7 and concrete slabs may be accepted as Class A roof covering.

2106.2 BASE SHEET APPLICATION: Base sheets shall be applied only to solid surface roofs and shall be cemented to a suitable deck using not less than twenty-five (25) pounds of hot asphalt or not less than two (2) gallons of cold bituminous compound in accordance with the manufacturer's published specifications or thirty (30) pounds of hot coal tar pitch per roofing square, or nailed to roof sheathing using not less than one (1) nail to each one and one-third (1 1/3) square feet, or may be spot-cemented to a non-nailable deck using not less than ten (10) pounds of hot asphalt per roofing square.

Successive layers shall be cemented to the base sheets using no less cementing material than that specified for solidly cemented base sheets.

Nails for composition roofs shall be not smaller than No. 12 gauge, with heads not less than seven-sixteenths (7/16) inch and shall be long enough to penetrate into the sheathing three-quarter (3/4) inch or through the thickness of the sheathing, whichever is less. Smaller size head nails may be used provided metal discs are used with them. Exposed nails and shingle nails shall be corrosion-resistant.

2106.3 COMPOSITION ASPHALT ORGANIC FELT SHINGLES: Composition shingles shall be applied only to solidly sheathed roofs.

Compostion shingles shall not be installed on a roof having a slope of less than four (4) in twelve (12) unless approved by the building official.

Composition shingle roofs shall have an underlay of not less than fifteen (15) pound felt. applied as required for a base sheet. The underlay may be omitted over existing roofs, or where the roof slope exceeds seven (7) inches to twelve (12) inches, or where shingles are laid not less than three (3) thicknesses at any point.

Nails for composition roofs shall be not smaller than No. 12 gauge, with heads not less than three-eighths (3/8) inch in diameter for shingle application and shall be long enough to penetrate into the sheathing three-quarter (3/4) inch or through the thickness of the sheathing, whichever is less. Smaller size head nails may be used provided metal discs are used with them. Exposed nails and shingle nails shall be corrosion-resistant..

Composition shingles shall be fastened according to manufacturer's printed instructions but not less than four (4) nails per each strip shingle not more than thirty-six (36) inches wide and two (2) nails per each individual shingle less than twenty (20) inches wide.

Roof valley flashing shall be provided of not less than No. 28 galvanized sheet gauge corrosion-resistant metal and shall extend at least eight (8) inches from the center line each way, and shall have a splash diverter rib not less than three-quarter (3/4) inch high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than four (4) inches.

Roof valley flashing may be of laced composition shingles, applied in an approved manner, with an underlay of not less than thirty (30) pound felt extending ten (10) inches from the center line each way, or shall be of two (2) layers of ninety (90) pound mineral surfaced cap sheet cemented together with the bottom layer not less than twelve (12) inches wide laid face down, and the top layer not less than twenty-four (24) inches wide laid face up.

2106.4 SLATE SHINGLES: Slate shingles shall be applied in an approved manner and securely fastened with corrosion-resistant nails or corrosion-resistant nails and wire.

Slate shingle roofs shall have an underlay of not less than two (2) layers of fifteen (15) pound felt or one (1) layer of thirty (30) pound felt, applied as required for a base sheet.

Nails for slate shingle tiles shall be not less than No. 14 gauge copper or No. 14 gauge corrosion-resistant as specified and shall be long enough to penetrate into the sheathing three-quarter (3/4) inch, or through the thickness of the sheathing, whichever is less.

Roof valley flashing shall be provided of not less than No. 28 gauge galvanized sheet corrosion-resistant metal and shall extend at least eleven (11) inches from the center line each way and shall have a splash diverter rib not less than one (1) inch high at the flow line formed as part of the flashing. Sections of flashing

shall have an end lap of not less than four (4) inches.

2106.5 ASBESTOS CEMENT SHINGLES: Asbestos-cement roofing shall be applied in an approved manner. Asbestos-cement roofing shall have an underlay of not less than fifteen (15) pound felt, applied as required for a base sheet. The underlay may be omitted where the asbestos-cement shingles or sheets are applied over an existing roof covering.

Asbestos-cement roofing shall not be installed on a roof having a slope of less than three (3) in twelve (12) unless approved by the building official.

Corrugated asbestos-cement roofing not less than five-sixteenths (5/16) inch thick may be used wherever No. 24 galvanized sheet gauge corrugated steel is permitted.

Nails for asbestos-cement shingles shall be not less than No. 11 gauge corrosion-resistant and shall be long enough to penetrate into the sheathing three-quarter (3/4) inch or through the thickness of the sheathing, whichever is less.

Roof valley flashing shall be the same as required for slate shingles.

2106.6 METAL: Flat sheets or shingles shall be applied only to solidly sheathed roofs.

Metal roofing shall be applied in an approved manner.

Metal shingles shall not be installed on a roof having a slope of less than three (3) in twelve (12) unless approved by the building official.

Metal shingles shall be applied over an underlay of not less than thirty (30) pound felt, applied as required for a base sheet.

2106.7 TILE, CLAY OR CONCRETE SHINGLES: All roof tile shall be securely fastened with corrosion-resistant nails or nails and wire, or other approved means.

Tile shall not be installed on a roof having a slope of less than three (3) in twelve (12) unless approved by the building official.

Tile with projection anchor lugs at the bottom of the tile shall be held in position by means of one (1) inch by two (2) inch wood stripping, treated to resist moisture deterioration, nailed to the roof sheathing over the underlay, or other approved means.

Tile roofs shall have an underlay of not less than two (2) layers of fifteen (15) pound felt or one (1) layer of thirty (30) pound felt, applied as required for a base sheet.

Nailing and valley flashing shall be the same as required for slate shingles.

2106.8 BUILT-UP ROOFING: Mineral aggregate surfaced built-up roofing shall consist of three (3) layers of fifteen (15) pound fiber felt installed in accordance with this section on roofs having slopes not greater than three (3) in twelve (12).

Built-up roofing shall be applied only to solid surface roofs.

Base sheets shall be cemented to a suitable deck using not less than twenty-five (25) pounds of hot asphalt or not less than two (2) gallons of cold bituminous compound in accordance with manufacturer's published specifications or thirty (30) pounds of hot coal tar pitch per roofing square, or nailed to roof sheathing using not less than one (1) nail to each one and one-third (1 1/3) square feet, or may be spot-cemented to a non-nailable deck using not less than ten (10) pounds of hot asphalt per roofing square.

Successive layers shall be cemented to the base sheets using no less cementing material than that specified for solidly cemented base sheets.

Mineral aggregate surfaced roofs shall be surfaced with not less than fifty (50) pounds of hot asphalt or other cementing material in which is embedded not less than three hundred (300) pounds of gravel or other approved surfacing materials or two hundred fifty (250) pounds of crushed slag per roofing square.

Cap sheets shall be cemented to the base sheets using no less cementing material than that specified for solidly cemented base sheets.

Hot asphalt shall be applied at a temperature of not less than 375°F. nor more than 450°F. for high melt types. Low melt types shall not be applied at a temperature of less than 350°F. nor more than 400°F.

Coal tar pitch shall not be heated to a temperature above 375°F.

2106.9 WOOD SHINGLES: Wood shingles may be applied to roofs with solid or spaced sheathing. The spaced sheathing shall be spaced not to exceed four (4) inches clear nor more than the width of the sheathing board. Spaced sheathing shall be not less than one (1) inch by three (3) inches nominal dimensions.

Shingles shall be laid with a side lap of not less than one and one-half (1 1/2) inches between joints in adjacent courses, and one-half (1/2) inch in alternate courses. Spacing between shingles shall be not less than one-quarter (1/4) inch nor more than three-eighths (3/8) inch. Each wood shingle shall be fastened to the sheathing with two (2) nails only.

Shingles shall not be installed on a roof having a slope less than four (4) in twelve (12) unless they are installed over an underlay of not less than fifteen (15) pound felt, applied as required for a base sheet.

Roof valley flashing shall be provided of not less than No. 28 gauge galvanized sheet corrosion-resistant metal and shall extend eight (8) inches from the center line each way. Sections of flashing shall have an end lap of not less than four (4) inches.

Weather exposures shall not exceed those set forth in Section RS-21-9. Hip and ridge weather exposures shall not exceed those permitted for the field of the roof.

2106.10 WOOD SHAKES: Wood shakes may be applied to roofs with solid or spaced sheathing. The spaced sheathing shall be spaced not to exceed four (4) inches clear nor more than the width of the sheathing board. Spaced sheathing shall be not less than one (1) inch by four (4) inches nominal size. In snow areas, sheathing shall be solid and the shakes shall be applied over an underlay of not less than fifteen (15) pound felt, applied as required for a base sheet.

Shakes may be laid in straight or staggered courses with a side lap of not less than one and one-half (1 1/2) inches between joints in adjacent courses. Spacing between shakes shall be not more than one-half (1/2) inch.

Each wood shake shall be fastened to the sheathing with two (2) nails. The starter course at the eaves shall be doubled and the bottom layer shall be either fifteen (15) inch or eighteen (18) inch wood shakes or wood shingles. Fifteen (15) inch or eighteen (18) inch shakes may be used for the final course at the ridge.

Shakes shall be laid with not less than eighteen (18) inch wide strips of not less than thirty (30) pound felt shingled between each course in such manner that no felt is exposed to the weather below the shake butts.

Shakes shall not be installed on a roof having a slope less than four (4) in twelve (12) unless they are installed over an underlay of not less than thirty (30) pound felt, applied as required for a base sheet.

Roof valley flashing shall be provided of not less than No. 28 gauge galvanized sheet corrosion-resistant metal and shall extend at least eleven (11) inches from the center line each way and shall have a splash diverter rib not less than one (1) inch high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than four (4) inches.

Weather exposures shall not exceed those set forth in Section RS-21-9. Hip and ridge weather exposures shall not exceed those permitted for the field of the roof.

TABLE 2106-1 ROOF COVERINGS

ROOF COVERING MATERIAL	FASTENER SPECIFICATIONS			Spacing Soecifications[4]
	Festener[2,3] Style	Min. O.D. Crown	O.D. Leg Lengths	
Base Sheet (Roofing Felt)	12 ga. Roofing Nail		7/8	All metal discs placed and stapled or nailed 12 inches on center
	16 ga. Staple	7/16	3/4	
Composition Shingles	12 ga. 3/8" HD Roofing Nail		1¼	(4) Nails or staples per each 36" section of shingle
	16 ga. Staple	3/4	1	
	16 ga. Staple	7/16	1¼	(6) Staples per each 36" section of shingle
Composition Ridge, Hip, Caps	12 ga. 3/8" HD Roofing Nail		1¼	A minimum of (4) nails or staples are required for ridge capping
	16 ga. Staple	3/4	1	
	16 ga. Staple	7/16	1¼	
Wood Shingles	.076 Shingle Nail		1¼	16" and 18" Shingle – (2) fasteners per shingle
	.080 T-Nail	–	1¼	
	16 ga. Staple	7/16	1¼	
	.080 Shingle Nail		1½	24" Shingle – (2) fasteners per shingle
	.080 T-Nail	–	1½	
	16 ga. Staple	7/16	1½	
Wood Shakes	.0915 – Shingle Nail		2	(2) Nails or staples per each shake
	.0915 to .099 T-Nail		2	
	16 ga. Staple	7/16	2	

Note 1: Shingles and shakes attached to roof sheathing having the underside of the sheathing exposed to visual view may be attached in these locations with nails or staples having shorter lengths than specified so as not to penetrate the exposed side of the sheathing.

Note 2: All nails and staples shall be rust-resistant (galvanized-zinc or aluminum).

Note 3: Nails may have T-heads, clipped round heads or standard heads.

Note 4: Roof coverings shall be fastened in an approved manner.

SECTION 2107.0 CHIMNEYS AND FIREPLACES

2107.1 GENERAL: Conformity with the applicable material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2107.2 SUPPORT: Masonry chimneys shall be constructed in accordance with Figure 2107-1.

2107.3 ADDITIONAL LOAD: Chimneys shall not support loads other than their own weight unless they are designed and constructed to support the additional load.

2107.4 TERMINATION: Chimneys shall extend at least three (3) feet above the highest point where they pass the roof of a building and at least two (2) feet higher than any portion of the building within ten (10) feet.

2107.5 WALL THICKNESS: Masonry chimneys shall be constructed of solid masonry units or of reinforced concrete with walls not less than four (4) inches in thickness.

2107.6 FLUE LINING (MATERIAL): Masonry chimneys shall be lined with fireclay flue liners not less than five-eighths (5/8) of an inch in thickness or with other approved liner of material that will resist, without cracking or softening, a temperature of 1800° F.

EXCEPTION: Masonry chimneys may be constructed without flue liners when walls are at least eight (8) inches in thickness.

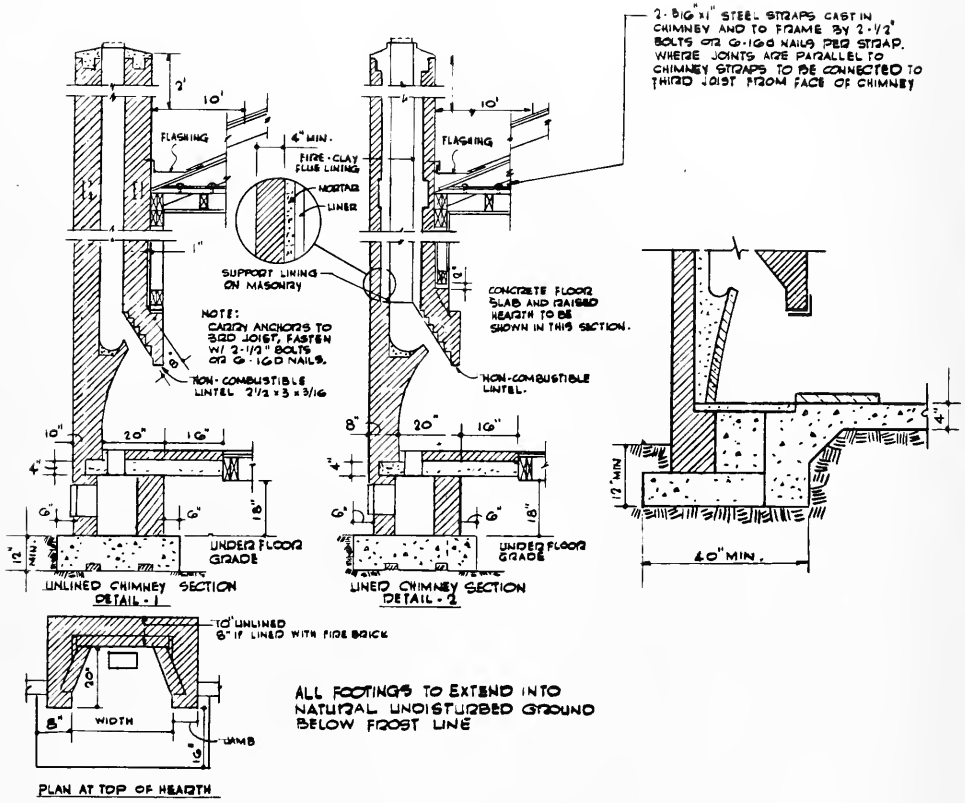
2107.7 FLUE LINING (INSULATION): Flue liners shall extend from a point not less than eight (8) inches below the lowest inlet, or in the case of fireplaces, from the top of the smoke chamber, to a point above the enclosing walls. Fireclay flue liners shall be laid with tight mortar joints left smooth on the inside.

2107.8 MULTIPLE FLUES: Where more than two (2) flues are located in the same chimney, masonry wythes shall be built between adjacent flue linings so that there are not more than two (2) flues grouped together between such wythe separation. The masonry wythes shall be at least four (4) inches thick and bonded into the walls of the chimney. Where two (2) flues adjoin each other in the same chimney with only flue lining separation between them, the joints of the adjacent flue linings shall be staggered at least seven (7) inches.

2107.9 FLUE AREA (APPLIANCE): Chimney flues shall not be smaller in area than that of the area of the connector from the appliance.

2107.10 FLUE AREA (FIREPLACE): Chimney flues for fireplaces shall not be smaller in area than the values set forth in Table 2107.1.

FIGURE 2107-1 FIREPLACE CONSTRUCTION DETAILS



NOTES

1. WHERE PLATES ARE CUT ANCHOR TO CHIMNEY BY 3/8" x 1" STEEL STRAPS HOOKED INTO CHIMNEY AND ATTACHED TO PLATES BY 2 3/8" x 3" LAG SCREWS, 2 1/2" BOLTS OR 6-16d NAILS.

2. WHERE DAMPERS ARE USED THEY SHALL NOT BE LESS THAN NO. 12 GA. METAL AND WHEN FULLY OPEN THE DAMPER OPENING SHALL BE NOT LESS THAN 90% OF THE REQUIRED FLUE AREA

NOTE: THE FIREPLACE ASHPIT AND CLEANOUT SHOWN IS OPTIONAL.

TABLE 2107-1 MINIMUM FLUE AREA FOR MASONRY CHIMNEYS CONNECTED TO FIREPLACES

TYPE OF FLUE		
Round Lined	Square or Rectangle Lined	Lined with Fire-brick or Unlined
1/12 of fireplace opening area but not less than 50 square inches	1/10 of fireplace opening area but not less than 64 square inches	1/8 of fireplace opening area but not less than 100 square inches

2107.11 INLET: Inlets to masonry chimneys shall enter from the side. All inlets shall have a thimble of fireclay, rigid refractory material, metal, or other arrangement that will prevent the connector from pulling out of the inlet or from extending beyond the wall of the liner.

2107.12 CLEANOUT OPENING: Cleanout openings shall be provided in masonry chimneys in accordance with Figure 2107-1 and shall be equipped with ferrous metal doors and frames arranged to remain tightly closed when not in use. Cleanout openings shall be located not less than two (2) feet below the lowest inlet to the flue.

2107.13 CHIMNEY CLEARANCE: Wood beams, joists, headers and studs shall not be placed within two (2) inches from the outside face of a masonry chimney built partially or entirely within the dwelling. Masonry chimneys built entirely outside of the dwelling may be placed one (1) inch minimum from combustible material.

2107.14 CHIMNEY FIRESTOPPING: All spaces between masonry chimneys and wood beams, joists, or headers shall be firestopped by placing noncombustible material to a depth of one (1) inch at the bottom of such spaces.

2107.15 FACTORY-BUILT CHIMNEYS: Factory-built chimneys shall be of an approved type.

2107.16 FIREPLACE WALLS: Masonry fireplaces shall be constructed of solid masonry units, stone, or reinforced concrete in accordance with Figure 2107-1. Where a lining of firebrick at least two (2) inches in thickness or other approved lining is provided, the total thickness of back and sides, including the lining, shall be not less than eight (8) inches. Where no lining is provided, the thickness of back and sides shall be not less than ten (10) inches.

2107.17 STEEL FIREPLACE UNITS: Steel fireplace units incorporating a firebox liner of not less than one-quarter (1/4) inch in thickness and an air chamber may be installed with masonry to provide a total thickness at the back and sides of not less than eight (8) inches, of which not less than four (4) inches shall be of solid masonry. Warm air ducts employed with steel fireplace units of the circulating air type shall be constructed of metal or masonry.

2107.18 LINTEL: Masonry over a fireplace opening shall be supported by a lintel of noncombustible material.

2107.19 HEARTH EXTENSION (MATERIAL): Masonry fireplaces at or near the floor level shall have hearth extensions of brick, concrete, stone, tile or other approved noncombustible material properly supported or reinforced to carry its own weight and all imposed loads. Combustible forms and centers used during the construction of hearth and hearth extension shall be removed after the construction is completed.

2107.20 HEARTH EXTENSION: Hearth extensions shall extend at least sixteen (16) inches in front of, and at least eight (8) inches beyond each side of fireplace opening. Where the fireplace opening is six (6) square feet or larger, the hearth extension shall extend at least twenty (20) inches in front of, and at least twelve (12) inches beyond each side of the fireplace opening.

2107.21 FIREPLACE CLEARANCE: Wood or combustible framing shall not be placed within two (2) inches of outside face of a masonry fireplace and not less than six (6) inches from inside surface of nearest flue lining. Wood framing and other combustible material shall not be placed within four (4) inches of the back surface of a masonry fireplace.

2107.22 FIREPLACE FIRESTOPPING: All spaces between masonry fireplaces and wood beams, headers, joists or trimmers shall be firestopped by placing noncombustible material to a depth of one (1) inch at the bottom of such spaces.

2107.23 COMBUSTIBLE MATERIALS: Woodwork or other combustible materials shall not be placed within six (6) inches of a fireplace opening. Combustible material within twelve (12) inches of the fireplace opening shall not project more than one-eighth (1/8) of an inch for each inch distance from such opening.

2107.24 FACTORY-BUILT FIREPLACES: Factory-built fireplaces that consist of a fire chamber assembly, one or more chimney section, a roof assembly and other parts as tested and listed as an assembly by a nationally recognized testing laboratory and approved by the State Building Code Commission may be installed when complying with all the following provisions:

a) The fire chamber assembly is installed to provide clearance to combustible materials not less than set forth in the listing.

b) The chimney sections are installed to provide clearance to combustible material not less than specified in the listing and if the fireplace chimney extends through floors and ceilings, factory-furnished firestops or firestop-spacers shall be installed. Portions of chimneys which extend through rooms or closets are to be enclosed to avoid

personal contact, contact of combustible material, and damage to the chimney.

c) Hearth extensions shall be not less than three-eighths (3/8) inch thick asbestos, hollow metal, stone, tile or other approved noncombustible material. Such hearth extensions may be placed on combustible subflooring or finish flooring. The hearth extension shall be readily distinguished from the surrounding floor.

d) Hearth extensions shall extend not less than sixteen (16) inches in front of and at least eight (8) inches beyond both sides of the fireplace opening.

2107.25 FACTORY-BUILT FIREPLACE STOVES: Factory-built fireplace stoves, consisting of a free-standing fire chamber assembly, that have been tested and are listed by a nationally recognized testing laboratory and approved by the State Building Code Commission, may be installed, in accordance with the requirements of said listing.

SECTION 2108.0 MECHANICAL, DEFINITIONS

2108.1 GENERAL: Conformity with the applicable material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2108.2 DEFINITIONS: For the purpose of the mechanical requirements the terms used shall be defined as follows and as set forth in the Basic Code.

ABSORPTION UNIT: A factory tested assembly of component parts producing refrigeration for comfort, heating or cooling by the application of heat.

BOILER, LOW PRESSURE HOT WATER AND LOW PRESSURE STEAM: A boiler furnishing hot water for air conditioning at pressures not exceeding one hundred sixty (160) pounds per square inch and at temperatures not more than 250°F., or steam at pressures not more than fifteen (15) pounds per square inch.

B.T.U. RATING: The listed maximum input capacity of any appliance, expressed in British thermal units input per hour.

CONTROL, LIMIT: An automatic control responsive to changes in liquid level, pressure or temperature for limiting the operation of the controlled equipment.

CONTROL, PRIMARY SAFETY: The automatic safety control intended to prevent abnormal discharge of oil at the burner in case of ignition failure or flame failure; barometric oil feed is not considered a primary safety control.

CONTROL, SAFETY COMBUSTION: A primary safety control responsive

directly to flame properties, sensing the presence of flame and causing fuel to be shut off in event of flame failure.

DAMPER: Any device which when installed will restrict, retard or direct the flow of air in any duct, or the products or combustion in any heat producing equipment, its vent connector, vent or chimney therefrom.

DRAFT HOOD: A device placed in and made part of the vent connector from an appliance, or in the appliance itself, which is designed 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 appliances; (3) neutralize the effect of stack action of the chimney flue upon the operations of the appliance.

DUCT SYSTEMS: All ducts, duct fittings and plenums assembled to form a continuous passageway for the transmission of air.

EVAPORATIVE COOLER: A device used for reducing the heat of air for comfort cooling by the process of evaporation of water into an air stream.

FLOOR FURNACE: A self-contained furnace suspended from the floor of the space which is being heated, with means of observing the flame and lighting the furnace from such space.

FORCED AIR TYPE CENTRAL FURNACE: A central furnace equipped with a fan or blower which provides the primary means for circulation of air. It may be of the horizontal, upflow or downflow type.

FURNACE, GRAVITY-TYPE WARM-AIR: A warm-air furnace depending primarily on circulation of air through the furnace by gravity.

This definition also shall include any furnace approved with a booster-type fan, which does not materially restrict free circulation of air through the furnace when the fan is not in operation.

LABELED: The word "labeled" refers to equipment or material bearing the inspection label of an approved inspection agency.

NONCOMBUSTIBLE: A material which will not ignite and burn when subjected to fire.

PLENUM CHAMBER: An air compartment or enclosed space to which one or more distributing air ducts are connected.

PUMP, AUTOMATIC OIL: A pump, not an integral part of a burner, stove or unit, which automatically pumps oil from the supply tank and delivers the oil by gravity under a constant head to an oil-burning appliance. The pump is designed to stop pumping automatically in case of total breakage of the oil supply line between the pump and the appliance.

REFRIGERANT: The medium used to produce cooling or refrigeration by the process of expansion or vaporization.

REFRIGERATING SYSTEM: A combination of interconnected refrigerant containing parts constituting one (1) closed refrigerant circuit in which a refrigerant is circulated for the purpose of extracting heat.

In a Direct Refrigerating System the refrigerant is in direct contact with the material or space to be refrigerated or is located in air circulating passages.

In an Indirect Refrigerating System brine is cooled by a refrigerating system and circulated to the material or space to be refrigerated or is used to cool circulated air.

ROOM HEATER: A free standing, nonrecessed, comfort heating appliance installed in the space being heated and not connected to ducts.

SEALED COMBUSTION SYSTEM APPLIANCES: Obtain all combustion air from, and all flue gases are discharged to, the outside atmosphere.

TANK, AUXILIARY: An auxiliary supply tank, having a capacity of not over sixty (60) gallons, listed for installation in the supply piping between a burner and its main fuel supply tank.

TANK, INTEGRAL: A tank which is furnished by the manufacturer as an integral part of an oil-fired appliance.

TANK, STORAGE: A separate tank which is not connected directly or be a pump to the oil-burning appliance.

TANK, VACUUM OR BAROMETRIC: A tank not exceeding five (5) gallons capacity which maintains an oil tank in a sump or similar receptacle by barometric feed. Fuel is delivered from the sump to the burner by gravity.

VENT: A passageway, vertical or nearly so, for removing vent gases to the outer air.

TYPE B GAS VENT: Listed factory-made gas vents for venting listed or approved appliances, equipped to burn only gas, except those specifically listed for use with chimneys only.

TYPE BW GAS VENT: Listed factory-made gas vents for venting listed or approved gas-fired vented recessed heaters.

TYPE L GAS VENT: Low-Temperature, Venting Systems. A venting system consisting of listed factory made piping and fittings for use with fuel burning appliances listed as exhausting low temperature flue gases and approved for use with a type L venting system.

VENT CONNECTOR: (vent connector pipe.) That portion of the vent system which connects the gas appliance to the gas vent or chimney.

VENTED DECORATIVE APPLIANCE: A vented appliance whose function lies in the esthetic effect of the flames rather than functional effects.

VENTED WALL FURNACE: Vented comfort heating appliance designed for incorporation in a permanent attachment to a wall or partition and arranged to furnish heated air by gravity or by a fan.

VENT COLLAR: The outlet opening of an appliance or draft hood provided for connection of the vent system.

VENTING SYSTEM: The gas vent or chimney and vent connector, if used, assembled to form a continuous unobstructed passageway from the gas appliance to the outside atmosphere for the purpose of removing vent gases.

WARM-AIR FURNACE: A solid, liquid or gas-fired appliance for heating air to be distributed with or without duct systems to the space to be heated.

2109.0 EQUIPMENT GENERAL

2109.1 GENERAL: Conformity with the applicable material, test, construction and design standards specified in the reference standards of this article shall be acceptable as providing compliance with the requirements of this article.

2109.2 COMMONWEALTH OF MASSACHUSETTS REGULATIONS: All installation of gas appliances must comply with the Massachusetts Code for Installation of Gas Appliances and Gas Piping established under Chapter 737, Acts of 1960. The construction, installation and operation of oil burning equipment is subject to the provisions of FPR-3, established in accordance with Chapter 148, Section 10 of the MGLA, as amended. The construction, installation, testing and inspection of boilers, air tanks, ammonia compressor valves, and refrigeration and air-conditioning systems of five (5) tons of more capacity are subject to the Rules and Regulations issued by the Board of Boiler Rules under authority of Chapter 146 of the MGLA, as amended.

2109.3 COOPERATING AGENCIES: Nothing herein contained shall be deemed to nullify the provisions of other legal statutes or regulations of the Commonwealth of Massachusetts governing the operation and maintenance of boilers and other heating appliances and equipment.

2109.4 LABELED HEATING AND COOKING APPLIANCES: Approved 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 approved agencies shall be accepted by the building official when installed with the clearances pro-

vided in Tables 2109-1 and 2109-2 and in accordance with their listings.

2109.5 TYPE OF FUEL: Each comfort heating appliance shall be designed for use with the type of fuel to which it will be connected. Appliances shall not be converted from the fuel specified on the rating plate for use with a different fuel without securing reapproval from the building official and as recommended by the manufacturer of either the original equipment or the conversion equipment.

2109.6 COMMONWEALTH OF MASSACHUSETTS REGULATIONS: Oil burners and related equipment are subject to the Rules and Regulations promulgated in FPR-3, made in accordance with the provisions of Section 10, Chapter 148 of the MGLA, as amended. Unvented room heaters are prohibited by section 1011.52 of the Basic Code.

2109.7 SHUTOFF VALVE: A readily accessible approved shutoff valve shall be installed ahead of the union or other connection in the fuel piping outside and within three (3) feet of the appliance.

EXCEPTION: Shutoff valves may be accessibly located inside or under an appliance provided the appliance can be removed without removal of the shutoff valve.

2109.8 APPLIANCE INSTALLATION: Except as otherwise provided in this article or the Basic Code, the installation of comfort heating appliances shall conform to the conditions of their listing. The manufacturer's installation and operating instructions shall remain attached to the appliance.

2109.9 APPLIANCE ACCESS: Comfort heating appliances shall be accessible for inspection, service, repair and replacement without removing permanent construction.

Not less than thirty (30) inches working space and platform shall be provided in front of the appliance firebox opening of fuel-burning appliances except unit and room heaters which must have a minimum of eighteen (18) inches.

2109.10 CONTROL DEVICES: Automatic gas-burning comfort heating appliances shall be equipped with listed devices which will shut off the gas to the main burner or burners in the event of pilot failure.

EXCEPTION: The listed shutoff devices shall not be required on range or cooking tops, log lighters, lights, or other open burner manually operated appliances, or listed appliances not requiring such devices.

Liquid fuel-burning appliances shall be equipped with primary safety controls which will shut off flow of fuel to the burners in the event of ignition failure.

TABLE 2109-1 STANDARD INSTALLATION CLEARANCES
HEAT-PRODUCING APPLIANCES[1]

These clearances apply unless otherwise shown on listed appliances. Appliances shall not be installed in alcoves or closets unless so listed. For installation on combustion floors see footnote 2.

RESIDENTIAL TYPE APPLIANCES For Installation in Rooms Which Are Large		APPLIANCE					CHIMNEY CONNECTOR (Inches)	VENT CONNECTOR[3] (Inches)
		Above Top of Casing or Appliance (Inches)	From Top and Sides of Warm-Air Bonnet or Plenum (Inches)	From Front[4] (Inches)	From Back (Inches)	From Sides (Inches)		
BOILERS AND WATER HEATERS[5] FUEL								
Steam Boilers—15 p.s.i. Water Boilers—250° F Water Heaters—200° F All Water Walled or Jacketed	Automatic Oil or Combination Gas and Oil	6	—	24	6	6	18	—
	Automatic Gas	6	—	18	6	6	—	9
	Solid	6	—	48	6	6	18	—
FURNACES—CENTRAL								
Gravity, Upflow, Downflow, Horizontal and duct Warm Air—250° F maximum Limit Control	Automatic Oil or Combination Gas and Oil	6[7]	6[7]	24	6	6	18	—
	Automatic Gas	6[7]	6[7]	18	6	6	—	9
	Solid	18[8]	18[8]	48	18	18	18	—
	Electric	6[7]	6[7]	18	6	6	—	—
FURNACES—FLOOR								
For Mounting in Combustible Floors	Automatic Oil or Combination Gas and Oil	36	—	12	12	12	18	—
	Automatic Gas	36	—	12	12	12	—	9
HEAT EXCHANGER, SUPPLIED FROM A REMOTE SOURCE								
Steam—15 p.s.i. maximum Hot water—250° F. maximum		1	1	1	1	1	—	—
ROOM HEATERS AND ROOM HEATING STOVES BURNING SOLID FUEL								
Circulating Type Vented or Unvented	Oil or Solid	36	—	24	12	12	18	—
	Gas	36	—	24	12	12	—	9
Radiant or Other Type Vented or Unvented	Oil or Solid	36	—	36	36	36	18	—
	Gas	36	—	36	18	18	—	9
	Gas with Double Metal or Ceramic Back	36	—	36	12	18	—	9
RADIATORS, SELF-CONTAINED[6]								
Steam or Hot Water	Gas	36	—	6	6	6	—	9
RANGES—COOKING STOVES		[9]				Front Side / Other Side		
Vented or Unvented	Oil	30	—	—	9	24 / 18	18	—
	Gas	30	—	—	6	6 / 6	—	6
	Solid—Clay lined Firepot	30	—	—	24	24 / 18	18	—
	Solid unlined Firepot	30	—	—	36	36 / 18	18	—
	Electric	30	—	—	6	6	—	—
CLOTHES DRYERS								
Listed Types	Gas	6	—	24	6	6	—	1
	Electric	6	—	24	0	0 one side	—	—

Note 1: Standard clearances may be reduced in existing construction only by affording protection to combustible material in accordance with Table 2109-2.

Note 2: An appliance may be mounted on a combustible floor if the appliance is listed for such installation or if the floor is protected in an approved manner.

Note 3: Rooms which are large in comparison to the size of the appliance are those having a volume equal to at least twelve (12) times the total volume of a furnace and at least sixteen (16) times the total volume of a boiler. If the actual ceiling height of a room is greater than eight (8) feet, the volume of a room shall be figured on the basis of a ceiling height of eight (8) feet.

Note 4: The minimum dimension shall be that necessary for servicing the appliance including access for cleaning and normal care, tube removal, etc.

Note 5: The minimum dimension shall be eighteen (18) inches for gas appliances not equipped with draft hoods, except clothes dryers. The dimension may be six (6) inches for listed gas appliances equipped with draft hoods and for boilers and furnaces equipped with listed conversion burners and with draft hoods. A vent connector of listed Type B or L venting material may be used with listed gas appliances with draft hoods and may be installed at clearances marked on the material.

Note 6: Steampipes and hot-water heating pipes shall be installed with a clearance of at least one (1) inch to all combustible construction or material, except that at the points where pipes carrying steam or hot water at not over fifteen (15) pounds gage pressure emerge from a floor, wall, or ceiling, the clearance at the opening through the finish floor boards or wall ceiling boards may be reduced to not less than one-half (½) inch. Each such opening shall be covered with a plate of noncombustible material.

Such pipes passing through stock shelving shall be covered with not less than one (1) inch of approved insulation.

Wood boxes or casings enclosing uninsulated steam- or hot-water heating pipes, or wooden covers to recesses in walls in which such uninsulated pipes are placed, shall be lined with metal or asbestos millboard.

Where the temperature of the boiler piping does not exceed 160°F., the provisions of this Table shall not apply.

Coverings or insulation used on steam- or hot-water pipes shall be of noncombustible material.

Note 7: For a listed oil, combination gas-oil, gas or electric furnace this dimension may be two (2) inches if the furnace limit control cannot be set higher than 250°F., or this

dimension may be one (1) inch if the limit control cannot be set higher than 200°F.

Note 8: The dimension may be six (6) inches for an automatically stoker-fired forced warm-air furnace equipped with 250°F. limit control operated by draft intensity of .13-inch water gage.

Note 9: To combustible material or metal cabinets. If the underside of such combustible material or metal cabinet is protected with asbestos millboard at least one-quarter (¼) inch thick covered with sheet metal of not less than No. 28 gage, the distance may be not less than twenty-four (24) inches.

Comfort heating fuel-burning appliances whose manual fuel controls are not readily accessible from the main portion of the building being heated shall be equipped with remote controls.

Forced-air and gravity-type warm-air furnaces shall be equipped with a listed air outlet temperature limit control which cannot be set for temperatures higher than 250°F. The controls shall be located in the bonnet or plenum, within two (2) feet of the discharge side of the heating element of gravity furnaces or in accordance with the conditions of listing.

2109.11 RANGES--VERTICAL CLEARANCE ABOVE COOKING TOP: Domestic freestanding or built-in ranges shall have a vertical clearance above the cooking top of not less than thirty (30) inches to unprotected combustible material. When the underside of such combustible material is protected with asbestos millboard at least one-quarter (1/4) inch thick covered with sheet metal of not less than No. 28 U.S. gauge or a metal ventilating hood, the distance shall be not less than twenty-four (24) inches.

2109.12 RANGES--HORIZONTAL CLEARANCE TO BUILT-IN TOP COOKING UNITS: The minimum horizontal distance from the center of the burner head(s) of a top (or surface) cooking unit to surrounding top or surface shall be not less than that distance specified by the permanent marking on the unit.

2109.13 OPEN TOP BROILER UNITS: Listed open top broiler units and hoods shall be installed in accordance with their listing and the manufacturer's instructions.

2109.14 DOMESTIC CLOTHES DRYERS: Where a clothes dryer is connected to a moisture exhaust duct, it shall be installed in accordance with manufacturer's instructions and recommendations.

A clothes dryer moisture exhaust duct shall not be connected into any vent connector, gas vent or chimney.

TABLE 2109-2 MAXIMUM REDUCED CLEARANCES (INCHES) WITH SPECIFIED FORMS OF PROTECTION[1]

TYPE OF PROTECTION Applied to the Combustible Material Unless Otherwise Specified and Covering All Surfaces Within the Distance Specified as the Required Clearance With No Protection (Thicknesses Are Minimum)	WHERE THE REQUIRED CLEARANCE WITH NO PROTECTION IS											
	36 Inches			18 Inches			12 Inches		9 Inches	6 Inches		
	Above	Sides and Rear	Chimney or Vent Connector	Above	Sides and Rear	Chimney or Vent Connector	Above	Sides and Rear	Chimney or Vent Connector	Above	Sides and Rear	Chimney or Vent Connector
(a) ¼" asbestos millboard spaced out 1"[2]	30	18	30	15	9	12	9	6	6	3	2	3
(b) No. 28 Manufacturers' Standard gage steel sheet on ¼" asbestos millboard	24	18	24	12	9	12	9	6	4	3	2	2
(c) No. 28 Manufacturers' Standard gage steel sheet spaced out 1"[2]	18	12	18	9	6	9	6	4	4	2	2	2
(d) No. 28 Manufacturers' Standard gage steel sheet on 1/8" asbestos millboard spaced out 1"[2]	18	12	18	9	6	9	6	4	4	2	2	2
(e) 1½" asbestos cement covering on heating appliance	18	12	36	9	6	18	6	4	9	2	1	6
(f) ¼" asbestos millboard on 1" mineral fiber batt reinforced with wire mesh or equivalent	18	12	18	6	6	6	4	4	4	2	2	2
(g) No. 22 Manufacturers' Standard gage steel sheet on 1" mineral fiber batt reinforced with wire or equivalent	18	12	12	4	3	3	2	2	2	2	2	2
(h) ¼" asbestos cement board or ¼" asbestos millboard	36	36	36	18	18	18	12	12	9	4	4	4
(i) ¼" cellular asbestos	36	36	36	18	18	18	12	12	9	3	3	3

Note 1: Except for the protection described in (e), all clearances should be measured from the outer surface of the appliance to the combustible material disregarding any intervening protection applied to the combustible material.

Note 2: Spacers should be of noncombustible material.

Ducts for exhausting moisture from clothes dryers shall not be constructed with sheet metal screws or other fastening means which extend into the duct.

In no case shall the moisture exhaust terminate beneath the building or in the attic.

Domestic clothes dryers shall be moisture exhausted to the outside in an habitable room or room containing other fuel-burning appliances.

2109.15 FUEL-BURNING APPLIANCE LABELING: Every fuel-burning comfort heating appliance shall bear a permanent and legible factory applied nameplate on which shall appear:

a) The manufacturer's name or trademark.

b) The B.t.u. rating.

c) The model and serial number.

d) Instructions for the lighting, operation and shut-down of the appliance.

e) The type of fuel approved for use with the appliance.

f) A seal indicating approval of the appliance by an approved testing agency, if acceptance is based on such approval.

2109.16 ELECTRICAL APPLIANCE LABELING: Every electric appliance listed in Table 2109-1 shall bear a permanent and legible factory applied nameplate on which shall appear:

a) Name or trademark of the manufacturer.

b) The catalog (model) number or equivalent.

c) The electrical rating in volts, amperes and phase.

d) Individual marking for each electrical component in amperes or watts, volts and phase shall appear on nameplate of that component.

2109.17 APPLIANCE: Appliances installed in garages or other areas where they may be subjected to mechanical damage shall be suitably guarded against damage.

Appliances generating a flame, glow or spark capable of igniting flammable vapors may be installed on the floor of a garage provided that a door of the garage opens to an adjacent ground or driveway level that is at or below the level of the garage floor. When this condition does not exist appliances shall be installed so that the ignition source is at least eighteen (18) inches above the garage floor.

EXCEPTION: Sealed combustion system appliances may be installed at floor level.

2110.0 COMBUSTION AIR

2110.1 GENERAL AIR SUPPLY: All fuel-burning equipment shall have a sufficient supply of air for fuel combustion. ventilation draft hood dilution.

2110.2 VOLUME REQUIRED: Additional combustion air shall be provided for fuel-burning appliances if the volume of an appliance room in cubic feet is less than one-twentieth (1/20) of the masimum input B.t.u. rating of all appliances therein.

EXCEPTION: Sealed combustion system appliances, cooking appliances, refrigerators and clothes dryers.

2110.3 AIR SUPPLY: Rooms containing fuel-burning appliances and not having the volume required in section 2110.2 shall be provided with two (2) square inches of combustion air opening for each input of one thousand (1000) B.t.u. rating with a total of not less than two hundred (200) square inches.

EXCEPTION: One (1) square inch for each input rating of one thousand (1000) B.t.u.'s may be permitted provided the compartment floor area is more than twice the floor area of the appliance and the total area if not less than one hundred (100) square inches.

One-half (1/2) of the required combustion air opening shall extend within the upper twelve (12) inches of the room and the other one-half (1/2) shall extend within the lower twelve (12) inches.

EXCEPTION: In any room containing gas or liquid burning appliances which has more than twice the floor area of all such appliances, the required combustion air supply may be reduced fifty (50) percent, but not less than one hundred (100) square inches and in all rooms larger than fifty (50) square feet the required combustion air opening may be located within the upper twelve (12) inches of the room.

2110.4 COMBUSTION AIR SOURCE: Combustion air may be obtained from interior spaces whose volume in cubic feet is equal to one-twentieth (1/20) of the input B.t.u. rating of all fuel-burning comfort and water heating appliances in the space.

Outside combustion air shall be supplied through openings or ducts of the required cross-sectional area extending to the appliance room.

The same duct shall not serve both the upper and lower combustion air supply openings. The duct serving the upper air opening must be level or extended upward from appliance room.

2110.5 ATTIC COMBUSTION AIR: Combustion air supply may be obtained from an attic area provided:

a) The attic ventilation is sufficient to provide the required volume of combustion air.

b) Circulating air supplies for blower-type furnaces shall not be obtained from the area.

2110.6 UNDER FLOOR COMBUSTION AIR: The lower combustion air supply required by Section 2110.3 may be obtained from under floor areas having unobstructed openings to the outside equivalent to not less than twice the required combustion air opening between the under floor space and the appliance room.

2110.7 OPENING REQUIREMENTS: Outside combustion air openings shall be covered with corrosion-resistant screen of one-quarter (1/4) inch mesh.

2110.8 COMBUSTION AIR DUCTS: Combustion air supply ducts shall be of corrosion-resistant material having a cross-sectional dimension of not less than three (3) inches and terminating in a space not less than six (6) inches in depth in front of, or open to, the front or firebox side of the appliance. The space shall extend from the floor to the ceiling of the appliance room.

2110.9 GRAVITY-TYPE WARM-AIR FURNACES: Gravity-type warm-air furnaces shall be provided with combustion air supply specified in this section.

TABLE 2110-1 APPLIANCE ROOM COMBUSTION AIR REQUIREMENTS IN COLD CLIMATES (TIGHT CONSTRUCTION)

TYPE OF OPENINGS	Minimum total free area of ducts or openings, where volume of compartment is less than 16 times of the appliances therein	Minimum total free area of ducts or openings, where volume of compartment is more than 16 times of the appliances therein
Direct Opening or Vertical Ducts to Outside	1 Square Inch for each 4000 B.t.u.'s	1 Square Inch for each 5000 B.t.u.'s
Horizontal Ducts to Outside	1 Square Inch for each 2000 B.t.u.'s	1 Square Inch for each 2500 B.t.u.'s
To Inside * of Building	1 Square Inch for each 1000 B.t.u.'s	1 Square Inch for each 2000 B.t.u.'s

*Combustion air shall be taken from other interior areas complying with Section 2110.2

2110.10 EXHAUST AND VENTILATION SYSTEMS: Air requirements for the operation of exhaust fans, kitchen ventilation systems, clothes dryers and fireplaces shall be considered in determining the adequacy of a space to provide combustion air requirements.

2110.11 COLD CLIMATE: Appliance rooms of unusually tight construction located in areas where temperatures prevail at lower than 20°F., may be provided with combustion air as set forth in Table 2110.1. Opening shall conform to Section 2110.3.

EXCEPTION: Sealed combustion systems.

SECTION 2111.0 WARM-AIR FURNACE

2111.1 INSTALLATION: A direct-fired furnace shall not be located downstream from a regrigerant evaporator or other air cooling coil unless the heating equipment is listed for such use.

A refrigerant evaporator or cooling coil shall not be located in the air discharge duct of a warm-air furnace except where the furnace is listed for operation at not less than 0.5-inch water column static pressure or for use with a cooling coil.

Conversion of existing furnaces for use with cooling coils shall be permitted only if approved by the building official.

2111.2 COMBUSTION AIR: Fuel-burning warm-air furnaces shall be supplied with adequate combustion air as required by Section 2110.0 of this article.

The combustion chamber opening shall be separated from the fan plenum of a forced air furnace by an airtight separation.

2111.3 WORKING SPACE: A working space not less than thirty (30) inches deep and thirty (30) inches high shall be provided to the front or firebox side of all furnaces.

A space not less than twenty-four (24) inches wide and thirty (30) inches high shall be provided to the access panel to the temperature limit control, air filter and where applicable, fuel control valve. A space not less than twenty-four (24) inches wide and eighteen (18) inches high shall be provided to the vent collar of fuel-burning furnaces.

2111.4 PROHIBITED LOCATION: Warm-air furnaces shall not be located in a bedroom, bathroom, closet or confined space with access only to such room or space.

EXCEPTIONS:

a) Access to attic or underfloor furnaces may be through a closet.

b) Sealed combustion systems.

c) Enclosed furnaces.

d) Electric furnaces.

2111.5 ROOM ACCESS: Any room containing a warm-air furnace shall have access thereto by a door and passageway of not less than two (2) feet by six (6) feet six (6) inches and large enough to permit removal of equipment.

EXCEPTION: Underfloor and attic installations.

2111.6 CLEARANCE OF WARM-AIR FURNACES: Clearances shall be provided for warm-air furnaces in accordance with the requirements of Table 2109-1 or their listing. The clearance of the combustion chamber opening side shall be not less than six (6) inches for fuel-burning appliances.

2111.7 ATTIC FURNACES: A warm-air furnace installed in an attic less than five (5) feet in height shall be listed for that location.

A passageway thirty (30) inches by thirty (30) inches minimum shall be provided from the attic opening to the furnace and its controls. The opening and passageway shall be large enough to allow replacement of any part and the attic opening shall not be located more than twenty (20) feet from the furnace measured along the center line of the passageway. The passageway shall be unobstructed and have solid flooring not less than twenty-four (24) inches wide.

2111.8 UNDERFLOOR FURNACES: Warm-air furnaces installed in the underfloor area shall comply with the following requirements:

a) An access opening and passageway shall be provided of sufficient height and width to permit removal of the furnace but not less than thirty (30) inches by thirty (30) inches and which extends to the working space in front of the furnace. The distance from the passageway opening to the heating equipment shall not exceed twenty (20) feet.

b) Furnaces supported on the ground shall rest on concrete or masonry bases extending not less than three (3) inches above the adjoining ground level.

c) Furnaces suspended from the building shall have a clearance of at least six (6) inches from the ground. Furnace excavations shall extend to a depth of not less than six (6) inches below and twelve (12) inches beyond the sides of the furnace, except that the control side shall have a clearance of not less than thirty (30) inches. Walls of excavations exceeding twelve (12) inches in depth shall be lined with concrete masonry extending not less than four (4) inches above the adjoining ground level. In flood plane areas not less than a twelve (12) inch clearance shall be provided between the furnace and finish grade.

2111.9 EXTERIOR FURNACES: Warm-air furnaces located on the roof of a building shall be listed for outdoor installation and approved for such use.

Warm-air furnaces installed on the exterior of buildings shall comply with the following requirements:

a) Unless listed for outside installation, an appliance located on the exterior of a building shall be enclosed in a weather-resistant housing. A weatherproof housing may be constructed of No. 24 gage galvanized steel or No. 22 gage aluminum. The enclosure shall have not less than a six (6) inch clearance from the furnace.

b) The appliance shall be installed on a level platform.

c) For ground installations the appliance shall be supported on a concrete or masonry base extending not less than three (3) inches above the adjoining ground level.

2111.10 CIRCULATING AIR SUPPLY--GENERAL: The circulating air supply shall be taken from outside the building or from the conditioned area inside the building or from both sources.

The circulating air supply for a forced air comfort heating system shall be conducted through ducts complying with Section 2114.0 or through concealed spaces provided vent or vent connectors do not extend into or through these spaces.

A volume damper shall not be placed in the circulating air supply inlet so as to reduce the supply to the furnace.

The outside circulating air supply inlet shall be covered with screen having one-quarter (1/4) inch openings.

2111.11 CIRCULATING AIR SUPPLY--REQUIREMENT: The unobstructed area of circulating air supply openings to a gravity-type warm-air furnace shall be not less than seven (7) inches for each input of one thousand (1000) B.t.u. rating or as required by the listing conditions of the furnace.

The unobstructed area of circulating air supply openings or ducts to a forced air warm-air furnace shall be not less than two (2) square inches for each input of one thousand (1000) B.t.u. rating of the furnaces or as required by the conditions of listing.

The total area of circulating air supply openings need not be larger than the minimum sized circulating air supply opening as required by the conditions of listing.

2111.12 CIRCULATING AIR SUPPLY--SOURCE: The circulating air supply for a comfort heating system shall not be taken from the following locations:

a) Within ten (10) feet of an appliance or plumbing vent outlet which is located less than three (3) feet above the circulating air supply inlet.

b) Areas having objectionable odors, fumes or flammable vapors.

c) Areas whose volume is less than twenty-five (25) percent of the volume served by the system and where permanent openings to supplemental areas are not provided in accordance with this section.

EXCEPTION: Openings for a warm-air furnace may be reduced to not less than fifty (50) percent of the required circulating air supply area provided the balance is taken from a room or hall having at least three (3) doors leading to other rooms served by the furnace.

d) Areas having a direct-fired fuel-burning appliance.

EXCEPTIONS:

1) A gravity-type comfort heating system.

2) A blower-type comfort heating system where the circulating air supply is taken from an area having a volume exceeding one (1) cubic foot for each ten (10) B.t.u.'s of fuel input rating of all fuel-burning appliances therein and at least seventy-five (75) percent of the conditioned air is discharged back into the area provided the circulating air supply inlet is not located within ten (10) feet of an appliance firebox or draft diverter.

2111.13 CONDITIONED AIR SUPPLY: The minimum unobstructed total area of the conditioned air ducts from a blower-type warm-air furnace shall be not less than two (2) square inches for each one thousand (1000) B.t.u. approved hourly input rating of the furnace and the minimum unobstructed total area of the conditioned air ducts from a gravity-type warm-air furnace shall be not less than seven (7) square inches for each one thousand (1000) B.t.u. approved hourly input rating or as specified by the conditions of listing of the furnace.

In no case need the total area of the conditioned air ducts be larger than the outlet plenum collar opening on the furnace.

For the purpose of this section a volume damper, grill, or register installed for the purpose of controlling the conditioned air flow shall not be considered an obstruction.

SECTION 2112.0 VENTED DECORATIVE APPLIANCES, FLOOR FURNACES, VENTED WALL FURNACES AND VENTED ROOM HEATERS

2112.1 GENERAL: A vented decorative appliance, floor furnace, vented wall furnace, or vented room heater shall not be located under a stairway.

2112.2 VENTED DECORATIVE APPLIANCES: Vented decorative appliances shall comply with the requirements for comfort heating appliances.

2112.3 PROHIBITED USE: Unvented room heaters are prohibited in accordance with Chapter 688 of the Acts of 1962 of the General Laws of the Commonwealth of Massachusetts.

2112.4 FLOOR FURNACES LOCATION: Flat floor furnaces shall be installed not less than six (6) inches from walls.

Wall register floor furnaces shall be installed not less than six (6) inches from inside room corners.

EXCEPTION: Replacement floor furnaces of the same or lesser input rating may be installed in the original location when approved by the building official.

Floor furnaces shall not be located where draperies or a door can swing within twelve (12) inches of the warm air outlet.

Floor furnaces warm air outlets shall not be installed less than sixty (60) inches below overhead projections.

A clear floor space of fifteen (15) inches shall be provided along two (2) adjoining sides of flat floor furnaces.

The floor furnace burner assembly shall not project into an occupied underfloor area.

2112.5 FLOOR FURNACE ACCESS: An opening and passageway not less than twenty-four (24) by eighteen (18) inches shall be provided to every floor furnace. The passageway shall be not more than twenty (20) feet in length from the access opening or from an underfloor area thirty (30) inches or more in height.

2112.6 FLOOR FURNACE INSTALLATION: Floor furnaces shall be supported independently of the grill and shall have not less than six (6) inches clearance from grade.

EXCEPTION: Sealed furnaces may have a grade clearance of two (2) inches minimum.

Furnace excavations shall extend not less than eighteen (18) inches beyond the control side and twelve (12) inches beyond the sides and back of the furnace. The excavation shall slope outward from the bottom to the natural grade at an angle not greater than forty-five (45) degrees from the horizontal.

Floor furnaces shall not be installed on concrete slabs on grade.

2112.7 WALL FURNACE LOCATION: Vented wall furnaces designed to be installed in a nominal four (4) inch wall shall be not less than six (6) inches from inside room corners except where listed

for reduced clearances.

EXCEPTION: Vented wall furnaces replacements approved by the building official.

Vented wall furnaces shall not be located where a door can swing within twelve (12) inches of the furnace air inlet or outlet and shall not be installed less than eighteen (18) inches below overhead projections.

2112.8 WALL FURNACE COMBUSTION AIR: Vented wall furnaces shall be provided with combustion air in accordance with Section 2110.0.

EXCEPTION: Combustion air openings may be omitted to the area in which a vented wall furnace is installed provided a cased opening or archway leads from that area into other rooms having a minimum combined volume in cubic feet equivalent to one-twentieth (1/20) of the input B.t.u. rating of the furnace.

2112.9 WALL FURNACE INSTALLATION: Ducts shall not be attached to a wall furnace. Casing extensions or boots may be installed if listed as part of the appliance.

2112.10 VENTED ROOM HEATERS: Floor mounted type unit heaters shall be installed in accordance with Table 2109-1.

2112.11 ROOM HEATERS: Vented room heaters shall be installed in accordance with Table 2109-1 or as listed.

2112.12 UNVENTED ROOM HEATERS: No unvented fuel-burning room heaters shall be installed.

SECTION 2113.0 VENTING OF APPLIANCES

2113.1 GENERAL: All fuel-burning comfort heating and comfort cooling appliances shall be vented to the outside. Venting systems shall consist of approved chimneys, approved vents or a venting assembly which is an integral part of a listed appliance or may be designed in accordance with accepted engineering practices.

Venting systems which are integral parts of vented appliances shall be installed in accordance with the terms of their listing, manufacturer's installation requirements and applicable requirements of this article.

2113.2 COMMONWEALTH OF MASSACHUSETTS REQUIREMENTS: Gas vents required for appliances or equipment using fuel gases of any kind such as natural gas, manufactured gas, undiluted liquified petroleum gases, liquified 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.

2113.3 TYPE OF VENTING SYSTEMS REQUIRED: Gas appliances shall be vented in conformance with the regulations provided in Section 2113.2. Oil burning appliances may be used with type L ventes where so listed.

2113.4 INSTALLATION AND CONSTRUCTION: Manually operated dampers shall not be placed in chimneys, vents or vent connectors of liquid or gas-burning appliances. Fixed baffles on the appliance side of draft hoods and draft regulators shall not be classified as dampers.

Automatically operated dampers shall be of approved type designed to maintain a safe damper opening and arranged to prevent firing of the burner unless the damper is opened to a safe position.

2113.5 LOCATION: Vents shall not extend into or through an air supply duct or plenum.

EXCEPTION: Venting systems may pass through a combustion air duct.

Appliances shall not be vented into a fireplace or into a chimney serving a fireplace.

2113.6 LENGTH PITCH--CLEARANCE: Gravity vents shall not have more than two (2) offsets of more than forty-five (45) degrees from the vertical.

The horizontal run of a gravity vent and its connectors shall not be greater than seventy-five (75) percent of the vertical height of the venting system measured from the appliance outlet.

Vent connectors in gravity-type venting systems shall have continuous rises of not less than one-quarter (1/4) inch per foot of length measured from the appliance vent collar to the vent.

Single wall metal vent connectors for an appliance shall be located entirely within the room or area where the appliance is located.

2113.7 VENT TERMINATION--GENERAL: Vents shall extend above the roof surface, through a flashing and terminate in a listed vent cap.

2113.8 GRAVITY VENT TERMINATION: Gravity-type venting systems, other than Type BW or venting systems which are integral with listed appliance, shall terminate not less than five (5) feet above the highest vent collar which they serve.

2113.9 B OR BW VENT TERMINATION: Type B or BW gas vents shall terminate not less than one (1) foot above the roof nor less than four (4) feet from a portion of the building which extends at an angle of more than forty-five (45) degrees upward from the horizontal.

2113.10 L VENT TERMINATION: Type L venting systems shall terminate not less than two (2) feet above the roof nor less than four (4) feet from a portion of the building which extends at an angle of more than forty-five (45) degrees upward from the horizontal.

2113.11 SPECIAL VENT REQUIREMENTS: Venting systems shall terminate not less than four (4) feet below, four (4) feet horizontally from or one (1) foot above a door, window or gravity air inlet into a building.

EXCEPTION: Venting systems which are integral parts of listed equipment may be located closer provided the door, window or gravity air inlet is serving the same room in which the appliance is located; the venting system does not terminate less than nine (9) inches from the door, window or gravity air inlet; and the appliance does not exceed an input rating of fifty thousand (50,000) B.t.u.'s.

Venting systems shall terminate not less than three (3) feet above forced air inlets located within ten (10) feet (horizontally); nor less than four (4) feet from private property lines.

2113.12 VENT SIZE: Vent systems shall have internal cross-sectional areas of not less than the area of the vent collars but not less than seven (7) square inches except where the vents are integral parts of listed appliances.

2113.13 MULTIPLE APPLIANCE VENTING SYSTEMS: Two (2) or more listed appliances may be connected to common gravity-type venting systems provided the appliances are equipped with listed primary safety controls and listed safety shutoff devices for oil and gas fuel respectively and comply with the following requirements:

a) Appliances which are connected to common venting systems shall be located in the same story of the building, except engineered systems as set forth in Section 2113.1.

b) Two (2) or more connectors shall not enter common venting systems unless the inlets are offset so that no portion of an inlet is opposite the other inlets.

c) The venting system area shall be not less than the area of the largest vent connector plus fifty (50) percent of the areas of the additional vent connectors. An oval vent may be used provided its capacity is not less than the capacity of the round vent for which it is substituted.

2113.14 EXISTING VENTING SYSTEMS: Existing venting systems may be connected to replaced appliances in accordance with the following requirements:

a) The venting system shall have been installed in accordance with the Code in effect at that time and have no apparent defects.

b) The internal area of the venting systems shall be in accordance with Section 2113.11.

2113.15 DRAFT HOODS: Draft hoods shall be located in the same room or space as thecombustion air openings of the appliances and shall be located so that the relief opening is not less than six (6) inches from any surface other than the appliance it serves, measured in a direction ninety (90) degrees to the plane of the relief opening.

2113.16 FACTORY-BUILT CHIMNEYS: Approved factory-built chimneys shall be installed in accordance with the terms of their listing, the manufacturer's instructions, and the applicable requirements of this article.

2113.17 MASONRY CHIMNEYS DESIGN: Masonry chimneys shall be designed, anchored, supported and reinforced as set forth in Section 2107.0 of this article.

SECTION 2114.0 DUCTS

2114.1 MATERIAL: Ducts conveying air from outside the building or air from evaporative coolers shall be constructed of galvanized steel or corrosion-resistive metal.

Ducts or concealed spaces used for inside circulating air may be of combustible material. Where space between studs in walls or partitions is used as a duct the portions of such space so used shall be cut off from all remaining unused portions by tight-fitting stops of sheet metal or of wood not less than two (2) inches nominal thickness. Not more than one (1) firestop may be crossed.

Ducts conveying heated conditioned air shall be of noncombustible material.

Approved ducts, plenums and fittings constructed of asbestos-cement, concrete or ceramic may be installed in the ground or in a concrete slab.

Metal ducts shall conform to Table 2114-1.

Ducts constructed of gypsum products shall not be subject to air temperatures of more than 125°F.

2114.2 INSTALLATION: When required, ducts shall be insulated equivalent to Table 2114-2 and metal ducts shall be securely fastened in place at changes of direction in accordance with Table 2114-3.

Metal ducts shall not be installed within four (4) inches of the ground except when encased in not less than two (2) inches of concrete.

Rectangular metal duct supports set forth in Table 2114-3 shall be riveted, bolted or screwed to each side of the duct.

Horizontal round duct supports set forth in Table 2114-3 shall

TABLE 2114-1 GAGES OR METAL DUCTS AND PLENUMS USED FOR COMFORT HEATING OR COOLING FOR A DWELLING UNIT

	COMFORT HEATING OR COOLING		
	GALVANIZED STEEL		
	Nominal Thickness (in inches)	Equivalent Galvanized Sheet Gage Number	Approximate Aluminum B & S Gage
Round Ducts and Enclosed Rectangular Ducts			
14" or less	0.016	30	26
Over 14"	0.019	28	24
Exposed Rectangular Ducts			
14" or less	0.019	28	24
Over 14"	0.022	26	23

TABLE 2114-2 INSULATION OF DUCTS[1]

DUCT LOCATION		
Roof or Exposed to Outside Air	B and W	
Attics[3]	A	
Underfloor Spaces	A	
Within the Conditioned Space[2]		None Required
Cement Slab or Within Ground		None Required

Note A: One (1) inch of fiber glass or rock-wool insulation with a minimum density of 0.65 pound per cubic foot or two (2) layers of one-quarter (¼) inch air cell asbestos or air cell foil.

NOTES FOR TABLE 2114-2 (Continued)

Note B: Two (2) inches of fiber glass or rock-wool insulation with a minimum density of 0.75 pound per cubic foot or four (4) layers of one-quarter (¼) inch air cell asbestos or one-quarter (¼) inch air cell foil, or one (1) inch fiber glass insulation with a minimum density of one and one-half (1½) pounds per cubic foot.

Note W: Approved weatherproof vapor barrier.

Note 1: Insulation not required for evaporative systems.

Note 2: Insulation may be omitted on that portion of a duct which is located within a vertical wall space if the wall space is directly adjacent to the occupied portion of the building.

Note 3: Vapor barrier should be provided for cooling ducts in attics or areas of high humidity.

TABLE 2114-3 METAL DUCT SUPPORTS

DUCT TYPE	MAX. SIDE OR DIA.	DUCT POSITION	HANGER OR STRAP SIZE AND SPACING
CIRCULAR	10	Vertical	No. 18 gage galvanized steel x 2" @ 12' o.c.
		Horizontal	No. 30 gage galvanized steel x 1" or No. 18 steel wire @ 10' o.c.
	20	Vertical	No. 16 gage galvanized steel x 2" @ 12' o.c.
		Horizontal	No. 28 gage galvanized steel x 1" or No. 18 steel wire @ 10' o.c.
RECTANGULAR	24	Vertical	1" x 1/8" steel galvanized strap @ 12' o.c.
		Horizontal	No. 18 gage galvanized steel x 1" @ 10' o.c.
	36	Vertical	1" x 1-1/8" steel galvanized angle @ 12' o.c.
		Horizontal	1" x 1/8" steel strap galvanized @ 10' o.c.

consist of one (1) hanger installed in accordance with the following requirements:

a) The hanger shall be attached to one (1) inch wide circular bands of same gage as duct extending around and supporting ducts exceeding ten (10) inches in diameter.

b) The ducts shall be braced to prevent lateral displacement.

SECTION 2115.0 COMFORT COOLING

2115.1 COMMONWEALTH OF MASSACHUSETTS RULES AND REGULATIONS: All installations of gas appliances shall be subject to and must comply with the Massachusetts Code for Installation of Gas Appliances and Gas Piping established under Chapter 737 of the MGLA as amended. All oil-burning appliances shall be subject to the regulations made in accordance with Section 10 of Chapter 148 of the MGLA as amended, governing the construction, installation and operation of oil-burning equipment. Also, compliance shall be required with the provisions of the rules and regulations issued by the Board of Boiler Rules under the authority of Chapter 146 of the MGLA, as amended, governing the construction, installation, testing and inspection of boilers, air tanks, ammonia compressor safety valves, and refrigeration and air-conditioning systems of five (5) tons or more capacity.

2115.2 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 statutes governing the transportation and use of hazardous gases, explosives and other flammablve substances.

2115.3 PERMITS: One and two-family dwellings 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.

2115.4 INSTALLATION: Group 2 refrigerants shall not be used in direct refrigerating systems.

An approved means shall be provided for the collection and disposal of condensate from the air cooling coil to outside the building or other approved locations.

Comfort cooling equipment, other than ducts and piping, shall be located not less than three (3) inches above the ground.

Electric lighting shall be provided for equipment located inside a building.

2115.5 ACCESS: Equipment requiring servicing shall be accessible by means of passageway two (2) feet by six (6) feet six (6) inches minimum.

EXCEPTION: An access opening to the attic or underfloor area may be reduced to a thirty (30) inch dimension provided the equipment can be replaced.

Equipment shall be provided with an unobstructed space thirty (30) inches by six (6) feet six (6) inches minimum on the service side.

EXCEPTION: The height of the working space may be reduce to thirty (30) inches for an air handling unit, air filter or refrigerant and brine control valves. Fan coils in drop ceilings may be serviced through combination return air grills.

2115.6 CIRCULATING AIR SUPPLY SOURCE: A positive separation shall be provided between the combustion air and the circulating air supply.

The circulating air supply source shall conform to the requirements of a blower type comfort heating system as set forth in Section 2111.10.

2115.7 RETURN AIR LIMITATION: Comfort cooling systems shall be arranged so that the circulating air from one (1) dwelling unit does not discharge into another dwelling unit.

2115.8 SCREEN: Exterior circulating air supply inlets shall be covered with screen having one-quarter (1/4) inch openings.

2115.9 REFRIGERANT PIPING: All refrigerant pipe and fittings installed within a building or structure and which may reach surface temperatures that will result in condensation forming on the piping shall be insulated.

SECTION 2116.0 ABSORPTION UNITS AND ABSORPTION SYSTEMS FOR COMFORT COOLING AND COMFORT HEATING

2116.1 GENERAL: Absorption units used for comfort heating or comfort cooling systems shall conform to the requirements of Sections 2109.0, 2110.0 and 2114.0.

2116.2 IDENTIFICATION: Fuel-burning absorption units shall bear a label containing the following information:

a) Manufacturer's name

b) Model number

c) Amount and type of refrigerant

d) Factory test pressures or pressures applied

e) Normal B.t.u. input rating

f) Cooling capacity in B.t.u.'s

g) Type of fuel

h) Symbol of the organization certifying the approval of the equipment

i) Instructions for the lighting, operation and shutdown of the system

SECTION 2117.0 FUEL SUPPLY SYSTEMS

2117.1 GENERAL: New fuel supply systems, except parts thereof controlled and maintained by a public utility, shall conform to the requirements of this section and shall not be made operative until first approved by the building official.

Fuel supply system design, construction and workmanship shall be consistent with generally accepted good practice and in conformity with nationally recognized applicable standards acceptable to the State Building Code Commission.

2117.2 LOCATION: Location of fuel supply tanks, meters, main shutoff valves, relief valves, and regulators other than integral appliance regulators shall be approved by the building official and shall conform to state and local regulations.

2117.3 AUTHORITY TO DISCONNECT: The building official is hereby authorized to order disconnected any fuel supply or appliance which does not conform to this Code or which is found to be defective and may endanger life or property.

A notice shall be attached to the piping or appliances stating the reasons for disconnection. Such notice shall not be removed nor shall the system or appliance be reconnected until authorized by the building official.

2117.4 PIPING SUPPORT: Gas piping shall be supported by metal straps or hooks at not more than six (6) feet on center for piping one (1) inch or less in size and not more than ten (10) feet on center for piping larger than one and one-quarter (1 1/4) inches. Piping shall be protected against physical damage. Buried piping shall be laid in a solid bed.

Gas piping shall not be strained or bent and appliances shall not be supported by supply piping.

2117.5 LIQUID FUEL SUPPLY: Supply piping and all related equipment serving oil-burning appliances shall be subject to the Rules and Regulations promulgated in FPR-3 made in accordance with the provisions of Section 10 of Chapter 148 of the MGLA as amended.

RS-21-1 Shower Compartment Finish

Glazed Ceramic Wall Tile installed with Portland Cement Mortar. ANSI A108.1-1967

Ceramic Tile installed with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy-ANSI A108.6-1969

Dry-Set Portland Cement Mortar (for installation of ceramic tile)-ANSI A118.1-1967

Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy-ANSI A118.3-1969

Organic Adhesives for Installation of Ceramic Tile-ANSI A136.1-1967 (Type I only in Shower Compartments)
Standard Specification for Ceramic Tile-ANSI A137.1-1967

Ceramic Tile installed with Dry-Set Portland Cement Mortar. ANSI A108.5-1967

Ceramic Mosaic Tile Installed with Portland Cement Mortar. ANSI A108.2-1967

Ceramic Tile Installed with Water-Resistant Organic Adhesives. ANSI A108.4-1968

RS-21-2 Glazing Materials

Glass. F.S. DD-G 451c

Safety Glazing Materials. ANSI Z97.1-1972

RS-21-3 Foundations

Building Brick and Facing Brick. (Made from Clay or Shale.) Standard Specifications C62-58 and C216-66 of the ASTM.

Sand-Lime Building Brick. Standard Specification C73-51 of the ASTM.

Concrete Building Brick. Standard Specification C55-55 of the ASTM.

Hollow Load-Bearing Concrete Masonry Units. Standard Specification C90-59 of the ASTM.

Solid Load-Bearing Concrete Masonry Units. Standard Specification C145-59 of the ASTM.

Method of Test for Concrete Masonry Units. Standard Specification C140-63T of the ASTM.

Structural Clay Load-Bearing Wall Tile. Standard Specifications C34-62 and C112-60 of the ASTM.

Cast Stone. Specification ACI 704-44 of the American Concrete Institute.

Cold-Drawn Steel Wire for Concrete Reinforcement. Standard Specification A82 of the ASTM.

Cement, Masonry. Standard Specification C91-67 of the ASTM.

Quicklime for Structural Purposes. Standard Specification C5-59 of the ASTM.

Hydrated Lime for Masonry Purposes. Standard Specification C207-49 of the ASTM.

Processed Pulverized Quicklime. Standard Specification C51-47 of the ASTM.

Mortar for Masonry Other than Gypsum. Specifications C161-44T and C270-59T of the ASTM.

Aggregate for Masonry Mortar. Specification C144-52T of the ASTM.

Aggregates for Grout. Standard Specification C404 of the ASTM.

Sampling and Testing Brick. Standard Specification C67-60 of the ASTM.

Portland Cement. Standard Specifications C150-62 and C175-66 of the ASTM.

Portland Blast Furnace Slag Cement. Specification C205-62T of the ASTM.

Portland Pozzolan Cement. Specification C340-62T of the ASTM.

Concrete Aggregates. Specification C33-61T of the ASTM.

Concrete Proportions. ACI 613-54 and 613A-59 of the American Concrete Institute.

Concrete Reinforcement. Specifications A615-68, A616-68, A617-68 and A82-66 of the ASTM.

Steel Bar Mats. Standard Specifications A184-65, A615-68, A616-68 and A617-68 of the ASTM.

Welded Steel Wire Fabric. Specification A185-61T of the ASTM.

Admixtures for Concrete. Standard Specification C494-62T of the ASTM.

Concrete Tests. Standard Specifications C31-62, C39-61, C42-61 and C192-62 of the ASTM.

Splitting Tensile Strength. Specification C496-62T of the ASTM.

Ready-Mixed Concrete. Standard Specification C94-62 of the ASTM.

Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction. AWS D12. 1-61 of the American Welding Society.

Hollow Brick. (Hollow Masonry Units Made from Clay or Shale) Standard Specification C652-70 of the ASTM.

Building Brick and Facing Brick. (made from Clay or Shale) Standard Specifications C62-69 and C216-69 of the ASTM.

Mortar for Masonry Other than Gypsum. Standard Specification C270-68 of the ASTM.

Aggregate for Masonry Mortar. Standard Specification C144-70 of the ASTM.

Aggregate for Masonry Grout. Standard Specification C404-70 of the ASTM.

Methods of Sampling and Testing Brick. Standard Specification C67-66 of the ASTM.

Applicable Standards or Publications in Reference Standard RS-21-5.

RS-21-4 Preservatives

AWPB Standards CP-22, CP-33, CP-44, CP-55, and CP-77 for pressure treated poles.

AWPB Standards LP-2, LP-3, LP-4, LP-5 and LP-7 for pressure treated softwood lumber used above ground.

AWPB Standards LP-22, LP-33, LP-44, LP-55 and LP-77 for pressure treated softwood lumber used in contact with the ground.

RS-21-5 Wall Construction

Applicable Standards or Publications in Reference Standard RS-21-3.

Classification, Definition and Methods of Grading for all Species of Lumber. Standard D245-70 of the ASTM; American Softwood Lumber Standards PS 20-70 of the U.S. Department of Commerce.

Eastern Pine, Jack Pine, Eastern Spruce, Balsam Fire, Eastern Hemlock and Tamarack. Grading Rules, Northern Hardwood and Pine Manufacturers Association (September 1, 1970).

National Design Specification for Stress-Grade Lumber and Its Fastenings. National Forest Products Association 1970 with May 1971 Supplement.

Northeastern Lumber-Standard Grading Rules, Northeastern Lumber Manufacturers Association (September 1970).

Pine, Southern. Grading Rules, Southern Pine Inspection Bureau (September 1970).

Redwood. Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service (November 1970).

Softwood Plywood. Construction and Industrial Product Standard PS 1-66 (June 1969) of the U.S. Department of Commerce, Bureau of Standards.

TPI 1970 Roof Truss Specification.

West Coast Lumber. Standard Grading Rules, West Coast Lumber Inspection Bureau (September 1, 1970).

Western Lumber. Standard Grading Rules, Western Wood Products Association (September 1, 1970).

Wood Poles. Specification and Dimensions for Wood Poles, ANSI 05.1-1963.

Plank-and-Beam Framing. Wood Construction Data No. 4, National Forest Products Association.

Fiberboard Nail-Base Sheathing and Structural Insulating Board. Standard Specifications D2277-66 and C208-66 of the ASTM.

Particleboard. U.S. Department of Commerce, Commercial Standard CS 236-66.

Material Specifications for Structural Steel. Standard Specifications A27, A36, A53, A148, A167, A235, A237, A242, A245, A252, A303, A307, A325, A354, A374, A375, A412, A440, A441, A446, A449, A490, A500, A501, A502, A514, A529, A570, A572 and A588 of the ASTM.

Standard Specification for Structural Glued Laminated Timber Using "E" Rated and Visually Graded Lumber of Douglas Fir, Southern Pine, Hem-Fir and Lodepole Pine, August 1971, American Institute of Timber Construction.

Canadian Lumber-National Lumber Grades Authority 1970 Standard Grading Rules for Canadian Lumber, by Canadian Lumber Standards Administrative Board.

Specifications for Aluminum Structures of the Aluminum Association.

Connectors other than those specified in Section 2102.0 of this Code may be used in accordance with Table RS-21-6.

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, American Institute of Steel Construction, 1969 Edition and Supplements Nos. 1 and 2.

RS-21-6 Wall Covering

Applicable Standards and Publications in Reference Standards RS-21-2 and RS-21-5.

Aluminum Structures. Specifications for, by the Aluminum Association (November 1967).

Plaster Liquid Bonding Agents. U.S. Government Military Specification MIL-B-19235 (Docks) (1965), and Standards Specifications of the California Lathing and Plastering Contractors Association (1965), and Recommendations of the Gypsum Association.

Adhesives for Fastening Gypsum Wallboard to Wood Framing. Specification C557-67 of the ASTM.

Perlite, Vermiculite and Sand Aggregates for Gypsum and Portland Cement Plaster. Standard Specification C35-70 of the ASTM.

Metal Lath, Wire Lath, Wire Fabric Lath and Metal Accessories. Approved Standard A42.4-1967, of the American National Standards Institute, Inc.

Gypsum Wallboard Tape and Joint Compound. Standard Specifications C475-70 and C474-67 of the ASTM.

Gypsum Backing Board. Standard Specification C442-67 of the ASTM.

Gypsum Lath. Standard Specification C37-69 of the ASTM.

Lime. Standard Specifications C206-68 and C6-49 of the ASTM.

Gypsum Plasters. Standard Specification C28-68 of the ASTM.

Gypsum Sheathing Board. Standard Specification C79-67 of the ASTM.

Gypsum Veneer Plaster. Standard Specification C587-68 of the ASTM.

Gypsum Veneer Base. Standard Specification C588-68 of the ASTM.

TABLE RS-21-6 ALTERNATE ATTACHMENTS

NOMINAL MATERIAL THICKNESS	DESCRIPTION[1,2] OF FASTENER & LENGTH	SPACING[3] OF FASTENERS	
		EDGES	INTERMEDIATE SUPPORTS
Plywood Subfloor, Roof and Wall Sheathing to Framing			
5/16"	.097 - .099 Nail 1½" Staple 15 ga. 1-3/8"	6"	12"
3/8"	Staple 15 ga. 1-3/8"	6"	12"
	.097 - .099 Nail 1½"	4"	10"
1/2"	Staple 15 ga. 1½"	6"	12"
	.097 - .099 Nail 1-5/8"	3"	6"
5/8"	.113 Nail 1-7/8" Staple 15 and 16 ga. 1-5/8"	6"	12"
	.097 - .099 Nail 1¾"	3"	6"
3/4"	Staple 14 ga. 1¾"	6"	12"
	Staple 15 ga. 1¾"	5"	10"
	.097 - .099 Nail 1-7/8"	3"	6"
1"	Staple 14 ga. 2"	5"	10"
	.113 Nail 2¼" Staple 15 ga. 2"	4"	8"
	.097 - .099 Nail 2-1/8"	3"	6"
Floor Underlayment; Plywood – Hardboard – Particleboard			
1/4" and 5/16"	.097 - .099 Nail 1½" Staple 15 and 16 ga. 1¼"	6"	12"
	.080 Nail 1¼"	5"	10"
	Staple 18 ga. 3/16 crown 7/8"	3"	6"
3/8"	.097 - .099 Nail 1½" Staple 15 and 16 ga. 1-3/8"	6"	12"
	.080 Nail 1-3/8"	5"	10"
1/2"	.113 Nail 1-7/8" Staple 15 and 16 ga. 1½"	6"	12"
	.097 - .099 Nail 1¾"	5"	10"

Note 1: Nail is a general description and may be T-head, modified round head, or round head.

Note 2: Staples shall have a minimum crown width of seven-sixteens (7/16) inch o.d. as noted.

Note 3: Nails or staples shall be spaced at not more than six (6) inches o.c. at all supports where spans are forty-eight (48) inches or greater. Nails or staples shall be spaced at not more than ten (10) inches o.c. at intermediate supports for floors.

Gypsum Wallboard. Standard Specification C36-70 of the ASTM.

Keene's Cement. Standard Specification C61-64 of the ASTM.

Gypsum Molding Plaster. Standard Specification C59-50 of the ASTM.

Gypsum Plastering. Standard Specification A42.1-1964 of the ASA.

Interior Lathing and Furring. Standard Specifications A42.4-1967 of the ASTM.

Application and Finishing of Gypsum Wallboard. Standard Specifications A97.1-65 of the ANSI.

Surface Burning Characteristics of Building Materials. Standard Method of Test E84-70 of the ASTM.

RS-21-7 Floors

Applicable Standards or Publications in Reference Standards RS-21-3 and RS-21-5.

Maximum Spans for Joists and Rafters, Technical Bulletin 2, of SFPA.

Canadian Dimension Lumber, 1971, Canadian Wood Council.

RS-21-8 Roof-Ceiling

Applicable Standards or Publications in Reference Standards RS-21-3 and RS-21-6.

Maximum Spans for Joists and Rafters, Technical Bulletin 2, of SFPA.

Canadian Dimension Lumber, 1971, Canadian Wood Council.

RS-21-9 Roof Coverings

Aluminum Sheet Metal Work in Building Construction by the Aluminum Association (October 1967).

Composition Roofing. Standard Specification 55-A (May 1967) Underwriters' Laboratories, Inc.

Roofing Asphalt. Standard Specification D312-44 of the ASTM.

Composition Roofing. Standard Specification 55-B. (April, 1962) Underwriters' Laboratories, Inc.

Sheet Metals. Standard Specifications A245-62aT, A361-63T and B209-70 of the ASTM.

Corrosion-Resistant Metals. Standard Specifications A219-58, A239-41 and B209-70 of the ASTM.

Composition Roofing Testing. Standard Specification 790 (September, 1958), Underwriters' Laboratories, Inc.

Hand-Split Shakes. Grading and Packing Rules, Hand-Split Red Cedar Shakes 1971, Red Cedar Shingle and Hand-Split Shake Bureau.

Asbestos-Cement Shingles. Standard Specification C222-60 of the ASTM.

Slate Shingles. Standard Specification C406-57T of the ASTM.

Wood Shingles. Commercial Standard CS31-52, U.S. Department of Commerce, National Bureau of Standards. Grading and Packing Rules for Red Cedar Shingles (1971) Red Cedar Shingles and Handsplit Shake Bureau.

Wire. Standard Specifications B134-62, B211-63, and B250-62 of the ASTM.

RS-21-10 Chimney and Fireplace

Applicable Standards or Publications in Reference Standards RS-21-3 and RS-21-5.

RS-21-11 Mechanical Materials

Galvanized Sheet Metals. Standard Specification A525-64T of the ASTM.

Tank Piping and Valves for Oil Burning Appliances. Pamphlet No. 31, June, 1965, of the NFPA.

Nonmetallic Ducts. Standard No. 181 of the UL.

Refrigeration. Standard No. B9.1-1964 of the ANSI.

Wrought Steel and Wrought Iron Pipe. Standard B36.10-1959 of the ANSI.

Seamless Copper Tube, Copper Pipe and Red Brass Pipe. Standard Specifications B42-62, B43-62, B68-60, B88-66, B251-66 and B280-66 of the ASTM.

Compression (neoprene) Gaskets (including hubless piping system) for Cast Iron Piping and Fittings in Condensate Drain Lines. Standard Specification C564-70 of the ASTM, or CISPI Standards HSN-72 and 301-72.

Stainless Steel Coupling (hubless piping system) for Cast Iron Piping and Fittings in Condensate Drain Lines. CISPI Standard 301-72.

Load Calculation for Residential Winter and Summer Air Conditioning. Manual J, Third Edition, of NISC.

Installation of Gas Appliances and Gas Piping. Standard No. 54, 1969 or the NFiPA.

Installation of Gas Piping and Gas Equipment on Industrial Premises and Certain Other Premises. Standard No. 54-A, 1969 of the NFiPA.

Chimeys, Fireplaces and Venting Systems. Standard No. 211, 1970 of the NFiPA.

Installation of Residence-type Warm Air Heating and Air Conditioning Systems. Standard No. 90-B, 1971 of the NFiPA.

RS-21-12 Mechanical Equipment

Applicable Standards or Publications in Reference Standard RS-21-11.

Mechanical Ventilation. Testing and Rating Procedures of Home Ventilating Institute.

RS-21-13 Smoke/Heat Detectors

NFPA Standard No. 101 of 1971-1972

NFPA Standard No. 74 of 1971-1972

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By section number

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APPENDIX A

ACCREDITED AUTHORITATIVE AGENCIES

CONCRETE

American Concrete Institute
P. O. Box 4754 Redford Station
22400 West Seven Mile Road
Detroit, Michigan 48219 . . . . . ACI

Concrete Reinforcing Steel Institute
228 North LaSalle Street
Chicago, Illinois 60601 . . . . . .CRSI

Gypsum Association
201 North Wells Street
Chicago, Illinois 60606 . . . . . .GA

National Concrete Masonry Association
2009 Fourteenth Street, North
Arlington, Virginia 22201 . . . . . .NCMA

National Lime Association
4000 Brandywine Street, NW
Washington, D. C. 20016 . . . . . NLA

Portland Cement Association
5420 Old Orchard Road
Skokie, Illinois 60076 . . . . . PCA

ELECTRICAL

Institute of Electrical and
Electronics Engineers, Inc.
345 East 47th Street
New York, New York 10017. . . . . .IEEE

Illuminating Engineers Society
345 East 47th Street
New York, New York 10017. . . . . IES

International Association of
Electrical Inspectors
802 Busse Highway
Park Ridge, Illinois 60068. . . . . .IAEI

National Electrical Manufacturers
Association
155 East 44th Street
New York, New York 10017 . . . . . .NEMA

National Electric Sign Association
10922 South Western Avenue
Chicago, Illinois 60642 . . . . . .NESA

EQUIPMENT

Air-Conditioning and Refrigeration
Institute
1815 North Fort Myer Drive
Arlington, Virginia 22209. . . . . ARI

American Gas Association
1032 East 62nd Street
Cleveland, Ohio 44103 . . . . . AGA

American Petroleum Institute
1625 K Street, NW
Washington, D. C. 20005 . . . . . API

American Society of Heating,
Refrigerating and Air-Conditioning
Engineers
United Engineering Center
345 East 47th Street
New York, New York 10017 . . . . . .ASHRAE

The American Society of Mechanical
Engineers
United Engineering Center
345 East 47th Street
New York, New York 10017 . . . . . .ASME

Home Ventilating Institute
230 North Michigan Avenue
Chicago, Illinois 60601 . . . . . HVI

Incinerator Institute of America
2425 Wilson Boulevard
Arlington, Virginia 22201. . . . . IIA

The Institute of Boiler and
Radiator Manufacturers
393 Seventh Avenue-10th Floor
New York, New York 10001 . . . . . I-B-R

National Automatic Sprinkler and
Fire Control Association, Inc.
2 Holland Avenue
White Plains, New York 10603 . . . . . .NASFCA

National Elevator Industry, Inc.
600 Third Avenue
New York, New York 10016 . . . . . NEI

National LP-Gas Association
79 West Monroe Street
Chicago, Illinois 60603. . . . . NLPGA

National Oil Fuel Institute, Inc.
60 East 42nd Street
New York, New York 10017 . . . . . .NOFI

National Environmental Systems
Contractors Association
221 N. LaSalle Street
Chicago, Illinois 60601. . . . . NESCA

Uniform Boiler and Pressure Vessel
Laws Society, Inc.
57 Pratt Street
Hartford, Connecticut 06103. . . . . .UBPVLS

GOVERNMENT AGENCIES

Commonwealth of Massachusetts
Department of Public Health
Boston, Mass. 02111. . . . . Mass-DPH

Commonwealth of Massachusetts
Department of Public Safety
Boston, Mass. 02215. . . . . Mass-DPS

Commonwealth of Massachusetts
Executive Office of Human Services
Boston, Mass. 02202. . . . . Mass-EOHS

Commonwealth of Massachusetts
Outdoor Advertising Board
Boston, Mass. 02116. . . . . Mass-OAB

Department of Defense
Office of Civil Defense
Office of the Secretary of the Army
Washington, D. C. 20390. . . . . DOD-OCD

Federal Aviation Agency
Systems Research and Development
Service
Washington, D. C. 20553. . . . . .FAA

Federal Specifications
Superintendent of Documents
Government Printing Office
Washington, D. C. 20234. . . . . FS

Forest Products Laboratory
United States Department of
Agriculture
Madison, Wisconsin 53705 . . . . . .FPL

Housing and Home Finance Agency
Division of Housing Research
Washington, D. C. 20410. . . . . HHFA

Joint Army-Navy Specifications
Bureau of Supplies and Accounts
Navy Department
Washington, D. C. 20225
Air Material Command
Wright-Patterson Air Force Base
Dayton, Ohio 45433. . . . . .JAN

National Bureau of Standards
(Department of Commerce)
Washington, D. C. 20234. . . . . .NBS

National Research Council of Canada
Division of Building Research
Ottawa, Ontario, Canada. . . . . NRCC

Naval Facilities Engineering
Command
(formerly Bureau of Yards and Docks)
Navy Department
Washington, D. C. 20390. . . . . NFEC

Navy Specifications
Bureau of Supplies and Accounts
Navy Department
Washington, D. C. 20225. . . . . NS

Product Standards Section
Office of Engineering Standards
Services
National Bureau of Standards
Washington, D. C. 20234. . . . . PS

Public Health Service
Department of Health, Education
and Welfare
Washington, D. C. 20201. . . . . PHS

Superintendent of Documents
Government Printing Office
Washington, D. C. 20402. . . . . GPO

United States Department of
Agriculture
Washington, D. C. 20225. . . . . .USDA

United States Department of Commerce
Construction Division
Washington, D. C. 20225. . . . . .USDC

United States Forest Service
Madison, Wisconsin 53705 . . . . . .USFS

United States Department
of Health, Education and Welfare
Washington, D. C. 20201. . . . . USHEW

United States Naval Supply Depot
5801 Tabor Avenue
Philadelphia, Pennsylvania 19120 . . . . . USNSD

INTERIOR FINISHES AND MASONRY

Acoustical and Insulating Materials
Association
205 West Touhy Avenue
Park Ridge, Illinois 60068 . . . . . AIMA

American Hardboard Association
20 North Wacker Drive
Chicago, Illinois 60606. . . . . AHA

Asphalt and Vinyl Asbestos Tile
Institute
101 Park Avenue
New York, New York 10017 . . . . . AVATI

Facing Tile Institute
333 North Michigan Avenue
Chicago, Illinois 60601. . . . . FTI

Gypsum Association
201 North Wells Street
Chicago, Illinois 60606. . . . . GA

Marble Institute of America, Inc.
Pennsylvania Building
Washington, D. C. 20004. . . . . .MIA

Indiana Limestone Institute of
America, Inc.
400 East 7th Street-P. O. Box 489
Bloomington, Indiana 47401 . . . . . ILIA

National Building Granite Quarries
Association, Inc.
P. O. Box 444
Concord, New Hampshire 03302 . . . . . NBGQA

National Concrete Masonry Association
2009 Fourteenth Street, North
Arlington, Virginia 22201. . . . . NCMA

National Lime Association
4000 Brandywine Street, NW
Washington, D. C. 20016. . . . . .NLA

National Particleboard Association
711 Fourteenth Street, NW
Washington, D. C. 20005. . . . . .NPA

Perlite Institute, Inc.
45 West 45th Street
New York, New York 10036 . . . . . PI

Portland Cement Association
5420 Old Orchard Road
Skokie, Illinois 60076 . . . . . .PCA

The Society of the Plastics
Industry, Inc.
250 Park Avenue
New York, New York 10017 . . . . . .SPI

Brick Institute of America
1750 Old Meadow Road
McLean, Virginia 22101 . . . . . .BIA
(Formerly Structural Clay
Products Institute)

Tile Council of America
Research Center-P. O. Box 326
Princeton, New Jersey 08540. . . . . .TCA

Vermiculite Institute
141 West Jackson Blvd.
Chicago, Illinois 60604. VI

METAL AND STEEL

Aluminum Association
750 Third Avenue
New York, New York 10017 . . . . . AA

American Institute of Steel
Construction, Inc.
101 Park Avenue
New York, New York 10017 . . . . . AISC

American Iron and Steel Institute
150 East 42nd Street
New York, New York 10017 . . . . . AISI

American Welding Society
2501 N. W. Seventh Street
Miami, Florida 33125 . . . . . .AWS

Architectural Aluminum
Manufacturers Association
35 East Wacker Drive
Chicago, Illinois 60601. . . . . AAMA

Cast Iron Soil Pipe Institute
2029 K Street, NW
Washington, D. C. 20006. . . . . .CISPI

Concrete Reinforcing Steel Institute
228 North LaSalle Street
Chicago, Illinois 60601. . . . . CRSI

Copper Development Association, Inc.
405 Lexington Avenue
New York, New York 10017 . . . . . CDA

Lead Industries Association, Inc.
292 Madison Avenue
New York, New York 10017 . . . . . LIA

Metal Building Manufacturers
Association
2130 Keith Building
Cleveland, Ohio 44115. . . . . MBMA

Metal Lath Association
12703 Triskett
Cleveland, Ohio 44111. . . . . .MLA

National Association of Architectural
Metal Manufacturers
228 North LaSalle Street
Chicago, Illinois 60601. . . . . .NAAMM

Rail Steel Bar Association
38 South Dearborn Street
Chicago, Illinois 60603. . . . . RSBA

Research Council on Riveted and
Bolted Structural Joints of the
Engineering Foundation
United Engineering Center
345 East 47th Street
New York, N. Y. 10017. . . . . RCRBSJEF

Steel Deck Institute
9836 W. Roosevelt Road
Westchester, Illinois 60153. . . . . .SDI

Steel Bar Mills Association
(formerly Rail Steel Bar
Association)
38 South Dearborn Street
Chicago, Illinois 60603. . . . . SBMA

Steel Door Institute
2130 Keith Building
Cleveland, Ohio 44115. . . . . .SDI

Steel Joist Institute
2001 Jefferson Davis Highway
Arlington, Virginia 22202. . . . . .SJI

Steel Scaffolding & Shoring Institute
2130 Keith Building
Cleveland, Ohio 44115. . . . . SSSI

The Steel Window Institute
2130 Keith Building
Cleveland, Ohio 44115. . . . . .SWI

Wire Reinforcement Institute
5034 Wisconsin Avenue, NW
Washington, D. C. 20016. . . . . .WRI

GENERAL STANDARDS AND TESTING LABORATORIES

American Insurance Association
85 John Street
New York, New York 10038 . . . . . .AIA

American National Standards Institute, Inc.
(formerly United States of America
Standards Institute, Inc. . . . . .USASI)
(formerly American Standards Association)
1430 Broadway
New York, New York 10018 . . . . . ANSI

American Society for Testing and
Materials
P. O. Box 7510
Philadelphia, Pennsylvania 19101 . . . . . ASTM

Factory Mutual Engineering Division
Standards-Laboratories Department
1151 Boston-Providence Turnpike
Norwood, Massachusetts 02062 . . . . . FMED

General Electric Company
3198 Chestnut Street
Philadelphia, Pennsylvania 19101 . . . . . GE

National Fire Protection Association
470 Atlantic Avenue
Boston, Massachusetts 02110 . . . . . .NFiPA

National Sanitation Foundation
Testing Laboratory, Inc.
School of Public Health
P. O. Box 1468
Ann Arbor, Michigan 48106. . . . . .NSFTL

United States of America
Standards Institute, Inc.
(See American National Standards, Inc. . . . . ANSI)

Underwriters' Laboratories, Inc.
207 East Ohio Street
Chicago, Illinois 60611. . . . . .ULI

FIRE TESTING LABORATORIES (FLOOR, WALLS, ROOF AND SIMILAR TESTS)

National Bureau of Standards
(Department of Commerce)
Superintendent of Documents
Government Printing Office
Washington, D. C. 20234. . . . . NBS

The Ohio State University
Building Research Laboratory
2070 Neil Avenue
Columbus, Ohio 43210 . . . . . OSU

Underwriters' Laboratories, Inc.
207 East Ohio Street
Chicago, Illinois 60611. . . . . ULI

Underwriters' Laboratories, Inc.
333 Pfingsten Road
Northbrook, Illinois 60062 . . . . . ULI

Underwriters' Laboratories, Inc.
1655 Scott Boulevard
Santa Clara, California 95050. . . . . ULI

University of California at Berkeley
College of Engineering
Berkeley, California 94720 . . . . . UCB

FLAMESPREAD TESTING LABORATORIES

Southwest Research Institute
8500 Culebra Road
San Antonio, Texas 78228 . . . . . .SWRI

Underwriters' Laboratories, Inc.
1655 Scott Boulevard
Santa Clara, California 95050. . . . . ULI

Underwriters' Laboratories, Inc.
333 Pfingsten Road
Northbrook, Illinois 60062 . . . . . ULI

STRUCTURAL TESTING LABORATORIES

The Detroit Testing Laboratory, Inc.
12800 Northend Avenue
Detroit, Michigan 48237. . . . . DTL

Forest Products Laboratory
United States Department
of Agriculture
Madison, Wisconsin 53705 . . . . . FPL

General Electric Company
3198 Chestnut Street
Philadelphia, Pennsylvania 19101 . . . . . GE

Robert W. Hunt Company
810 South Clinton
Chicago, Illinois 60607. . . . . RWH

IIT Research Institute
(formerly Armour Research
Foundation)
10 West 35th Street
Chicago, Illinois 60616. . . . . IITRI

NAHB Research Foundation, Inc.
Research Laboratory
Rockville, Maryland. . . . . .NAHB

H. C. Nutting Company
4120 Airport Road
Cincinnati, Ohio 45226 . . . . . HCN

The Ohio State University
Building Research Laboratory
2070 Neil Avenue
Columbus, Ohio 43210 . . . . . OSU

The Pennsylvania State University
Research Institute
University Park, Pennsylvania 16802. . . . . PSU

Pittsburgh Testing Laboratory
1330 Locust Street
Pittsburgh, Pennsylvania 15219 . . . . . PTL

University of Detroit
Research Institute
Detroit, Michigan 48221. . . . . UD

UNCLASSIFIED MISCELLANEOUS

The American Institute of Architects
1735 New York Avenue, NW
Washington, D. C. 20006. . . . . AIA

American Public Health Association
1790 Broadway
New York, New York 10017 . . . . . APHA

American Society of Civil Engineers
United Engineering Center
345 East 47th Street
New York, New York 10017 . . . . . ASCE

American Society of Sanitary
Engineering
960 Illuminating Building
Cleveland, Ohio 44113. . . . . ASSE

American Water Works Association
2 Park Avenue
New York, New York 10016 . . . . . AWWA

Building Officials and Code
Administrators International, Inc.
1313 East 60th Street
Chicago, Illinois 60637. . . . . BOCA

Building Research Advisory Board
Division of Engineering
National Research Council
2101 Constitution Avenue
Washington, D. C. 20418. . . . . BRAB

International Association of Plumbing
& Mechanical Officials
5032 Alhambra Avenue
Los Angeles, California 90032. . . . . .IAMPO

International Conference of
Building Officials
5360 South Workman Mill Road
Whittier, California 90601 . . . . . ICBO

Manufacturing Chemists' Association, Inc.
1825 Connecticut Avenue, NW
Washington, D. C. 20006. . . . . MCA

Mineral Fiber Products Bureau
509 Madison Avenue
New York, New York 10022 . . . . . MFPB

Mobile Homes Manufacturers
Association
20 North Wacker Drive
Chicago, Illinois 60606. . . . . MHMA

National Association of
Building Manufacturers
1619 Massachusetts Avenue, N. W.
Washington, D. C. 20036. . . . . NABM

National Association of Home Builders
National Housing Center
1625 L Street, NW
Washington, D. C. 20036. . . . . NAHB

National Clay Pipe Institute
P. O. Box 310
350 West Terra Cotta Avenue
Crystal Lake, Illinois 60014 . . . . . NCPI

National Insulation Manufacturers
Association
441 Lexington Avenue
New York, New York 10017 . . . . . NIMA

National Mineral Wool Insulation
Association
Rockefeller Center
1270 Sixth Avenue
New York, New York 10020 . . . . . .NMWIA

National Research Council
Ottawa 2, Canada . . . . . NRC

National Society of Professional
Engineers
2029 K Street, NW
Washington, D. C. 20006. . . . . NSPE

Sheet Metal and Air Conditioning
Contractor's National
Association, Inc.
1611 North Kent Street
Arlington, Virginia 22209. . . . . SMACNA

Southern Building Code Congress
3617-Eighth Avenue, South
Birmingham, Alabama 35222. . . . . SBCC

Truss Plate Institute, Inc.
Suite 800
919 Eighteenth Street, NW
Washington, D. C. 20006. . . . . TPI

WOOD AND WOOD PRODUCTS

Acoustical and Insulating Materials
Association
205 West Touhy Avenue
Park Ridge, Illinois 60068 . . . . . .AIMA

American Hardboard Association
20 North Wacker Drive
Chicago, Illinois 60606. . . . . AHA

American Institute of Timber
Construction
333 W. Hampden Avenue
Englewood, Colorado 80110. . . . . .AITC

American Plywood Association
1119 A Street
Tacoma, Washington 98401 . . . . . APA-DFPA

American Wood Preservers'
Association
1625 Eye St., N. W.
Washington, D. C. 20006. . . . . .AWPA

American Wood Preservers'
Bureau
P. O. Box 6085
Arlington, Virginia 22206. . . . . .AWPB

American Wood Preservers'
Institute
1651 Old Meadow Road
McLean, Virginia 22101 . . . . . .AWPI

Appalachian Hardwood
Manufacturers, Inc.
1015 Mercantile Library Building
414 Walnut Street
Cincinnati, Ohio 45202 . . . . . AHM

Association of Timber and Timber
Treatment of Inspection Agencies
729 Fisher Road
Grosse Pointe, Michigan 48230. . . . . ATTTIA

California Redwood Association
617 Montgomery Street
San Francisco, California 94111. . . . . CRA

Hardwood Plywood Manufacturers
Association
P. O. Box 6246
Arlington, Virginia 22206. . . . . HPMA

National Forest Products Association
1619 Massachusetts Avenue, NW
Washington, D. C. 20036. . . . . .NFoPA

National Particleboard Association
2306 Perkins Place
Silver Springs, Maryland 20910 . . . . . NPA

Northeastern Lumber Manufacturers
Association, Inc.
13 South Street
Glen Falls, New York 12801 . . . . . .NELMA

Northern Hardboard and Pine
Manufacturers Association, Inc.
501 Northern Building
Green Bay, Wisconsin 54301 . . . . . .NHPMA

Product Fabrication Service
P. O. Box 5038
Madison, Wisconsin 53705 . . . . . PFS

Red Cedar Shingle and Handsplit
Shake Bureau
5510 White Building
Seattle, Washington 98101. . . . . RCSHSB

Lumber Manufacturers Association
805 Sterick Building
Memphis, Tennessee 38103 . . . . . .SHLMA

Southern Forest Products
Association
P. O. Box 52468
New Orleans, Louisiana 70150 . . . . . SFPA
(Formerly Southern
Pine Association)

Timber Engineering Company
5530 Wisconsin Ave., N. W.
Washington, D. C. 20015. . . . . TECO

Truss Plate Institute, Inc.
919-18th Street, N. W.
Washington, D. C. 20006. . . . . TPI

Western Wood Products
Association
1500 Yeon Building
Portland, Oregon 97204 . . . . . WWPA

APPENDIX B

ACCEPTED ENGINEERING PRACTICE STANDARDS

(See also appendices C, D, E, F and G for standards on specific materials or test of units or assemblies; some of which include engineering practice standards for specific applications.)

CONCRETE

Concrete Formwork-Recommended Practice for . . . . ACI 347-68
Inspection & Testing Agencies for
Concrete and Steel . . . . . ASTM E329-70
Manufacturing Reinforced Concrete Floor
and Roof Units-Recommended Practice for. . . . . ACI 512-67
Reinforced Concrete-Building Code
Requirements for . . . . . ACI 318-1971
Reinforced Concrete Structures, Manual of
Standard Practice for Detailing. . . . . ACI 315-1965
Reinforced Gypsum Concrete-Specifications
for . . . . . ANSI A59.1-1954
Welding Reinforcing Steel, Metal Inserts
and Connections in Reinforced Concrete
Construction, Recommended Practices for . . . AWS D 12.1-61

ELECTRICAL ILLUMINATION

Daylighting-Recommended Practices of . . . . . IES RP5-1962
Design Criteria for Lighting
Interior Living Spaces . . . . . .IES RP11-1969
Electrical Code-Massachusetts State. . . . . Mass-DPS-FPR 11
Industrial Lighting. . . . . ANSI A 11.1-1970
Lighting Handbook. IES-1972
Office Lighting-Recommended Practice . . . . . IES RPI-1966
School Lighting-Recommended Practice . . . . . IES RP3-1970

EQUIPMENT

Guide and Data Book, Applications. . . . . ASHRAE, 1968
Guide and Data Book, Equipment . . . . . ASHRAE, 1969
Guide and Data Book, Handbook of
Fundamentals . . . . . ASHRAE, 1967

Air Conditioning and Ventilating

Air Conditioning and Ventilating Systems
of Other Than Residence Type . . . . . NFiPA 90A-1973

Air Conditioning, Warm Air Heating, Residence Type . . . . . NFiPA 90B-1973
Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying . . . . .NFiPA 91-1973
Gas-Fired Absorption Summer Air Conditiong Appliances . . . . . ANSI Z 1.40.1-1969
Vapor Removal From Commercial Cooking Equipment . . . . . .NFiPA 96-1973

Elevators and Lifts

Automotive Lifts . . . . . USDC CS 142-65
Elevators, Dumbwaiters, Escalators and Moving Walks-Safety Code for . . . . . ANSI A17.1-1971
Manlifts-Safety Standard for . . . . . ANSI A90.1-1969

Heating

Boiler Code and Unfired Pressure Vessel Code ASME-1971
Central Heating Gas Appliances-Approved Requirements for
-Gas-Fired Gravity and Fan Type Floor Furnaces . . . . . ANSI Z21.48-1967
-Gas-Fired Gravity and Fan Type Vented Wall Furnaces . . . . . ANSI Z21.49-1972
-Gas-Fired Gravity and Forced Air Central Furnaces . . . . . ANSI Z21.47-1971
-Gas-Fired Low Pressure Steam and Hot Water Boilers . . . . . ANSI Z21.13-1972
Chimneys, Fireplaces and Venting Systems-Standard for . . . . . NFiPA 211-1972
Flue Linings, Sizes of . . . . . ANSI A62.4-1947
Gas-Fired Duct Furnaces . . . . . ANSI Z21.34-1971
Gas-Fired Gravity and Fan Type Sealed Combustion System Wall Furnaces. . . . . ANSI Z21.44-1971
Gas-Fired Heavy Duty Forced Air Heaters. . . . . .ANSI Z83.5-1967
Gas-Fired Room Heaters, Vol. 1, Vented Room Heaters-Approval Requirements for . . . . . ANSI Z21.11.1-1971
Gas-Fired Single Firebox Boilers . . . . . ANSI Z21.52-1971
Gas Unit Heaters . . . . . ANSI Z21.16-1971
Oil Burning Equipment. . . . . NFiPA 31-1972
Vented Decorative Gas Appliances . . . . . ANSI Z21.50-1968
Venting Systems, For Temperature Type L-Testing Standards for . . . . . ULI 641-1965

Incinerators

Air Setting Refractory Mortar. . . . . ASTM C178-1958
Domestic Gas-Fired Incinerators. . . . . .ANSI Z21.6-1969
Incinerator Standards. 11A-1970
Refractories for Incinerators. . . . . ASTM C106-1967

Refrigeration

Mechanical Refrigeration-Safety Code for. . . . . ASHRAE 15-1970 also ANSI B9.1-1971

Unclassified Miscellaneous

Draft Hoods, Listing Requirements for. . . .ANSI Z21.12-1937
Mobile Homes, Body and Frame Design and Construction and Installation of Plumbing, Heating and Electrical Systems. . . . . NFiPA 501B-1973
General Standards of Construction and Equipment for Hospital and Medical Facilities . . . . . USHEW HRA-74-4000
One- and Two-Family Dwelling Code. . . . . BOCA, AlnA, SSBC, ICBO-1971

FIRE PROTECTION AND SAFETY PRACTICES

Life Safety Code . . . . . .NFiPA 101-1973
NOTE: NFiPA 101-1973 is acceptable for matters of design of exits not provided for by this Code. Finish and Construction requirements incorporated therein are not applicable.
Aircraft Hangars . . . . . .NFiPA 409-1973
Cutting and Welding-Oxygen Fuel Gas Systems for . . . . . .NFiPA 51-1973
-in Confectionery Manufacturing Plants. . . . NFiPA 657-1967
Dip Tanks Containing Flammable or Combustible Liquids. . . . . NFiPA 34-1966
Dry-Cleaning and Dry-Dyeing, and the Keeping, Storage and Use of Cleaning and Dyeing Fluid in Connection Therewith. . . . . Mass-DPS FPR 2-1963
Dry Cleaning and Dry Dyeing Plants . . . . . NFiPA 32-1972
Dust Explosions and Ignition, Prevention of
-in Country Grain Elevators. . . . . NFiPA 64-1959
-in Flour and Feed Mills and Allied Grain Storage Elevators. . . . . .NFiPA 61C-1973
-in Grain Elevators, Bulk Handling Facilities. . . . . .NFiPA 61B-1973
-in Industrial Plants-Fundamental Principles for . . . . . NFiPA 63-1971
-in Plastic Industry . . . . . .NFiPA 654-1963
-in Spice Grinding Plants. . . . . .NFiPA 656-1959
-in Starch Factories . . . . . .NFiPA 61A-1973
Explosion Venting Guide. . . . . NFiPA 68-1954
Film, Motion Picture, Cellulose Nitrate-Storing and Handling of. . . . . NFiPA 40-1967
Flammable Fluids, Solids, or Gases-Keeping, Storage, Manufacture or Sale in Limited Quantities. . . . . .Mass-DPS FPR 13-1965
Garages
-Construction and Maintenance of Buildings or other Structures Used as Garages and the related Storage, Keeping and Use of Gasoline. . . . . Mass-DPS FPR 4-1968

-Parking Structures. . . . . .NFiPA 88A-1973
-Repair Garages. . . . . .NFiPA 88B-1973
Gases, Liquefied Petroleum
-Storage and Handling of . . . . . NFiPA 58-1972
-at Utility Gas Plants-Storage and Handling of. . . . . NFiPA 59-1968
Construction, Location, Installation and Operation of Liquefied Petroleum Gas Systems, Gas Piping and Appliance Installations in Buildings. . . . . Mass-DPS FPR 5-1962
Guide for Smoke and Heat Venting. . . . . NFiPA 204-1968
Incinerators, Rubbish Handling . . . . . NFiPA 82-1972
Liquids, Flammable . . . . . .NFiPA Vol. 1-1969-70
Liquids, Flammable and Combustible . . . . . NFiPA 30-1973
Outdoor Assembly, Places of (Grandstands, Tents and Air Supported Structures). . . . .NFiPA 102-1972
Piers and Wharves-Construction and Protection of . . . . . NFiPA 87-1971
Plastics-Manufacturing and Handling of . . . . . Mass-DPS FPR 6-1948
Pulverized Fuel Systems-Installation and Operation of . . . . . NFiPA 60-1973
Pyroxylin Plastics in Factories-Storage, Handling and Use of . . . . . NFiPA 42-1967
Pyroxylin Plastics in Warehouses, Wholesale and Retail Stores. . . . . NFiPA 43-1967
Recommended Safe Practices for Gas Shielded Are Welding. . . . . AWS A6.0-66
Safe Practices for Welding and Cutting Containers That Have Held Combustibles . . . . AWS A6.0-65
Safety in Welding and Cutting. . . . . ANSI Z49.1-1967
Safety Film, Motion Picture. . . . . ANSI PH22.31-1967
Spray Finishing Using Flammable and Combustible Materials. . . . . NFiPA 33-1973
Underground Flammable and Combustible Liquid Tanks, Leakage From . . . . . .NFiPA 329-1965

GLASS

Safety Glazing Material Used in Buildings, Performance, Specifications and Methods of Test for . . . . . ANSI Z97.1-1972

INTERIOR FINISHES

Gypsum Base for Veneer Plasters, Standard Specification for. . . . . ASTM C588-68

Gypsum Board Products and Gypsum Partitions Tile or Block, Physical Testing of . . . . . ASTM C473-70
Gypsum Lath, Standard Specification for. . . . . ASTM C37-69
Gypsum Plasters and Gypsum Concrete-Standard Method for Physical Testing of. . . .ASTM C472-73
Gypsum Plastering-Specifications for. . . . .ANSI A42.1-1964
Gypsum Plastering-Specifications for. . . . . .ASTM C28-68
Gypsum Veneer Plaster. . . . . .ASTM C587-68
Gypsum Veneer Plaster-Specifications for Application. . . . . .Gyp. Assoc.-1970
Gypsum Wallboard-Specifications for. . . . . ASTM C36-73
Application and Finishing of Wallboard Specifications for. . . . . .ANSI A97.1-1965
Interior Lathing and Furring-Specifications for. . . . . .ANSI A42.4-1967
Interior Marble-Specifications for. . . . . .ANSI A94.1-1961
Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior, Lathing and Furring for, Specifications for. . . . . .ANSI A42.3-1971
Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior, Lathing and Furring for, Specifications for. . . . . .ANSI A42.2-1971
Screw Type Steel Framing Members to Receive Gypsum Board. . . . . .GA 203-72
Tile, Ceramic, Installed with
-Chemical Resistant, Water Cleanable Tile-Setting Epoxy. . . . . ANSI A108.6-1969
-Dry-Set Portland Cement Mortar. . . . . .ANSI A108.5-1967
-Water Resistant Organic Adhesives. . . . . ANSI A108.4-1968
USDC CS181-1952
Tile, Ceramic Mosaic, Installed with Portland Cement Mortar. . . . . ANSI A108.2-1967
Tile, Glazed Ceramic Wall, Installed with Portland Cement Mortar. . . . . ANSI A108.1-1967
Tile, Quarry and Paver, Installed with Portland Cement Mortar. . . . . ANSI A108.3-1967
Vermiculite Plastering and Vermiculite Acoustical Plastic for Sound Conditioning-Standard Specifications for. VI-1963

MASONRY

Cold Weather Masonry Construction. . . . . .SCPI(BIA)-1968
Design and Construction of Loadbearing Concrete Masonry-Specifications for. NCMA-1970
Engineered Brick Masonry-Requirements for. . .SCPI(BIA)-1969
NOTE: This standard (SCPI(BIA)-1969) is only applicable to brick masonry of solid masonry units made from clay or shale.

Marble, Exterior Thin, in Curtain or Panel Walls-Specifications for. . . . . .ANSI A94.3-1961
Marble, Exterior Thin Veneer-Specifications for. . . . . .ANSI A94.2-1961
Marble, Interior-Specifications for. .(See Interior Finishes)
Masonry-Building Code Requirements for. . . . .ANSI A41.1-1953
Reinforced Masonry-Building Code Requirements for. . . . . .ANSI A41.2-1960
Shotcreting-Recommended Practice for. . . . . ACI 506-1966

ALUMINUM

Aluminum Construction Manual, Aluminum Formed Sheet Building Sheathing Design Guide. AA-1969
Aluminum Construction Manual, Specifications for Aluminum Structures. AA-1971

STEEL

Architecturally Exposed Structural Steel-Specification for. AISC-1960
Deep Longspan Steel Hoists, DLJ and DLH Series SJI/AISC-1972
Design of Cold-Formed Steel Structural Members-Specification for. AISI-1968
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Gas Systems for Welding and Cutting (See Fire Protection and Safety Practice)
Light Gauge Steel Studs, Runners, and Rigid Furring Channels, Specification for. . .ASTM C645-1970
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Open Web Steel Joists, J-Series and H-Series-Standard Specification for. SJI/AISC-1972
Steel Drill Screw Application of Gypsum Sheet Material to Light Gage Steel Studs, Specification for. . . . . .ASTM C646-72
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WOOD AND WOOD PRODUCTS

Adhesives for Field Gluing Plywood to Wood Framing. APA-1973
APA Glued Floor System. APA-1972
Hurricane-Resistant Plywood Construction. APA-1966
Pile Foundations Know How. AWPI-1969
Pole Building Design. AWPI-1969
Plywood Beams-Design and Fabrication of. APA-1972
Plywood Construction Systems. APA-1972
Plywood Curved Panels-Design of. APA-1968
Plywood Curved Panels-Fabrication of. APA-1971
Plywood Design Specifications. APA-1966
Plywood Diaphragm Construction. APA-1970
Plywood Folded Plate Fabrication. APA-1971
Preservative Treatment of Wood-Standard Instructions for the Inspection of. . . . . AWPA M2 1962
Pressure Treated Timber Foundation Piles for Permanent Structures. AWPI-1967
Pressure-Treated Wood Products--Standard for the Care of. . . . . .AWPA M4-1962
Span Tables for Joists and Rafters in Residential Construction. NFoPA-1970
Stress Grade Lumber and Its Fastenings-National Design Specifications for. NFoPA-1973
Structural Design Data-Wood. NFoPA-1970
Timber Construction Manual. AITC-1966
Timber Construction Standards (except AITC 117, 118 and 120). AITC-100-1972
Timber Structural Glued Laminated
-Inspection Manual for. . . . . AITC 200-73
-Standard for. . . . . AITC 103-65-1965
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Standards of Construction and
Equipment for. . . . . USHEW HRA-74-4000
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Loads, Minimum Design in Buildings and Other Structures,
Building Code Requirements for. . . . . .ANSI A58.1-1972
Safety Code for Vertical Shoring-
Recommended Standard. SSSI-68
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Standards for. . . . . ANSI A60.1-1949
Swimming Pools and Other Public Bathing Places,
Recommended Practice for Design, Equipment
and Operation. APHA-1957
Swimming Pools-Minimum Standards for. . Mass-DPH Article VI-1969
Welding in Building Construction-Code for. . . .AWS D1.0-69-1969

APPENDIX C

MATERIAL STANDARDS

(See also Appendix D for standards for tests of specific materials.)

CONCRETE

Aggregates, Concrete Specifications for.....ASTM C33-71a
Aggregates, Lightweight for Structural Concrete-Specifications for.....ASTM C330-69
Aggregates, Lightweight, for Concrete Masonry Units.....(See Masonry)
Aggregates, Lightweight, for Insulating Concrete-Specifications for.....ASTM C332-66
Forms for One-way Concrete Joist Construction-Types and Sizes of.....USDC PS 16-69
Gypsum Concrete-Specifications for.....ASTM C317-70
Manufacturing Reinforced Concrete Floor and Roof Units-Recommended Practice for.....ACI 512-67
Masonry Units-Concrete.....(See Masonry)
Natural Cement-Specifications for.....ASTM C10-70a
Portland Cement-Specifications for.....ASTM C150-72
Ready Mix Concrete-Specifications for.....ASTM C94-72
Reinforcing.....(See Metals)
Thin-Section Precast Concrete Construction-Minimum Requirements for.....ACI 525-1963
Vermiculite Concrete-Roofs and Slabs on Grade, Specifications for.....ANSI A122.1-1965
Waterproof Paper for Curing Concrete-Specifications for.....ASTM C171-69

INTERIOR FINISHES

Adhesives, Organic, for Installation of Ceramic Tile-Standard for.....ANSI A136.1-67
Aggregates, Inorganic, for use in Gypsum Plaster-Specifications for.....ASTM C35-70
Dry-Set Portland Cement Mortar-(For Ceramic Tile).....(See Masonry)
Epoxy, Chemical Resistant, Water Cleanable Tile-Setting and Grouting-Standard Specifications for.....ANSI A118.3-1969
Gypsum-Specifications for.....ASTM C22-1950
Gypsum and Gypsum Products, Chemical Analysis of-Standard Methods for.....ASTM C471-72
Gypsum Base for Veneer Plaster--Specifications for.....ASTM C588-68
Gypsum Board Products and Gypsum Partition Tile or Block, Physical Testing of-Standard Methods for.....ASTM C473-70

Gypsum Lath-Specifications for.....ASTM C37-69
Gypsum Plasters-Specifications for.....ASTM C28-68
Gypsum Plasters and Gypsum Concrete, Physical
Testing of-Standard Methods for.....ASTM C472-73
Gypsum Veneer Plaster-Specifications for.....ASTM C587-68
Gypsum Wallboard-Specifications for.....ASTM C36-73
Lime Hydrated, Normal Finishing-Specifications for.....ASTM C6-68
Lime Hydrated, Special Finishing-Specifications for..ASTM C206-68
Lime-Cement Stucco-Standard Specifications for....ANSI A42.5-1960
Quicklime and Hydrated Lime-Method of
Physical Testing of.....ASTM C110-71
Quicklime for Structural Purposes-Specifications for...ASTM C5-68
Tile, Ceramic-Standard Specifications for.....ANSI A137.1-67
Tile, Structural Clay-Specifications for.....ASTM C57-1957

MASONRY

Aggregate, Fine-Effect of Organic Impurities in,
on Strength of Mortar.....ASTM C87-69
Aggregates, Lightweight, for Concrete Masonry Units-
Specifications for.....ASTM C331-69
Aggregate for Masonry Grout-Specifications for.....ASTM C404-70
Aggregate for Masonry Motor-Specifications for.....ASTM C144-70
Brick, Building (Solid Masonry Units Made from
Clay or Shale)-Specifications for.....ASTM C62-69
Brick, Concrete Building-Specifications for.....ASTM C55-71
Brick, Face, Calcium Silicate (Sand Lime Brick)-
Specifications for.....ASTM C73-72
Brick, Facing (Solid Masonry Units Made from
Clay or Shale)-Specifications for.....ASTM C216-71
Brick, Hollow (Solid Masonry Units Made from
Clay or Shale)-Specifications for.....ASTM C652-1970
Brick, Sand-Lime Building-Specifications for.....ASTM C73-72
Cement, Blended Hydraulic-Specifications for.....ASTM C595-1968
Cement, Keene's-Specifications for.....ASTM C61-1964
Cement, Masonry-Specifications for.....ASTM C91-71
Ceramic Tile (Veneers).....(See Interior Finishes)
Clay Facing Tile, Structural-Specifications for.....ASTM C212-70
Clay Load Bearing Wall Tile, Structural-
Specifications for.....ASTM C34-70
Clay Nonload Bearing Screen Tile, Structural-
Specification for.....ASTM C530-70
Clay Nonload Bearing Wall Tile, Structural-
Specification for.....ASTM C56-71
Concrete Masonry, the Design and Construction
of Load Bearing.....NCMA-1971
Concrete Masonry Units, Hollow Load Bearing-
Specifications for.....ASTM C90-70
Concrete Masonry Units, Hollow Nonload Bearing-
Specifications for.....ASTM C129-71
Concrete Masonry Units, Solid Load Bearing-
Specifications for.....ASTM C145-71
Dry-Set Portland Cement Mortar-Standard
Specifications for.....ANSI A118.1-72

Glazed Units-Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units-Specifications for.....ASTM C126-71
Gypsum Partition Tile and Block-Specification for.....ASTM C52-72
Lime, Hydrated for Masonry Purposes-Specification for.....ASTM C207-68
Limes.....(See Interior Finishes)
Masonry Unit, Chemical Resistant.....ASTM C279-1954
Mineral Fiber Block and Board Thermal Insulation.....ASTM C612-1967T
Mortar and Grout for Reinforced Masonry-Specification for.....ASTM C476-71
Mortar for Unit Masonry-Specification for.....ASTM C270-71
Portland Cement-Specification for.....(See Concrete)
Refractories, Castable .....ASTM C401-1968

METAL

Alloy Steel Bolts, Quenched and Tempered, for Structural Steel Joints-Standard Specifications for.....ASTM A490-71
Alloy Steel Sheets and Strip, Regular Quality Hot-Rolled and Cold Rolled-Specification for.....ASTM A506-64
Aluminum-Alloy Bars, Rods and Wire-Standard Specifications for .....ASTM B211-72
Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes-Standard Specifications for.....ASTM B221-72
Aluminum-Alloy Die and Hand Forgings-Standard Specifications for.....ASTM B247-73
Aluminum Alloy Seamless Pipe and Seamless Extruded Tubing Standard Specifications for.....ASTM B241-72
Aluminum Alloy Sheet and Plate-Standard Specifications for.....ASTM B209-72a
Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded-Standard Specifications for ....ASTM B308-72
Aluminum-Alloy Drawn Seamless Tubes-Standard Specifications for.....ASTM B210-72
Aluminum-Alloy Extruded Structural Pipe and Tube-Standard Specifications for .....ASTM B429-72
Aluminum-Alloy Round Welded, Tubes-Standard Specifications for .....ASTM B313-72
Aluminum-Alloy Rivet and Cold Heading Wire and Rods-Standard Specifications for.....ASTM B316-72
Aluminum-Base Alloy Die Castings-Standard Specifications for .....ASTM B85-73
Aluminum Alloy Permanent Mold Castings-Standard Specifications for .....ASTM B108-72
Aluminum Alloy Sand Castings-Standard Specifications for .....ASTM B26-72
Aluminum Sliding Glass Doors-Specifications for.....AAMA 402.7-71
Aluminum Windows-Specifications for .....AAMA 302.7-71
Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding-Specifications for.....AWS A5.17-69

Bolts, High Strength, for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers-Specifications for.....ASTM A325-71
Bolts and Studs, Quenched and Tempered Steel, Specifications for.....ASTM A449-68
Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service-Specifications for.....ASTM A194-73
Carbon-Steel Castings Suitable for Fusion Welding for High Temperatue Service-Specifications for.....ASTM A216-70A
Carbon Steel Nuts-Specifications for.....ASTM A563-72
Carbon Steel Plates of Structural Quality, Low and Intermediate Tensile Strength-Specifications for, (Plate 2 inches and under in thickness).....ASTM A283-70a
Carbon Steel Strip, Cold-Rolled-Specifications for.....ASTM A109-72
Castings, Mild-to-Medium Strength Carbon Steel for General Application-Specifications for.....ASTM A27-71
Castings, Gray Iron-Specification for.....ASTM A48-71
Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Squares-Specifications for.....ASTM A500-72
Steel Castings for Structural Purposes, High Strength-Specifications for.....ASTM A148-71
Electrodes, Low Alloy Steel Covered Arc Welding-Specifications for.....AWS A5.5-69
Electrodes, Mild Steel Arc Welding Specifications for.....AWS A5.1-69
Forgings, Alloy Steel for General Industrial Use-Specifications for.....ASTM A237-67
Forgings, Carbon Steel for General Industrial Use-Specifications for.....ASTM A235-67
General Requirements for Carbon and High Strength Low Alloy Steel, Hot Rolled Strip, Hot Rolled Sheets, and Cold Rolled Sheets-Specifications for.....ASTM A568-71
High Strength, Low Alloy Structural Steel with 50,000 psi minimum yield point to 4 inches thick-Specifications for.....ASTM A588-71
Hot-Formed Welded and Seamless Carbon Steel Structural Tubing-Specifications for.....ASTM A501-71a
Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing-Specifications for.....ASTM A618-71
Hot Rolled Carbon Steel Sheets and Strip, Structural Quality-Specifications for.....ASTM A570-72
Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process for Roofing, Specification for.....ASTM A361-71

Structural Steel, High Strength Low Alloy
Columbium Vanadium-Specifications for.....ASTM A572-72
Structural Steel, High Strength Low Alloy
Manganese Vanadium-Specifications for.....ASTM A441-70a
Structural Steel, High Yield Strength,
Quenched and Tempered Alloy Steel Plate,
Suitable for Welding, Specifications for.....ASTM A514-70
Structural Steel with 42,000 psi Minimum Yield
Point (½ in. Maximum Thickness)-
Specification for.....ASTM A529-72

ROOFING AND SIDING

Asphalt for Dampproofing and Waterproofing-
Specifications for.....ASTM D449-71
Asphalt for Use in Constructing Built-Up
Roof Coverings-Specifications for.....ASTM D312-71
Asphalt Roll Roofing Surfaced with
Mineral Granules-Specification for.....ASTM D249-68
Asphalt Roll Roofing Surfaced with Powdered
Talc or Mica-Specifications for.....ASTM D224-68
Asphalt Shingles Surfaces with Mineral
Granules-Specifications for.....ASTM D225-70
Asphalt Siding Surfaced with Mineral
Granules-Specifications for.....ASTM D699-70
Fiberboard Nail-Base Sheathing-
Standard Specification for.....ASTM D2277-72
Fiber Insulation Board, Structural-
-Manufacturers Standards for Fiberboard
Nail-Base Sheathing .....IB Spec. No. 2-72
-Manufacturers Standards for Insulating
Roof Deck.....IB Spec. No. 1-70
-Method of Testing (Made from Vegetable
Fiber).....ASTM C209-66
-Specifications for (Made from Vegetable
Fiber).....ASTM C208-66
Formboard, Structural Insulating (Made from
Vegetable Fibers)-Specification for.....ASTM C532-66
Gypsum Sheathing Board-Specification for.....ASTM C79-67
Wood Shingles (Red Cedar, Tidewater, Red
Cypress and California Redwood).....USDC CS 31-52

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American Softwood Lumber Standard.....USDC PS20-70
Fireretardant Pressure Treatment, Plywood.....AWPA C27-70
Fireretardant Pressure Treatment,
Structural Lumber.....AWPA C20-70
Glue Laminated Structural Lumber Standards-
Structural Glued Laminated Southern Pine.....SPIB-65
Hardboard, Commercial Standard for.....USDC CS 251-63
Method for Establishing Structural
Grades of Lumber.....ASTM D245-70

Particleboard-Commercial Standard for.....USDC CS 236-66
Piles, Timber, Round-Specifications for.....ASTM D25-70
Piles, Wood Foundation, Creosotol.....AWPA C12-69
Plywood-Preservative Treatment for
Pressure Process.....AWPA C9-72
Preservative Treatment
-Of Lumber, Timber, Bridge Ties, and
Mine Ties (All Species)-Standards for.....AWPA C2-72
-Of Piles by Pressure Process-Standards for.....AWPA C3-72
-Of Poles by Pressure Process-Standards for.....AWPA C4-72
-By Pressure Process-All Timber Products-
Standards for.....AWPA C1-72
Quality Control Standards for Pressure-
Treated Lumber and Plywood
-With Creosote or Creosote Coal Tar
Solution (for Above Ground Use).....AWPB-LP-5-71
-With Creosote or Creosote Coal Tar
Solution (for Ground Contact).....AWPB-LP-55-71
-With Heavy Petroleum Solvent-Penta
Solution (for Above Ground Use).....AWPB-LP-7-71
-With Heavy Petroleum Solvent-Penta
Solution (for Ground Contact).....AWPB-LP-77-71
-With Light Petroleum Solvent-Penta
Solution (for above ground use).....AWPB-LP-3-71
-With Light Petroleum Solvent-Penta
Solution (for Ground Contact).....AWPB-LP-33-71
-With Volatile Petroleum Solvent (LPG)-
Penta Solution (for Above Ground Use).....AWPB-LP-4-71
-With Volatile Petroleum Solvent (LPG)-
Penta Solution (for Ground Contact).....AWPB-LP-44-71
-With Water-Borne Preservatives (for
Above Ground Use).....AWPB-LP-2-71
-With Water-Borne Preservatives (for
Ground Contact).....AWPB-LP-22-71
Shingles.....(See Roofing and Siding)
Glued Laminated Structural Lumber
Standards
-Structural Glued Laminated Members and
Laminations Before Gluing of Southern
Pine, Pacific Coast Douglas Fir and
Western Hemlock by Pressure Process.....AWPA C28-72
-Structural Glued Laminated Timber.....USDC PS 56-73
-Structural Glued Laminated Timber of
Douglas Fir, Western Larch, Southern
Pine and California Redwood.....AITC 117-1971
-U. S. Product Standard PSI-66 for
Softwood Plywood-Construction and
Industrial.....USDC-1970

UNCLASSIFIED MISCELLANEOUS

Felt-Methods of Testing.....ASTM D461-72
Flammability of Flexible Plastic-
Method of Test for.....ASTM D568-72

Flammability of Self-Supporting Plastic-
Method of Test for.....ASTM D635-72
Formboard, Gypsum-Specification for.....ASTM C318-67
Insulated Metal Roof Deck Standard.....FMED Standard 4450
Mortar, Ground Fire Clay.....ASTM C105-1947
Perlite Loose Fill Insulation-
Standard Specifications for.....ASTM C549-67
Plastics-Defintions of Terms Relating to.....ASTM D883-72
Plastics, Deformation of, Under Load-
Method of Test for.....ASTM D621-64
Preservatives for Wood
-Creosote-Standards for .....AWPA P 1-65
-Creosote, Coal Tar Solutions-Standards for.....AWPA P 2-68
-Oil-Borne Preservative-Standards for.....AWPA P 8-64
-Oil-Borne Solvents-Standards for.....AWPA P 9-72
-Water-Borne Preservatives-Standards for.....AWPA P 5-72
Thickness of Solid Electrical Insulation-
Method of Test for.....ASTM D374-73
Vermiculite Loose Fill Insulation-
Standard Specifications for.....ASTM C516-67

APPENDIX D

STRUCTURAL UNIT TEST STANDARDS

(See also appendices B and C for engineering practice standards and material standards which contain unit test methods.)

CONCRETE

Coarse Aggregates, Resistance to Abrasion of Small Size, by use of the Los Angeles Abrasion Machine-Test for.....ASTM C131-69
Fine and Coarse Aggregates Sieve or Screen Analysis of-Test of (A 37.8-1967).....ASTM C136-71
Concrete, Obtaining and Testing Drilled Cores and Sawed Beams of.....ASTM C42-68
Concrete Test
-Compression and Flexure Test Specimens in the Field, Making and Curing.....ASTM C31-1966
-Sampling Fresh.....ASTM C172-1968
-Specimens in the Laboratory-Making and Curing.....ASTM C192-69
Concrete, Molded Cylinders-Test for Compressive Strength of.....ASTM C39-72
Lightweight Insulating Concrete, Compressive Strength-Test for.....ASTM C495-69
Concrete Masonry Units-Sampling and Testing (A 84.1-1967).....ASTM C140-70
Concrete Masonry Units, Hollow Load Bearing-Specifications for.....ASTM C90-70
Concrete Masonry Units, Solid Load Bearing-Specifications for (A 81.1-1967).....ASTM C145-71
Concrete, Hardened Portland Cement-Test for Cement Content of (A 1.22-1967).....ASTM C85-66
Concrete, Portland Cement-Test for Slump of.....ASTM C143-1966
Concrete, Ready Mixed-Specifications for (A 37.69-1967)..... ASTM C94-71
Sands for Concrete-Test for Organic Impurities on.....ASTM C40-72

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Gypsum and Gypsum Products, Chemical Analysis of-Standard Methods for.....ASTM C471-72
Gypsum Board Products and Gypsum Partition Tile or Block, Physical Testing of-Standard Methods for..ASTM C473-68
Gypsum Concrete-Specifications for.....ASTM C317-70
Gypsum Formboard-Specifications for.....ASTM C318-67
Gypsum Lath-Specifications for.....ASTM C37-69
Gypsum Plasters-Specifications for.....ASTM C28-68
Gypsum Plasters and Gypsum Concrete, Physical Testing of-Standard Methods for.....ASTM C472-70
Gypsum Sheathing Board-Specifications for.....ASTM C79-67

Gypsum Wallboard-Specifications for.....ASTM C36-70
Insulating Board, (Made from Vegetable fiber)
-Methods of Testing.....ASTM C209-66
-Specifications for.....ASTM C208-66
Lime.....(See Masonry)

MASONRY

Aggregate for Masonry Mortar-Specifications for.....ASTM C144-70
Brick, Concrete Building-Specifications for.....ASTM C55-71
Brick-Methods of Testing and Sampling.....ASTM C67-66
Cement, Masonry-Specifications for.....ASTM C91-71
Ceramic Tile (Veneers) .....(See Interior Finishes)
Chemical Analysis of Limestone, Quicklime and
Hydrated Lime.....ASTM C25-72
Concrete Masonry Units.....(See Concrete)
Glazed Units-Ceramic Glazed Structural Clay
Facing Tile, Facing Bricks and Solid Masonry
Units-Specifications for.....ASTM C126-71
Lime and Limestone Products-Methods of Sampling,
Inspection, Packing and Marking of.....ASTM C50-68
Lime, Hydrated and Quick-Methods of Physical
Testing of.....ASTM C110-71
Lime, Hydraulic Hydrated for Structural Purposes-
Specifications for.....ASTM C141-67
Mortars, Hydraulic Cement-Method of Test for
Compressive Strength of (Using 2 inch cube
Specimens)..... ASTM C109-70T
Mortars, Hydraulic Cement-Method of Test for
Tensile, Strength of.....ASTM C19--72
Stone, Natural Building-Methods of Test for
Absorption and Bulk Specific Gravity of.....ASTM C97-70
Stone, Natural Building-Method of Test for
Compressive Strength of.....ASTM C170-70
Stone, Natural Building-Methods of Test for
Modulus of Ruptures of.....ASTM C99-70

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Cast Iron-Method of Testing Compression of.....ASTM A256-46
Metallic Materials-Methods of Tension Testing of.....ASTM E8-69

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Cement, Hydraulic-Methods of Sampling.....ASTM C183-71
Cement, Natural-Specifications for.....ASTM C10-70a
Cement, Portland-Specifications for.....ASTM C150-72
Clay Pipe, Testing .....ASTM C301-72
Plastics Under Load-Method of Test for Deforma-
tion of.....ASTM D621-64
Tile, Clay Drain-Specifications for.....ASTM C4-70

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Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials.....ASTM D1037-72
Timber, Small Clear Specimens-Method of Testing.....ASTM D143-72
Timbers in Structural Sizes-Methods of Static Tests of.....ASTM D198-67
Veneer, Plywood and Other Glued Veneer Construction-Methods of Testing.....ASTM D805-72

APPENDIX E

STRUCTURAL ASSEMBLY TEST STANDARDS

(See also appendix D for standards for test of unit materials.)

Metal Fasteners in Wood, Testing of.....ASTM D1761-68
Heavy Truss Assemblies, Testing.....ASTM E73-70
Panels for Building Construction-Methods of Conducting Strength Test of.....ASTM E72-68

APPENDIX F

DURABILITY TEST STANDARDS

(See also appendices C, D and E for tests of individual materials or unit assemblies.)

CONCRETE AND CONCRETE AGGREGATE

Concrete, Aggregate-Method of Tests for Voids in. . . . . .ASTM C30-70
Concrete, Air Content of Freshly Mixed, by the Pressure Method-Method of Test for. . . . . ASTM C231-72
Concrete, Weight per Cubic Foot, Yield and Air Content of-Method of Test for. . . . . ASTM C138-71T
Organic Impurities in Sand for Concrete-Method of Test for. . . . . .ASTM C40-72

MASONRY AND MASONRY PRODUCTS

Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units-Specifications for (Autoclave Test). . . . . .ASTM C126-71
Freezing and Thawing Tests (See Specifications for Materials)
-Bricks-Methods of Sampling and Testing. . . . . ASTM C67-66
-Drain Tile-Specifications for. . . . . ASTM C4-70

PLASTICS

Water Absorption of Plastics-Methods of Test for ASTM D570-72

ROOFING AND SIDING

Asphalt Roll Roofing, Cap Sheets, and Shingles-Methods of Testing. . . . . ASTM D228-69
Bituminous Materials, Accelerated Test of Weathering-Recommended Practice for. . . . . .ASTM D529-73
Felted and Woven Fabrics Saturated with Bituminous Substance for Use in Waterproofing and Roofing-Methods of Sampling and Testing. . . . . ASTM D146-72

UNCLASSIFIED MISCELLANEOUS

Fibre Building Boards-Method of
Accelerated Aging. . . . . .ASTM D1037-72
Gypsum and Gypsum Products, Chemical Analysis of-
Standard Methods for. . . . . .ASTM C471-72
Gypsum Board Products and Gypsum Partition
Tile or Block, Physical Testing of-
Standard Methods of. . . . . ASTM C473-68
Gypsum Plasters and Gypsum Concrete, Physical
Testing of-Standard Methods for. . . . . ASTM C472-70

APPENDIX G

FIRE TEST AND FLAME SPREAD TEST STANDARDS

COMBUSTIBLE OR NONCOMBUSTIBLE PROPERTIES

Fire Hazard Classification of Building Materials-Test Method for.....ULI Standard Test Method Subject 723-1960
Fireretardant Treatments of Building Materials.....NFiPA 703-1961
Flameresistant Textiles and Films, Standard Method of Tests for.....NFiPA 701-1969
Noncombustibility of Elementary Materials-Method of Test for Determining.....ASTM E136-65
Plastics-Standard Method of Test for Measuring the Density of Smoke from the Burning or Decomposition of.....ASTM D2843-1970
Wood Treated-Method of Test for Combustible Properties of
-by the Crib Test.....ASTM E160-69
-by the Fire Tube Apparatus.....ASTM E69-69

FIRERESISTANCE PROPERTIES

Building Construction and Materials-Method of Fire Test of..... ASTM E119-71
Ceiling Construction.....(See Building Construction)
Door Assemblies-Methods of Fire Tests of.....ASTM E152-72
Plastics, Ignition Properties of-Test for.....ASTM D1929-1968
Roof Coverings-Method of Fire Test of.....ASTM E108-70
Window Assemblies-Standard Methods of Fire Tests of.....ASTM E163-1965

FLAME SPREAD PROPERTIES

Flameresistance Tests-Acoustical Units, Prefabricated.....Fed. Spec. SS-5-118A-67
Flameresistant Textiles and Films-Standard Methods of Fire Test for.....NFiPA 701-1969
Surface Burning Characteristcs of Building Materials-Method of Test for.....ASTM E84-70
Textile Test, Method 5190-Burning Rate of Cloth; Thirty Degree Angle.....U. S. Federal Test Method Standard 191-1968

FLASH POINT

Fuel Oils, by Pensky-Masters Closed Tester-Methods of Test for Flash Point.....ASTM D93-72
Liquids other than Fuel Oil, by Tag Closed Tester-Method of Test for Flash Point (JTNW DO1-2400).....ASTM D56-70
Flash and Fire Points by Cleveland Open Cup-Method of Test for.....ASTM D92-72

APPENDIX H

FIRE PROTECTION STANDARDS

ALARM AND DETECTING SYSTEMS

Alarms Systems, Public Fire Service Communications..NFiPA 73-1973
Signaling Systems, Central Station Protective--
For Watchman, Fire Alarm and Supervisory Service,
Installation, Maintenance and Use of.....NFiPA 71-1972
Signaling Systems--Installation, Maintenance and Use
-Local Protective.....NFiPA 72A-1972
-Auxiliary Protective.....NFiPA 72B-1972
-Remote Station Protective.....NFiPA 72C-1972
-Proprietary Protective.....NFiPA 72D-1972

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Air Conditioning and Ventilating Systems
-other than Residence Type.....NFiPA 90A-1973
-Residence Type.....NFiPA 90B-1973
Aircraft Hangars.....NFiPA 409-1973
Doors, Tin-Clad Fire.....ULI 10(a)-68
Dust Explosion Prevention.....(See App. B)
Fire Dampers.....ULI Standard 555-1970
Fire Doors and Windows--Standard for.....NFiPA 80-1973
Fireresistance Ratings.....AIA-1968
Hardware, Sliding, for Standard Horizontally Mounted
Tin-Clad Fire Doors.....ULI 14(b)-1973
Hardware, Swinging, for Standard Tin-Clad Fire
Doors.....ULI 14(c)-1973
Equipment, Materials Service for Conservation of
Property Approval Guide 1973.....FMED-73

PROTECTION SYSTEMS

Carbon Dioxide Extinguishing Systems.....NFiPA 12-1973
Extinguishers, Portable Fire--Installation.....NFiPA 10-1973
Extinguishers, Portable Fire, Maintenance and Use.NFiPA 10A-1973
Foam Extinguishing Systems.....NFiPA 11-1973
Foam-Water Sprinkler and Foam-Water Spray Systems..NFiPA 16-1968
Hose Systems.....(See Standpipe
and Hose Systems)
Outside Protection (Yard Piping).....NFiPA 24-1973
Private Fire Brigades--Organization, Training and
Equipment of.....NFiPA 27-1967
Pumps, Centrifugal Fire-Installation of.....NFiPA 20-1972
Sprinkler Systems
-Installation of.....NFiPA 13-1973
-Care and Maintenance of.....NFiPA 13A-1971
Standpipe and Hose Systems.....NFiPA 14-1973
Valves Controlling Water Supplies for Fire Protection--
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Water Tanks for Private Fire Protection.....NFiPA 22-1971
Water Spray Systems.....NFiPA 15-73

APPENDIX I

UNIT DESIGN DEAD LOADS FOR STRUCTURAL DESIGN PURPOSES

WALLS AND PARTITIONS (UNPLASTERED)

	Pounds per Square Foot
12 inch common brick	120
12 " pressed brick	130
12 " sand-lime brick	105
12 " hollow concrete block--Stone Aggregate	74
Lightweight	55
10 " hollow concrete block--Stone Aggregate	62
Lightweight	46
8 " hollow concrete block--Stone Aggregate	50
Lightweight	36
6 " hollow concrete block--Stone Aggregate	42
Lightweight	36
4 " hollow concrete block--Stone Aggregate	27
Lightweight	20
12 " solid concrete block--Stone Aggregate	108
Lightweight	72
10 " solid concrete block--Stone Aggregate	84
Lightweight	62
8 " solid concrete block--Stone Aggregate	67
Lightweight	48
6 " solid concrete block--Stone Aggregate	50
Lightweight	37
4 " solid concrete block--Stone Aggregate	45
Lightweight	34
12 " combination brick and clay tile	80
8 " " " " "	60
12 " combination brick and concrete block	90
8 " " " " " "	72
12 inch load bearing clay tile	60
8 " " " " "	40
6 " " " " "	36
4 " " " " "	24
10 " non-load bearing clay tile	40
8 " " " " "	36
6 " " " " "	30
4 " " " " "	20
3 " " " " "	18
2 " " " " "	11
8 " non-load bearing hollow concrete block	40
6 " " " " " "	30
4 " " " " " "	20
T.C. 1½ inch split terra cotta furring	8
2 inch split terra cotta furring	10
3 " " " " "	12
6 " hollow gypsum block	24
5 " " " "	18
4 " " " "	15
3 " " " "	10

	Pounds per Square Foot
4 inch solid gypsum block	24
3 " " " "	18
2 " " " "	12
4 " glass block	18

	Pounds per Cubic Foot
Cast stone solid	144
Granite ashlar	168
Limestone ashlar	168
Marble ashlar	168
Sandstone ashlar	156
Rubble stone masonry	156
Terra cotta architectural (filled)	120
Terra cotta architecutral (unfilled)	72
Concrete, stone (plain)	144
Concrete, stone (reinforced)	150
Concrete, cinder	108
Fill, cinder	60
Earth (dry)	96
Earth (damp)	108
Earth (wet)	120
Cork	15
Timber, Ash	40
Timber, Douglas Fir	36
Timber, Cypress	30
Timber, Hemlock	30
Timber, Oak	48
Southern Pine, Short Leaf	36
Southern Pine, Long Leaf	48
Redwood	28
Spruce	30

PLASTER WORK

	Pounds per Square Foot
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

SUSPENDED CEILINGS

	Pounds per Square Foot
Cement on wood lath	12
Cement on metal lath	15
Gypsum on wood or metal lath	10

LATH AND PLASTER PARTITIONS

	Pounds per Square Foot
2 inch solid cement on metal lath	25
2 " solid gypsum on metal lath	18
2 " " " on gypsum lath	18
2 " metal studs gypsum & metal lath both sides	18
3 " " " " " " " " "	19

Pounds per Square Foot

4 inch metal studs gypsum & metal lath both sides.....20
6 inch wood studs plaster and wool lath, both sides.....18
6 " " " " " metal lath, both sides.....18
6 " " " " " plaster boards, both sides.....18
6 " " " unplastered gypsum board, both sides (dry wall).....10

FLOOR AND ROOF CONSTRUCTION — Pounds per Square Foot

Cinder fill per inch depth..... 5
Cinder concrete per inch depth..... 9
Stone concrete per inch depth.....12
Floor finish tile per inch depth.....12
Cement finish per inch depth.....12
Gypsum slabs per inch depth..... 4
Precast concrete plank per inch depth (as determined by test)
Hardwood flooring per inch depth..... 4
Underflooring per inch depth..... 3
Linoleum..... 2
Asphalt tile..... 2

ROOFS AND ROOFING — Pounds per square Foot

Metal Skylights.....10
3-ply roofing..... 4
4 " " 5
5 " " 6
Wood sheathing (1")..... 3
Plywood sheathing (5/16")..... 1
Corrugated iron roofing..... 3
Formed steel decking..... 3
Sheet lead..... 3
Slate tile roofing.....10
Cement tile.....16
Spanish tile.....20
Shingles, asbestos..... 6
Shingles, asphalt..... 6
Shingles, wood..... 6

APPENDIX J

UNIT WORKING STRESSES FOR ORDINARY MATERIALS

Unless otherwise specified herein, the allowable working stresses for ordinary materials, as defined in sections 701 and 722, shall be reduced ten (10) percent below the recommended values of the accepted engineering standards listed in the reference standards of article 8. 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 accepted engineering standards.

J-1 MASONRY STRESSES

J-1-A MORTAR FOR UNIT MASONRY: Mortar for unit masonry shall comply with either the proportion specifications as set out in section 816.2, or shall meet the property specifications of the accepted engineering standard listed in the reference standards of article 8. Unless laboratory data are presented to show that the mortar meets the requirements of the property specifications, the proportion specifications shall govern.

J-1-B COMPRESSIVE STRESSES: Except as permitted in other sections of the Basic Code, the compressive stresses in masonry shall not exceed the values as shown in table J-1.

J-1-C SHEAR AND TENSILE STRESSES: Except as permitted in other sections of the Basic Code, the allowable shear or tensile stresses in masonry shall not exceed the values permitted in the accepted engineering practice standards listed in the reference standards of article 8.

TABLE J-1 ALLOWABLE COMPRESSIVE STRESSES GROSS CROSS-SECTIONAL AREA (EXCEPT AS NOTED)

TYPE OF MASONRY AND GRADE OF MASONRY UNIT (PSI GROSS AREA)	TYPE OF MORTAR			
	M	S	N	O
	psi	psi	psi	psi
Solid masonry of brick and other solid units of clay or shale; sand-lime or concrete:				
8000 plus psi	400	350	300	200
from 4500 to 8000 psi	250	225	200	150
from 2500 to 4500 psi	175	160	140	100
from 1500 to 2500 psi	125	115	100	75
Grouted masonry of solid masonry units:				
from 4500 to 8000 psi	350	275	200	-
from 2500 to 4500 psi	275	215	155	-
from 1500 to 2500 psi	225	175	125	-
Solid masonry of solid concrete masonry units:				
1800 plus psi	175	160	140	100
from 1200 to 1800 psi	125	115	100	75
Masonry of hollow units	85	75	70	-
Hollow walls (cavity or masonry bonded)[1]				
Solid masonry units				
2500 plus psi	140	130	110	-
from 1500 to 2500 psi	100	90	80	-
Hollow masonry units	70	60	55	-
Stone ashlar masonry				
Granite	800	720	640	500
Limestone or marble	500	450	400	325
Sandstone or cast stone	400	360	320	250
Rubble stone, coursed, rough or random	140	120	100	80

Note 1: On gross cross-sectional area of wall minus area of cavity between wythes. The allowable comprehensive stresses for cavity walls are based upon the assumption that the floor loads bear upon but one (1) of the two (2) wythes. Where hollow walls are loaded concentrically, the allowable stresses may be increased by twenty-five (25) percent.

J-2 REINFORCED CONCRETE STRESSES

The allowable working stresses for ordinary materials shall be based on the following proportions (see table J-2) by dry volumetric measurement and maximum water content per sack of cement in accordance with the standard requirements for reinforced concrete specified in the reference standards of article 8 subject to the ten (10) percent reduction prescribed for ordinary materials.

J-3 REINFORCED GYPSUM CONCRETE STRESSES

When ordinary materials are used, the allowable working stresses shall be based on the following proportions, measured dry by weight with sufficient water to make a plastic mix that will fill the forms: one hundred (100) percent neat calcined gypsum; ninety-seven (97) percent gypsum and three (3) percent wood chips, shavings or fibers; and eighty-seven and five tenths (87.5) percent gypsum and twelve and five tenths (12.5) percent wood chips, shavings or fibers; with ultimate compressive strengths of eighteen hundred (1,800), one thousand (1000) and five hundred (500) pounds per square inch, respectively.

The working stresses shall not exceed the values prescribed in the standard for reinforced gypsum concrete listed in the reference standards of article 8 subject to the ten (10) percent reduction prescribed for ordinary materials.

J-4 STEEL REINFORCEMENT STRESSES

The allowable working stresses for reinforcement specified in the standard requirements for reinforced concrete listed in the reference standards of article 8 shall be used in all reinforced construction, including reinforced concrete, reinforced gypsum concrete and all forms of reinforced masonry subject to the ten (10) percent reduction specified for ordinary, unidentified materials.

J-5 STRUCTURAL STEEL STRESSES

When ordinary materials which are not identified as to manufacture and grade are used, the allowable working stresses specified in the standard for design, fabrication and erection of structural steel listed in the reference standards of article 8 shall be reduced ten (10) percent.

TABLES J-2 MAXIMUM WATER-CEMENT RATIOS AND MINIMUM CEMENT CONTENTS

SPECIFIED COMPRESSIVE STRENGTH [1] (PSI)	MINIMUM SACKS OF CEMENT PER CUBIC YARD OF CONCRETE	MAXIMUM PERMISSIBLE WATER-CEMENT RATIOS			
		NON-AIR-ENTRAINED CONCRETE		AIR-ENTRAINED CONCRETE	
		Absolute ratio by weight	U.S. Gal. per 94 lb. bag of cement	Absolute ratio by weight	U.S. Gal. per 94 lb. bag of cement
2500	5	0.65	7.3	0.54	6.1
3000	5½	0.58	6.6	0.46	5.2
3500	6	0.51	5.8	0.40	4.5

Note 1: 28-day strengths for cements meeting strength limits of ASTM C150, type I, IA, II OR IIA and 7-day strengths for type III and IIIA.

J-6 CAST IRON STRESSES

	Maximum stress in pounds per square inch
Tension	3,000
Extreme Tension (Fiber Stress in Bending)	3,000
Extreme Compression (Fiber Stress in Bending)	16,000
Shear	3,000
Column Compression	9,000 minus 40 $\frac{l}{r}$

Ratio $\frac{l}{r}$ not to exceed seventy (70)

J-7 COLD FORMED STEEL CONSTRUCTION STRESSES

When ordinary materials which are not identified as to manufacture and grade are used, the allowable working stresses specified in the standard for the Design, Fabrication and Erection of Cold-Formed Structural Steel listed in the reference standards of article 8, shall be reduced ten (10) percent.

J-8 LUMBER STRESSES

When the grade of lumber is not identified as provided in section 722 for controlled materials, the maximum allowable working stresses for the species of lumber used shall be determined in accordance with the principles for stress grade lumber as set forth in the National Design Specification for Stress-Grade Lumber and Its Fastenings, listed in the reference standards of article 8.

APPENDIX K

SPECIALIZED CODES

Executive Office of Public Safety
Department of Public Safety
BOARD OF FIRE PREVENTION REGULATIONS

FPR-2	Rules and Regulations Governing Dry-Cleaning and Dry-Dyeing and the Keeping, Storage and Use of Cleaning and Dyeing Fluid in Connenction Therewith
FPR-3	Rules and Regulations 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
FPR-4	Rules and Regulations Governing the Construction and Maintenance of Buildings or Other Structures Used as Garages, and the Related Storage, Keeping and Use of Gasoline.
FPR-5	Rules and Regulations Governing the Construction, Location, Installation and Operation of Liquefied Petroleum Gas Systems, Gas Piping and Appliance Installations in Buildings
FPR-6	Rules and Regulations Governing the Manufacturing and Handling of Plastics
FPR-8	Rules and Regulations Governing Construction, Location, Use and Maintenance of Tanks and Containers
FPR-9	Rules and Regulations for the Purpose of remedying any Condition Found to Exist in or about any Building or Other Premises or on any Ship or Vessel in Respect to Fires, the Prevention of Fire and Fire Hazards
FPR-11	Massachusetts State Electrical Code

FPR-13 Rules and Regulations Governing the Keeping, Storage, Manufacture or Sale in Limited Quantities of Flammable Fluids, Solids or Gases

BOARD OF BOILER RULES

BLR-1 Part I of Steam Boiler Rules

BLR-1-A Part I-A of Steam Boiler Rules, Atomic Energy Installations

BLR-2 Part II of Steam Boiler Rules, Power and Miniature Class

BLR-3 Low Pressure Steam-Heating Boilers

BLR-4 Part IV - Steam Boiler Rules

BLR-5 Part I - Air Tank Regulations, Installation and Inspection

BLR-6 Part II - Air Tank Regulations, Installation and Inspection

BLR-7 Refrigeration and Air Conditioning

BLR-8 Material Specifications

BLR-9 Welding Specifications

BLR-11 Fiberglass-Reinforced Plastic Pressure Vessels

BOARD OF ELEVATOR REGULATIONS

ELV-1 Elevator and Escalator Regulations

ELV-2 Elevator, Dumbwaiter, Escalator, and Moving Walk Regulations

BOARD TO FACILITATE THE USE OF PUBLIC BUILDINGS BY THE PHYSICALLY HANDICAPPED

PHR-1 Rules and Regulations of the Board to Facilitate the Use of Public Buildings by the Physically Handicapped

Executive Office of Consumer Affairs
Department of Public Utilities
GAS REGULATORY BOARD

Massachusetts Code for Installation of Gas Appliances and Gas Piping

Division of Registration
BOARD OF STATE EXAMINERS OF PLUMBERS

Massachusetts State Plumbing Code

Executive Office of Human Services
Department of Public Health
DIVISION OF ENVIRONMENTAL HEALTH

The State Sanitary Code

ARTICLE I	General Application and Administration
ARTICLE II	Minimum Standards of Fitness for Human Habitation
ARTICLE III	Housing and Sanitation Standards for Farm Labor Camps
ARTICLE IV	Sanitation Standards for Recreational Camps for Children
ARTICLE VI	Minimum Standards for Swimming Pools
ARTICLE VIII	Minimum Standards for Developed Family Type Camp Grounds
ARTICLE X	Minimum Sanitation Standards for Food Service Establishments

DIVISION OF HEALTH CARE AND STANDARDS

Designer's Guide (Bureau of Planning and Construction)

Licensure Rules and Regulations for Hospitals in Massachusetts, 1971

Intensive Care Unit Amendment, May 26, 1972

Rules and Regulations for the Licensure of Dispensaries and Clinics, 1964

Rules and Regulations for General Standards of Construction-Long Term Care Facilities in Massachusetts, September 29, 1972

Executive Office of Manpower Affairs
Department of Labor and Industries
DIVISION OF INDUSTRIAL SAFETY

Industrial Bulletin No. 12	Rules and Regulations for Prevention of Accidents on Construction Operations
Industrial Bulletin No. 13	Revised Rules and Regulations and Recommendations Pertaining to Structural Painting
Industrial Bulletin No. 18	Lighting Code for Factories, Workshops, Manufacturing, Mercantile Establishments

Executive Office of Environmental Affairs
Outdoor Advertising Division
OUTDOOR ADVERTISING BOARD

Rules and Regulations for the Control and Restriction of Billboards, Signs, and other Advertising Devices, October 1, 1973

APPENDIX L

LIST OF AGENCIES AND DEPARTMENTS ON THE TECHNICAL CODE COUNCIL

Board to Facilitate the Use of Public Buildings by the
Physically Handicapped
Department of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
Mr. Robert Lynch, Chairman . . . . . (617) 566-4500

Board of Boiler Rules
Department of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
Mr. John K. Olsen, Supervising District
Engineering Inspector. . . . . (617) 566-4500

Board of Elevator Regulations
Department of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
Mr. Adam Strachan, Chairman. . . . . (617) 566-4500

Board of Fire Prevention Regulations
Department of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
Mr. Samuel Gronich, Chairman . . . . . (617) 566-4500

Board of Schoolhouse Structural Standards
Department of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
Mr. Francis S. Harvey, Acting Chairman . . . (617) 566-4500

Board of State Examiners of Electricians
Division of Registration
100 Cambridge Street
Boston, MA 02202
Mr. John F. Cullen, Executive Secretary. . . (617) 727-3050

Board of State Examiners of Plumbers
Division of Registration
100 Cambridge Street
Boston, MA 02202
Mr. Irving J. Risi, Executive Secretary. . . (617) 727-3046

Bureau of Community Sanitation
Department of Public Health
600 Washington Street
Boston, MA 02100
Mr. Harold Rose, Senior Sanitary Engineer. . (617) 727-2656

Bureau of Engineering and Construction
Department of Public Health
80 Boylston Street
Boston, MA 02116
Mr. Richard Knapp, Director. . . . . (617) 727-8985

Division of Environmental Health
Department of Public Health
600 Washington Street
Boston, MA 02100
Mr. John C. Collins, Director. . . . . (617) 727-2690

Division of Health Care Standards
Department of Public Health
80 Boylston Street
Boston, MA 02116
Dr. Harvey Remmer, Acting Director . . . . . (617) 727-7836

Division of Industrial Safety
Department of Labor and Industries
100 Cambridge Street
Boston, MA 02202
Mr. Everett L. Grady, Director . . . . . (617) 727-3567

Division of Inspection
Department of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
Mr. John R. Loynd, Acting Chief of
Inspections. . . . . (617) 727-5152

Division of Outdoor Advertising
Executive Office of Environmental Affairs
80 Boylston Street
Boston, MA 02116
Mr. Peter B. Bronson, Acting
Executive Director . . . . . (617) 426-0708

Engineering and Maintenance
Department of Mental Health
190 Portland Street
Boston, MA 02114
Mr. James Kerr, Director . . . . . (617) 727-5647

Gas Regulatory Board
Department of Public Utilities
100 Cambridge Street
Boston, MA 02202
Mr. George Coogan, Chairman. . . . . .(617) 727-3539

Mobile Home Commission
1153 Boston Road
Springfield, MA 01119
Mr. Frank C. Gotta, Chairman . . . . . .(413) 783-6114

Office of the State Fire Marshal
Department of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
Mr. Joseph G. Sneider, State Fire Marshal . .(617) 566-4500

State Building Code Commission
Department of Community Affairs
141 Milk Street
Boston, MA 02109
Mr. Charles J. Dinezio,
Executive Secretary. . . . . .(617) 727-6916

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The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Possibly lack changes A-D (may be incorporated into the basic volume).

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

Amendments to the State Building Code

Date Filed April 11, 1975

Date Published April 22, 1975

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.

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The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

Michael S. Dukakis
GOVERNOR
Charles A. J. Theodore
CHAIRMAN
CHARLES J. DINEZZIO
EXECUTIVE DIRECTOR

(617) 727-6916

April 11, 1975

The Honorable Paul Guzzi
Secretary of Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of Chapter 802 of the Acts of 1972 as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on March 7, 1975 at 100 Cambridge Street, Boston on proposed amendments to the State Building Code, has adopted the attached 26 amendments to the Commonwealth of Massachusetts State Building Code. Also attached is Section 2100.10, which was adopted by the State Building Code Commission under the emergency provisions of Chapter 30A, Section 2(3) on January 9, 1975.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of Chapter 802 of the Acts of 1972.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:lms

Enclosures

SECTION 101.0

Add the following to the end of Section 101.0:

EXCEPT AS PROVIDED OTHERWISE IN THE BASIC CODE,

a) All buildings and structures erected or substantially altered prior to the effective date of the Basic Code shall meet, and shall be presumed to meet, the provisions of the applicable codes, rules or regulations, by-laws or ordinances in effect at the time such building or structure was erected or substantially altered.

b) In cases where no applicable codes, rules or regulations, by-laws or ordinances were in use at the time of such erection or substantial alteration, the provisions of section 104.0 of the Basic Code shall apply.

c) In cases where the provisions of the Basic Code are less stringent than the applicable codes, rules or regulations, by-laws or ordinances in force at the time of such erection or substantial alteration, the applicable provisions of the Basic Code shall apply, providing such application of these provisions does not result in danger to the public as determined by the building official.

SECTION 108.15

Add after the second sentence in Section 108.15 the following sentences:

Municipalities may waive the fees specified in Table 1-1 for buildings and structures, or parts thereof, owned by the municipality and for buildings and structures, or parts thereof, used solely for religious purposes. All state-owned buildings are exempt from said fees.

SECTION 113.52

After Section 113.51 add the following new subsection:

113.52 ARCHITECTS' AND ENGINEERS' SEAL: Unless otherwise provided in the Basic Code, all plans and specifications for buildings and structures containing more than thirty-five thousand (35,000) cubic feet of enclosed space shall bear the Massachusetts seal of registration of a qualified registered professional engineer or architect.

SECTION 130.0

After Section 129.0 add the following new section:

SECTION 130.0 FIRE PREVENTION - FIRE PROTECTION BOARD

SECTION 130.1

After Section 130.0 add the following new subsection:

130.1 CONSTITUTION OF THE FIRE PREVENTION - FIRE PROTECTION BOARD: There shall be a board under the control of the commission called the Fire Prevention - Fire Protection Board, hereinafter in section 130 called the board, which shall consist of eleven (11) members, two (2) of whom shall be members of the commission; one (1) of whom shall be the State Fire Marshal or his designee, all three (3) of whom shall be ex officio and voting members of the board, and eight (8) members to be appointed by the Chairman of the Commission for a term of one (1) year; three (3) of whom shall be representatives of the Fire Chiefs Association; two (2) of whom shall be representatives of the Massachusetts Fire Prevention Association; one (1) of whom shall be a representative of the International Municipal Signalmen's Association; one (1) of whom shall be a member of the Board of Fire Prevention Regulations and one (1) of whom shall be a Fire Protection Engineer. A chairman and a vice chairman shall be chosen by the members of the board to serve for one (1) year. A member of an agency or board of the state shall not be eligible for the office of chairman or vice chairman.

SECTION 130.2

After Section 130.1 add the following new subsection:

130.2 PURPOSE: The board will review and recommend to the Commission changes to the Basic Code relating to fire prevention and fire protection and more specifically those matters as contained in article 12 of the Basic Code.

SECTION 418.0

Repeal Section 418.0 of the State Building Code filed and promulgated on July 1, 1974 and substitute the following:

SECTION 418.0 AMUSEMENT PARKS

All buildings and structures used as part of an amusement park shall be subject to this Code. This section specifically includes any building or structure supporting a moving device. The jurisdiction of structures or buildings is limited to the points of interface of the moving device and rails, said device is to be controlled by Form B-11, Rules and Regulations for the Safety, Construction and Operation of Ferris Wheels, Carousels, Inclined Railways or Similar Amusement Devices, filed with the Secretary of State on December 16, 1974.

SECTION 418.1

Repeal Section 418.1 of the State Building Code filed and promulgated on July 1, 1974.

SECTION 422.8

Add the following sentence to the end of Section 422.8.

Cities or towns may enact by-laws or ordinances for enclosing private swimming pools by requiring the installation of fences or equivalent enclosures or means of protection from access to the pool.

SECTION 427.0

On the third line of Section 427.0, change the word "shall" which follows the words Office of Children to the word "may".

SECTION 427.12

On the first line of Section 427.12 change the title from "BASEMENT USE" to "CELLAR USE" and also on the first line change the word "basement" to "cellar".

SECTION 427.13

After Section 427.12 add the following new subsection:

427.13 ROOF USE: In buildings of type 1, 2A, and 2B construction, the roof may be used subject to the requirements of section 427.0.

SECTION 427.21

Repeal Section 427.21 of the State Building Code filed and promulgated on July 1, 1974 and substitute the following:

427.21 CELLARS: Where the cellar is used as the day care center, or part thereof, two (2) separate and independent means of egress shall be provided, remote as possible from each other, one (1) of which shall lead directly to grade. Required stairways shall be of at least one (1) hour fireresistive construction, and the stairways shall contain smoke/heat detectors connected to audible alarms in the day care center.

SECTION 427.22

Repeal Section 427.22 of the State Building Code filed and promulgated on July 1, 1974 and substitute the following:

427.22 BASEMENT USE: Where the basement is used as the day care center, or part thereof, the means of egress shall comply with the requirements of section 427.21, except that where the required stairway does not exceed nine (9) feet in vertical height smoke/heat detectors shall not be required.

SECTION 427.23

Repeal Section 427.23 of the State Building Code filed and promulgated on July 1, 1974 and substitute the following:

427.23 EGRESS CAPACITY FOR CELLARS: Every required egress below grade shall be adequate to provide for the intended full capacity of the occupancy in accordance with tables 6-1 and 6-3.

SECTION 427.24

Change the title of Section 427.24 by adding the words "OR CELLAR" after the word "BASEMENT" in the title. Also, add the following two new paragraphs to the end of Section 427.24.

In buildings of type 1, 2A, and 2B construction, except for L-2 use groups, equipped with a fire suppression system in compliance with section 1212.0, a single common corridor shall be acceptable for providing access to two (2) means of egress as required in this section.

Common corridors may be subdivided, for the purpose of section 427.0 to provide separate and independent exitways by using smoke stop partitions complying with the provisions of the Basic Code. The doors in the smoke stop partitions may be equipped with an automatic hold open device connected to smoke/heat detectors and designed to close automatically by activation of the smoke/heat detectors.

SECTION 427.25

Repeal Section 427.25 of the State Building Code filed and promulgated on July 1, 1974 and substitute the following:

427.25 EGRESS FROM EACH ROOM: Two (2) approved egresses located as remotely as possible from each other shall be provided for each room used for day care center use. One (1) such required egress may be by communicating door.

SECTION 427.26

Repeal Section 427.26 of the State Building Code filed and promulgated on July 1, 1974 and substitute the following:

427.26 ROOF EGRESS: Where the roof is used for a day care center two (2) enclosed stairways, remote as possible from each other, shall be provided leading to an exitway on a floor below or directly to a required exitway stairway. The stairways shall comply with all the provisions of section 427.0 and the Basic Code.

SECTION 427.27

On the first and second lines of Section 427.27 delete the words "as required by the building official and".

SECTION 427.4

Repeal "a)" in Section 427.4 and substitute the following:

a) the upper rail shall be not less than thirty (30) inches nor more than thirty-three (33) inches, measured vertically, above the nosing of the threads.

SECTION 427.7

Repeal Section 427.7 of the State Building Code filed and promulgated on July 1, 1974 and substitute the following:

427.7 ROOFS: Where a roof, or part thereof, is used for a day care center, there shall be a solid, smooth non-climbable fence or barrier a minimum of seven (7) feet high on all sides and separating the day care center area from any other uses. Fences shall be set back at least three (3) feet from the outside edge of the exterior wall. A weatherproof telephone or equivalent means of communication shall be provided.

SECTION 427.8

After Section 427.7 add the following new subsection:

427.8 All areas serving as day care centers shall have fire alarm systems as provided in Section 1218.213.

SECTION 427.9

After Section 427.8 add the following new subsection:

427.9 FLOOR AND CEILING PROTECTION: When the occupied floor is above any usable space, the floor assembly shall have three-quarter (3/4) hour fire rating, or the floor below shall be provided with smoke/heat detectors which will sound an audible alarm throughout the day care center.

SECTION 612.2

In Section 612.2, fifth paragraph, after the first sentence add the following new sentence:

Interior doors in dwelling units shall be a minimum of six (6) feet six (6) inches in height.

Add the following new paragraph to the end of Section 612.2:

The minimum clear width of any interior doorway, in dwelling units, except in closets and storage areas, shall be two (2) feet six (6) inches.

SECTION 1901.0 (DEFINITIONS)

Add to the end of the definition for "BUILDING COMPONENT" in Section 1901.0 the following words:

having concealed elements and/or identification.

SECTION 2100.10

The first sentence of Section 2100.10 is hereby repealed and the following is substituted:

In one and two-family dwellings, each dwelling unit shall have two (2) independent means of egress, remote as possible from each other and leading to grade; in addition, every floor within a dwelling unit shall have at least one (1) means of egress which shall provide a continuous and unobstructed path leading to grade.

SECTION 2100.11

On the second line of Section 2100.11 add after the word "doorways" the words "to habitable rooms".

In the third paragraph change six (6) feet eight (8) inches to six (6) feet six (6) inches.

Add the following new paragraph to the end of Section 2100.11:

The minimum clear width of any interior doorway, except in closets and storage areas, shall be two (2) feet six (6) inches.

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on April 11, 1975.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: John J. Twomey
Assistant Attorney General

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

Amendments to the State Building Code Commission Sec. 851.1 & 2102.2

Date Filed April 17, 1975

Date Published April 25, 1975

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.

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The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

Michael S. Dukakis
GOVERNOR

Charles A. J. Theodore
CHAIRMAN

CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

(617) 727-6916

April 17, 1975

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENT TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of Chapter 802 of the Acts of 1972 as amended, the State Building Code Commission, after proper notice and publication, and having conducted its public hearing on March 7, 1975 at 100 Cambridge Street, Boston, on proposed amendments to the State Building Code, has adopted the attached amendment to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of Chapter 802 of the Acts of 1972.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:lms

Enclosure

Effective immediately, Sections 851.1 and 2102.2 of the Commonwealth of Massachusetts State Building Code are suspended for one (1) year to allow the following:

Native mill lumber, which is ungraded, shall be acceptable with the approval of the building official for type 4 structures only.

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted this amendment to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

SECRETARY OF STATE
PUBLIC RECORDS
APR 17 4 24 PM '75

Filed with the Secretary of the Commonwealth on April 17, 1975

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence P. O'Malley
Assistant Attorney General

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

Amendments to the State Building Code

Date Filed May 19, 1975

Date Published May 23, 1975

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

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The Commonwealth of Massachusetts
State Building Code Commission
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ael S. Dukakis
GOVERNOR

rles A. J. Theodore
CHAIRMAN

ARLES J. DINEZIO
ECUTIVE DIRECTOR

(617) 727-6916

May 19, 1975

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 6, 1975 at 100 Cambridge Street, Boston on proposed amendments to the State Building Code, has adopted the attached 12 amendments to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

MAY 19 11 56 AM '75
SECRETARY OF STATE
PUBLIC RECORDS DIVISION

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:lms

Enclosures

SECTION 113.52

Add the following paragraph to the end of Section 113.52

> Plans, specifications, plats and records whenever stamped with the seal of a registered professional engineer or architect shall be signed by the registrant named thereon. The use of a facsimile signature stamp shall not be deemed to comply with this section.

SECTION 207.0

On the sixth line of Section 207.0, add after the words "civic administration activities" the word "courthouses".

On the seventh line of Section 207.0, add after the words "professional services" the words "clinics operated on an outpatient basis which do not harbor patients overnight".

SECTION 209.2

On the third line of Section 209.2, add after the word "clinics" the words "which are intended to be used for harboring patients overnight".

Add to the end of Section 209.2 after the word "uses", the words "but not including courthouses (see Use Groupe E)".

SECTION 610.31

After Section 610.3, add the following new section:

> 610.31 HEIGHT: A clear height of seven (7) feet six (6) inches shall be provided for at least seventy-five (75) percent of the floor area of the exitway corridors with no point less than seven (7) feet in height. No projection below the ceiling shall be located so as to obstruct the full view of exitway.

SECTION 1206.0

On the second and third lines of Section 1206.0, delete the words "and all buildings heretofore erected".

TABLE 12-1 (SECTION 1206.11)

Amend the "Conditions" contained in Table 12-1 under Section 1206.11 for use groups B-1, C, D and E to read as follows:

"3 stories and >3,000# per floor"

Add under use group L-1 the word "(Hotels)" to read as follows:

"L-1 (Hotels)"

RULES AND REGULATIONS FOR MANUFACTURED BUILDINGS, BUILDING COMPONENTS AND MOBILE HOMES

Under Section 1.2 Definitions, amend the "State Administrative Agencies" as follows:

On the fifth line add after the words "Massachusetts Board of Fire Prevention Regulations" the words "Massachusetts State Examiners of Electricians".

SECTION 1905.11

After Section 1905.1 add the following new section:

1905.11 ROOF LOADS: Section 6.4 of the 1974 edition of the ANSI A119.1, "Standards for Mobile Homes, Body and Frame Design and Construction Requirements, and the Installation of Plumbing, Heating and Electrical Systems" is modified to read as follows: NORTH ZONE: 35 lb/ft^2 (including wind and snow loads).

SECTION 1905.2

On the fourth line of Section 1905.2, add after the words "(1974 edition)" the words "as amended by the State Building Code Commission".

SECTION 2100.13

On the fourth line of Section 2100.13, change "six (6) feet four (4) inches" to "six (6) feet six (6) inches".

On the third and fourth lines, second paragraph, of Section 2100.13 delete the words "and the minimum width is not less than six (6) inches".

FIGURE 2100-1 (SECTION 2100.13)

In Figure 2100-1, change the minimum headroom from: - 6'8" to 6'6".

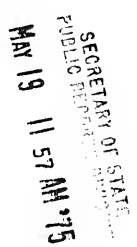
SECTION 2104.5

On the third and fourth lines of Section 2104.5 change the words "three-quarter (3/4) inch" to "one-quarter (1/4) inch".

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted this amendment to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission



Filed with the Secretary of the Commonwealth on May 19, 1975.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence P. O'Malley
Assistant Attorney General

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

Amendments

Date Filed June 16, 1975

Date Published June 23, 1975

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

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The Commonwealth of Massachusetts
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CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

(617) 727-6916

June 16, 1975

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 6, 1975 at 100 Cambridge Street, Boston on proposed amendments to the State Building Code, has adopted the attached 9 amendments to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:av

Enclosures

SECTION 107.8

Repeal Section 107.8 of the State Building Code in its entirety and substitute the following new section:

107.8 RESTRICTION ON EMPLOYEES: No full-time building commissioner, inspector of buildings, or full-time local inspector as defined herein shall be engaged in, or directly or indirectly connected with, the furnishing of labor, materials or appliances for the construction, alteration or maintenance of a building or structure, or the preparation of plans or of specifications therefor within the city, town or region for which he is appointed, unless he is the owner of the building or structure; nor shall any officer or employee associated with the building department engage in any work which conflicts with his official duties or with the interests of the department.

SECTION 108.15

Repeal Section 108.15 of the State Building Code in its entirety and substitute the following new section:

108.15 INSPECTION AND CERTIFICATION - SPECIFIED USE GROUPS: The building official shall periodically inspect and certify buildings and structures or parts thereof in use groups F, H, L-1, and L-2, according to Table 1-1. No certificate of inspection as herein specified shall be issued until an inspection is made certifying that the building or structure, or parts thereof, complies with all the applicable requirements of the Basic Code. Municipalities may waive, alter or amend, in whole or in part, all fees specified in Table 1-1 for buildings and structures, or parts thereof. All state-owned buildings are exempt from said fees. A copy of said certificate shall be kept posted as specified in section 121.2.

SECTION 416.821

On the fourth line change the words "five (5) foot candles" to "one (1) foot candle".

SECTION 416.822

On the fourth line change the words "five (5) foot candles" to "one (1) foot candle".

SECTION 503.3

On the fourth line change the words "three (3) foot candles" to "one (1) foot candle".

SECTION 612.41

Repeal Section 612.41 of the State Building Code in its entirety and substitute the following new section:

612.41 DOOR LOCKING MECHANISMS: All locks and fastenings on egress doors shall be readily openable from the inner side without the use of keys. Except for egress doors in dwelling units, the use of so-called draw bolts, hooks, and similar devices shall be prohibited. The following shall be acceptable as door-locking mechanisms for egress doors: crash bars, push paddles, quarter-turn knobs and T handles.

Exception: A locking device to be used only after the normal course of business hours to prevent theft may be used on exit doors from a bank, trust company, jewelry store, or other similar stores or establishments.

SECTION 623.1

Repeal Section 623.1 of the State Building Code in its entirety and substitute the following new section:

623.1 SIZE AND LOCATION: Except in one and two-family dwellings (L-3), and in exitways serving only three or fewer dwelling units in L-2 multi-family dwelling uses, all required exitways shall be provided with exit signs sufficient in number to indicate at any point in the required exitway the approved direction of egress discharge. Such signs shall incorporate, as an approved symbol, the word "EXIT". Such symbol and lettering shall be at least six (6) inches in height. Such signs shall have either red outlines on a white background or the reverse, and shall be made of noncombustible material. All required exit signs shall be illuminated in conformance with section 623.2 and shall be of an approved type.

SECTION 623.2

On the third line change the word "wherever" to "whenever".

On the last line change the words "twenty-five (25) foot candles" to "five (5) foot candles".

SECTION 624.2

On the second line change the words "three (3) foot candles" to "one (1) foot candle".

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on June 16, 1975.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

Amendment to Section 111.43

Date Filed July 1, 1975

Date Published July 11, 1975

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

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1000(4)9-75-R134956-0697 Estimated Cost Per Copy: $0.08

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The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

Michael S. Dukakis
GOVERNOR
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CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

(617) 727-6916

July 1, 1975

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENT TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 6, 1975 at 100 Cambridge Street, Boston on proposed amendments to the State Building Code, has adopted the attached amendment to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:lms

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted this amendment to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on July 1, 1975.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

PUBLISHED
JUL 11 1975
SECRETARY'S OFFICE

SECTION 111.43

Repeal Section 111.43 of the State Building Code in its entirety.

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

AMENDMENTS TO BUILDING CODE, s 101.3, etc. . . . . .

Date Filed December 30, 1974

Date Published December 31, 1974

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
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The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

IS W. SARGENT
GOVERNOR
ON STULL
CHAIRMAN
LES J. DINEZIO
TIVE SECRETARY

(617) 727-6916

December 30, 1974

Honorable John F. X. Davoren
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of Chapter 802 of the Acts of 1972 as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 1, 1974 at 100 Cambridge Street Boston on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of Chapter 802 of the Acts of 1972.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:av

Enc.

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code.

A true Copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on December 30, 1974.

Approved as to matter of form:

ROBERT H. QUINN
Attorney General

By: _____
First Assistant Attorney General

ARTICLE 1

CODE AMENDMENTS

REPEAL SECTION 101.3 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

101.3 ZONING RESTRICTIONS: When the provisions herein specified for structural strength, adequate egress facilities, sanitary conditions, equipment, light and ventilation, and fire safety conflict with the local zoning by-laws or ordinances, the Basic Code shall control the erection or alteration of buildings.

REPEAL SECTION 106.5 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

106.5 PHYSICAL VALUE: In applying the provisions of this section, the physical value of the building, at the option of the owner, shall be based on the assessed value of the building as recorded in the assessor's office of the municipality or on the basis of the current replacement cost of the building less physical deterioration, provided that satisfactory evidence of the current replacement cost less physical deterioration is submitted to the building official for his approval.

AFTER SECTION 107.8 ADD THE FOLLOWING NEW SUBSECTION:

107.9 RELIEF FROM PERSONAL LIABILITY: Insofar as the law allows, while acting for the municipality, the building official, charged with the enforcement of the Basic Code shall not be deemed personally liable in the discharge of his official duties.

REPEAL SECTION 108.14 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

108.14 INSPECTIONS: The building official shall make all the required inspections. The building official may accept reports of inspections from a qualified registered professional engineer or architect or others certified by the Commission, and all reports of such inspections shall be in writing; or the building official may engage such expert as he may deem necessary to report upon unusual technical issues that may arise.

REPEAL TABLE 1-1 CONTAINED ON PAGE 1-9 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE ATTACHED TABLE:

REPEAL SECTION 108.15 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

108.15 INSPECTION AND CERTIFICATION - SPECIFIED USE GROUPS: The building official shall periodically inspect and certify buildings and structures or parts thereof in use groups F, H, L-1, and L-2, according to Table 1-1. No certificate of inspection as herein specified shall be issued until an inspection is made, certifying that the building or structure, or parts thereof, complies with all the applicable requirements of the Basic Code, and until the fee is paid as specified on Table 1-1. A copy of the certificate of inspection shall be kept posted as specified in section 121.2.

REPEAL SECTION 109.11 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

109.11 LICENSING OF CONSTRUCTION SUPERVISORS: Effective January 1, 1976, any individual directly supervising persons engaged in construction, reconstruction, alterations, repairs, removal or demolition involving the structural elements of buildings and structures shall be licensed according to the "RULES AND REGULATIONS FOR LICENSING CONSTRUCTION SUPERVISORS." No city or town shall be prohibited from requiring such licensing of construction supervisors from January 1, 1975, through December 31, 1975.

REPEAL SECTION 111.43 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

111.43 CHANGE OF OCCUPANTS - DWELLING UNITS: When any dwelling unit is vacated, the building official shall be so notified by the owner before the unit is re-occupied within any twelve-month period. Upon determination of the building official, said dwelling unit may be inspected to determine if said unit conforms to the Basic Code. A dwelling unit shall be inspected within three (3) working days from the date of notification or it shall be deemed to be approved for occupancy. Nothing in this section is intended to require an owner to so notify the building official where another vacancy occurs within a twelve-month period of a prior notification.

REPEAL SECTION 113.5 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING.

113.5 PLANS AND SPECIFICATIONS: The application for the permit shall be accompanied by not less than three (3) copies of specifications and of plans drawn to scale, with sufficient clarity and detail dimensions to show the nature and character of the work to be performed. When quality of materials is essential for conformity to the Basic Code, specific information shall be given to establish such quality; and in no case shall the code be cited or the term "legal" or its equivalent be used as a substitute for specific information. The building official may waive the requirement for filing plans when the work involved is of a minor nature.

All plans filed with the building official shall include but not be limited to:

a) The accurate locations and dimension of all means of egress from fire and an occupancy schedule of persons for all occupiable spaces.

b) The method and amount of ventilation and sanitation.

c) The methods of fire stopping as required in this code.

d) Schedules and details indicating compliance of interior trim and finish with provisions of article 9.

REPEAL SECTIONS 127.0, 127.11 and 127.12 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

127.0 CONSTRUCTION MATERIALS SAFETY BOARD

127.11 CONSTITUTION OF THE CONSTRUCTION MATERIALS SAFETY BOARD: There shall be a board under the control of the commission called the Construction Materials Safety Board, hereafter in section 127 called the board, which shall consist of nine (9) members, one (1) of whom shall be a member of the commission who shall be ex officio and a voting member of the board, and eight (8) members to be appointed by the Chairman of the commission; one of whom shall be a registered professional engineer who is a structural engineer; one of whom shall be a registered architect; one of whom shall be a representative of a Commercial Testing Laboratory; one of whom shall be a representative of a Public Testing Laboratory; two of whom shall be representatives from the construction industry; one of whom shall be a member of a university faculty engaged in research and teaching in structural materials; and one of whom shall be a member of a university faculty engaged in research and teaching in the area of theoretical and applied mechanics.

127.12 CONSTRUCTION MATERIALS SAFETY BOARD: The board will review applications for registration for licensing of individuals and laboratories responsible for the inspection, control and testing of construction materials and report to the State Building Code Commission their recommendations. The board will collect information and review cases where disciplinary action against an existing license, whether an individual, laboratory or firm, has been proposed, and make recommendations to the State Building Code Commission. The commission will issue applications, receive payment of registration and licensing fees, and maintain records for the efficient dispatch of the duties of the board. The board shall submit to the commission reports from time to time as requested by the commission, but at least annually.

TABLE 1-1 -- REQUIRED MINIMUM INSPECTIONS AND CERTIFICATION FOR SPECIFIED USE GROUPS
(See ARTICLE 2 for complete descriptions of use groups.)

USE GROUP			INSPECTIONS	CERTIFICATIONS	FEES*
F-1-A	Assembly Theatres (accommodating over 400)	With stage and scenery	Monthly	Annually	150
F-1-B		Without Stage Movie Theatre	Semi-Annually	Annually	50
F-2	Assembly -- Night clubs and similar uses (accommodating over 400)		Semi-Annually	Annually	50
F-3	Assembly -- Lecture halls, recreation centers, terminals, etc. (accommodating over 400)		Semi-Annually	Annually	50
F-1-A	Assembly Theatres (accommodating 400 or less)	With stage and scenery	Prior to the issuance of each new certificate	Annually	25
F-1-B		Without stage Movie Theatre		Annually	25
F-2	Assembly -- Night clubs and similar uses (Accommodating 400 or less)			Annually	25
F-3	Assembly -- Lecture halls, recreation centers, terminals, etc. (Accommodating 400 or less)			Annually	25
F-4	Assembly -- Churches, low density recreation			Up to five years	25
F-5	Assembly -- Grandstands, bleachers, etc.			Every two years	50
F-6	Assembly -- Schools: 10 or more students			Every two years	50
F-7	Assembly -- All places of assembly accommodating between 20 and 49 persons			Annually	25
H-1	Institutional -- Restrained			Every two years	50
H-2	Institutional -- Incapacitated			Every two years	50
L-1	Residential -- Hotels			Annually	50
L-2	Residential -- Multi-Family			Up to five years	50

*FEES: (Applicable to the issuance of new certificates of inspection)

ARTICLE 2

CODE AMENDMENTS

THE FOLLOWING DEFINITION TO BE ADDED AFTER THE EXISTING DEFINITION FOR "AIRPLANE HANGAR" CONTAINED IN SECTION 201.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974:

AISLE: A clear and unobstructed passageway through a room.

THE FOLLOWING DEFINITION TO BE ADDED AFTER THE EXISTING DEFINITION FOR "CHIMNEY CONNECTOR" CONTAINED IN SECTION 201.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974:

CLASSROOM: A room with desks or equivalent used for group instruction purposes for ten (10) or more students. For the purpose of the provisions contained in Section 460.0, libraries, study halls, science laboratories, shops, domestic science rooms and typing rooms shall be considered classrooms for the number of students indicated in the occupancy schedule.

REPEAL THE DEFINITIONS UNDER "DWELLINGS" RELATIVE TO "ONE-FAMILY DWELLING; TWO-FAMILY DWELLING; MULTI-FAMILY APARTMENT HOUSE; BOARDING HOUSE, TOURIST HOME; LODGING HOUSE; DORMITORY; AND HOTEL;" CONTAINED IN SECTION 201.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

-ONE-FAMILY DWELLING: A building containing one (1) dwelling unit with not more than three (3) lodgers or boarders. L-3 Use Group.

-TWO-FAMILY DWELLING: A building containing two (2) dwelling units with not more than three (3) lodgers or boarders per dwelling unit. L-3 Use Group.

-MULTI-FAMILY APARTMENT HOUSE: Any building or portion thereof used as a multiple dwelling for the purpose of providing three (3) or more separate dwelling units with shared means of egress. L-2 Use Group.

-BOARDING HOUSE, TOURIST HOME: A building arranged or used for lodging, with or without meals, by more than three (3) lodgers or boarders. L-1 Use Group.

-LODGING HOUSE: Any building or portion thereof arranged or used for lodging by more than three (3) lodgers or boarders and where cooking or sanitary facilities may be provided. L-1 Use Group.

-DORMITORY: A space in a unit where group sleeping accommodations are provided, with or without meals, for persons not members of the same family group, in one room, or in a series of closely associated rooms under joint occupancy and single management, as in college dormitories, fraternity houses, military barracks and ski lodges. Use Group L-1.

-HOTEL: Any building containing six (6) or more guest rooms intended or designed to be used, or which are used, rented or hired out to be occupied or which are occupied for sleeping purposes by guests. Use Group L-1.

THE FOLLOWING DEFINITION TO BE ADDED AFTER THE EXISTING DEFINITION "HAZARD" CONTAINED IN SECTION 201.0 OF THE STATE BUILDING CODE, FILED AND PROMULGATED ON JULY 1, 1974:

HEAD OF THE FIRE DEPARTMENT: The chief executive officer of the fire department in a city, town or fire district having such an officer, otherwise the fire commissioner, board of fire commissioners or fire engineers, or commissioner of public safety; and in towns not having a fire department, the chief engineer, if any, otherwise the chairman of the board of selectmen. The words "head of the fire department" shall be construed, where the content allows, as though followed by the words "or person delegated by him."

THE FOLLOWING DEFINITION TO BE ADDED BEFORE THE DEFINITION FOR "REFRIGERANT" CONTAINED ON PAGE 2-15 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974:

RAISED PLATFORM: A raised portion of floor to be used for simple stage purposes that involves a minimum of fire hazard, so located that it extends not more than eighteen (18) feet behind the probable curtain line of the proscenium opening and of an area limited to seventeen and one-half (17.5) percent of the assembly room floor area of 1,550 square feet, whichever is less.

THE FOLLOWING DEFINITION TO BE ADDED AFTER THE DEFINITION FOR "SCAFFOLD" CONTAINED ON PAGE 2-16 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974:

SCHOOLHOUSE: Any building or premise in which a regular course of public or private instruction is given to not less than ten (10) students at one time except for rooms in buildings spearate from or attached to churches used for the primary purpose of religious instruction.

REPEAL SECTION 208.6 CONTAINED ON PAGES 2-25 AND 2-26 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

208.6 USE GROUP F-6 STRUCTURES shall include those buildings, structures, premises and parts thereof in which a regular course of public or private instruction is given to not less than ten (10) individuals at one time. Schools or rooms used for religious instruction which are under the jurisdiction or administration of a church or other defined religious body are regulated under Use Group F-4.

F-1B Schoolhouse Use: Schoolhouse structures or parts thereof used for F-1B assembly shall include all halls without a stage, except for a raised platform, equipped with fixed seats, and which may be used for motion picture performances.

F-3 Schoolhouse Use: Schoolhouse structures shall include all buildings with or without an auditorium in which persons assemble for amusement, entertainment or recreation, and incidential motion picture, dramatic or educational presentations, lectures or similar purposes, without a stage other than a raised platform and principally used without permanent seating facilities, including cafeterias and recreation centers; and buildings designed for other similar assembly purposes.

H Schoolhouse Use: All schoolhouse buildings and structures or parts thereof shall be classified in the institutional use group in which people suffering from physical limitations are harbored for medical other care or treatment, or in which people are detained for penal or correctional purposes, or in which the liberty of the inmates is restricted.

H-1 Schoolhouse Use shall include all schoolhouse buildings designed for the detention of people under restraint, including among others jails, prisons, reformatories, institutions licensed under the State Department of Mental Health and similar uses.

H-2 Schoolhouse Use shall include all schoolhouse buildings used for housing people suffering from physical limitations, including among others hospitals, sanitariums, infirmaries, orphanages, and institutions licensed under the State Department of Mental Health, and/or State Department of Public Welfare, and State Department of Education.

REPEAL THE "NOTES APPLICABLE TO TABLE 2-5" CONTAINED ON PAGE 2-33 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

NOTES APPLICABLE TO TABLE 2-5

GENERAL

For special high hazard uses involving a higher degree of fire severity and higher concentration of combustible contents, the fire-resistance requirements for structural elements shall be increased accordingly. (see section 400).

SPECIFIC

Note a The fire separation of 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 901).

Note b Protected exteriors shall be required within the fire limits in type 2 construction as follows: high hazard uses, 2-hour fireresistance with fire separation up to eleven (11) feet.

Note c One-story buildings of type 2-C construction which do not exceed three thousand (3000) square feet in area in all use groups except high

hazard assembly and institutional shall be exempt from the protected exterior wall requirements of table 2-5. (See section 302.4).

Note d 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 uses, except F-6, two (2) hours, but not less than the fire grading of the use group (See table 9-1).

Note e Stair enclosures in all buildings, other than one and two-family dwellings, which do not exceed three (3) stories or forty (40) feet in height with an occupancy load of less than forty (40) below and less than seventy-five (75) above the grade floor shall be of not less than three-quarter (3/4) hour fireresistance. In buildings of type 3 or 4 construction, such three-quarter (3/4) hour enclosures may be of combustible construction as provided in section 618.92.

Fire enclosures of exitways, exitway hallways, and stairways in schoolhouse buildings which do not exceed three (3) stories in height shall be of not less than three-quarter (3/4) hour fireresistance.

Note f In all buildings, except F-6 use group, 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 any other materials providing equivalent fireresistant and structural properties. (See sections 217 and 915).

Note g In Type 3A construction members which are of material other than heavy timber shall have a fireresistance rating of not less than 3/4 hour.

Note h Fire-Retardant Treated Wood, complying with section 903.72, may be used as provided in section 903.8.

REPEAL THE EXISTING TITLE FOR TABLE 2-6 AS CONTAINED ON PAGE 2-34 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

TABLE 2-6. HEIGHT LIMITATIONS (UPPER FIGURE: STORIES AND FEET ABOVE GRADE) AND AREA LIMITATIONS (LOWER FIGURE: AREA IN SQUARE FEET PER FLOOR PER STORY) OF BUILDINGS FACING ON ONE STREET OR PUBLIC SPACE NOT LESS THAN 30 FEET WIDE.

ADD A NEW LINE FOLLOWING THE EXISTING USE GROUP "F-4 CHURCHES, SCHOOLS NOTES K AND L" CONTAINED ON PAGE 2-34 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AS FOLLOWS:

	1A	1B	2A	2B	2C	3A	3B	3C	4A	4B
F-6 ASSEMBLY - Schools Notes m and n			5 ST 65' 34,200	3 ST 40' 22,500	2 ST 30' 14,400	3 ST 40' 21,600	3 ST 40' 19,800	N.P.	1 ST 20' 15,300	N.P.

REPEAL THE EXISTING "NOTES TO TABLE 2-6" AS CONTAINED ON PAGE 2-35 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

NOTES TO TABLE 2-6

GENERAL

For all buildings, except F-6 of type 3B construction, which have more than twenty-five (25) percent of the building perimeter fronting on a street or other unoccupied space which is at least thirty (30) feet wide and has unrestricted accessibility for fire equipment and apparatus, the tabular area may be increased by two (2) percent for each one (1) percent of such perimeter excess above the twenty-five (25) percent.

Example: Perimeter = 400 feet
Accessible Perimeter = 300 feet
1. 25% of 400 feet = 100 feet
2. Excess of accessible perimeter
accessible perimeter = 300 feet
25 % deduction = 100 feet
Excess of accessible perimeter = 200 feet
3. Percentage of excess = $\frac{200 \times 100\%}{400}$ = 50%
4. Increase allowable = 2 x 50% = 100%

A one hundred (100) percent increase in the tabular area is allowed, thus doubling the allowable area.

SPECIFIC

Note a In use groups B-1, B-2, C, D, E and F-4, the tabular areas may be increased two hundred (200) percent for one (1) story buildings and one hundred (100) percent for buildings over one (1) story in height when such buildings are equipped with automatic sprinkler systems not specifically required by (See section 308).

Note b Type 1 buildings permitted unlimited tabular heights and areas are not subject to special requirements that allow increased heights and areas for other types of construction.

Note c In use groups B, C, D, E and F-3, isolated buildings of other than frame construction may be of unlimited areas outside of the fire limits when not more than one (1) story or eighty-five (85) feet in height when complying with specific provisions of the Basic Code. (See section 309).

Note d In use groups B-1, B-2, C, D and E types 1, 2 and 3 construction may be increased one (1) story but not more than twenty (20) additional feet in height when equipped with automatic sprinkler systems not specifically required by law. (See section 310.2).

Note e 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.

Note f For exceptions to height and area limitations of high hazard use buildings, see article 4 governing the specific use. For other special fireresistive requirements governing specific uses, see section 905.

Note g For height and area exceptions covering public parking decks, see section 905.2.

Note h For height and area exceptions covering petroleum bulk-storage buildings, see section 905.3.

Note i For exceptions to height of multi-family dwellings of types 2-B and 3-B construction see section 905.6.

Note j For one-story combustible fibre warehouses, see section 408.3.

Note k The tabular area of one-story school buildings of use group F-4 may be increased two hundred (200) percent provided every classroom has at least one door opening directly to the exterior of the building. Not less than one-half ($\frac{1}{2}$) of the required exitways from any assembly room included in such buildings shall also open directly to the exterior of the building.

Note l For exception to area limitations for one-story buildings of type 2, 3-A and 3-B construction, see section 309.11.

Note m The tabular area for 4A construction shall be limited to 6,300 square feet for F-1B, F-3, and F-4 schoolhouse use and to 3,600 square feet for F-1A schoolhouse use.

Note n The first story in the two (2) story portions of buildings of this type of construction shall be constructed of the next most fireresistive type of construction, i.e., type 2B and 2C. For the purposes of this table, concrete filled steel tube columns shall be considered to have the equivalent of a three-quarter (3/4) hour fireresistance rating.

ARTICLE 3
CODE AMENDMENTS

REPEAL SECTION 301.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

SECTION 301.0 FIRE DISTRICTS SUBDIVISIONS

For the purpose of control of use and construction of buildings, the building official may establish limiting districts designated Fire District No. 1, Fire District No. 2 and Outside Fire Limits under the legal procedure of the municipalities of the Commonwealth of Massachusetts for creating and establishing fire districts.

NOTE A: NUMBER OF FIRE DISTRICTS. - The number of fire districts to be established will depend upon the prevailing character of construction and typical development of the specific locality. In large cities, two (2) fire districts are generally desirable while in cities of moderate size and in small political subdivisions, one fire district may be adequate to provide for the fire hazard inherent in concentrated commercial and manufacturing occupancies. The fire district should include all those areas of the municipality in which buildings of business, mercantile, industrial, storage and other use groups of similar fire and conflagration hazard are concentrated. If provision is made for only one fire district, the restrictions herein prescribed for Fire District No. 1 will be applicable to such district.

REPEAL SECTION 308.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

SECTION 308.0 AREA EXCEPTIONS

The provisions of this section shall modify the area limits of table 2-6 as herein specified. Section 308.1 shall not apply to F-6 use group buildings of type 3B construction.

ARTICLE 4

CODE AMENDMENTS

REPEAL SECTION 417.3 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

417.3 AISLES WITHOUT FIXED SEATS: Tables and chairs in all rooms and spaces for assembly use 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.

REPEAL SECTION 422.47 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

422.47 STEPS AND LADDERS: Steps or ladders may be used as approved means of egress from swimming pools. At least one (1) such approved means of egress must be provided in any pool constructed subject to the provisions of this Code. Steps must be nonskid and have the following requirements: Width ten (10) inches minimum, area two hundred and forty (240) square inches minimum, risers twelve (12) inches maximum.

REPEAL SECTION 423.5 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

423.5 HEIGHTS AND AREAS: Heights and areas of open parking structures shall not exceed the limits in the following table:

Table 4-4 HEIGHT AND LIMITATION FOR OPEN PARKING STRUCTURES

Type of Construction	Height	Area
1A, 1B, 2A	Unlimited	Unlimited
2B	100'	Unlimited
2C	75'	Unlimited

REPEAL SECTION 423.51 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

423.51 HORIZONTAL DISTANCE: The horizontal distance from any point on any level to an exterior wall opening on a street, alley, courtyard, or any other permanent open space shall not exceed two hundred (200) feet.

REPEAL SECTIONS 426.11, 426.12, 426.14 and 426.15 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

426.11 CORRIDORS: Corridors shall terminate at stairwells or at doors to grade, except that subsidiary corridors off main corridors, restricted to service area (linen closets, janitor closets, bathing areas, beauty or barber shops, storage, utility rooms, treatment or examining rooms or offices) may be dead-ended providing they do not extend farther than thirty (30) feet beyond the exit stair, door or corridor and serve a total occupant load of not more than ten (10) persons.

426.12 PATIENT ROOM EGRESS: Two independent egresses shall be provided from each patient's room, one of which may be by communicating door or direct to the outside.

426.14 COMMUNICATING DOORS: Communicating doors in patients' rooms and the direct-to-the-outside door from wards or dormitories may be omitted from type 1, 2A or 2B construction.

426.15 STAIRWAYS: Stairs shall be a minimum of four (4) feet between walls or between walls and balustrades.

AFTER SECTION 426.16 ADD THE FOLLOWING TWO NEW SUBSECTIONS:

426.17 EGRESS DOOR WIDTHS: Egress doors to the outside shall be forty-four (44) inches in width. Doors from the patients' rooms to the corridor shall be three (3) feet eight (8) inches in width. Communicating doors between rooms shall be a minimum of two (2) feet eight (8) inches in width.

426.2 CONSTRUCTION REQUIREMENTS: Nursing homes and convalescent homes shall be built only of type 1 and 2 construction.

ARTICLE 5

CODE AMENDMENTS

REPEAL SECTION 503.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

SECTION 503.0 STANDARDS OF NATURAL LIGHT

In the application of the provisions of this article, the standard of natural light for all habitable rooms, unless otherwise specifically required by the provisions of article 4 for special uses and occupancies, shall be based on two hundred and fifty (250) foot candles of illumination on the vertical plane adjacent to the exterior of the light transmitting device in the enclosure wall and shall be adequate to provide an average illumination of six (6) foot candles over the area of the room at a height of thirty (30) inches above the floor level.

REPEAL SECTION 503.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

503.1 WINDOW AND SKYLIGHTS: All habitable rooms or spaces shall contain windows, skylights, monitors, glazed doors, transoms, glass block panels or other light transmitting media opening to the sky or on a public street, yard or court complying with the provisions of this article. The light transmitting properties and the area of the devices used shall be adequate to meet the minimum daylighting requirements specified herein.

ARTICLE 6

CODE AMENDMENTS

ADD IN TABLE 6-1 AFTER "MERCANTILE, BASEMENT AND GRADE FLOOR AREA, AREAS ON OTHER FLOORS" THE FOLLOWING NEW CLASSIFICATIONS:

Schoolhouses (Note 3)
Classrooms.....20 net
Shops and Vocational.....50 net
Assembly (conference rooms, dining rooms, refreshment areas, exhibit rooms, gyms, lounges).....15 net

ADD THE FOLLOWING NEW NOTE 3 UNDER THE NOTES FOR TABLE 6-1:

Note 3. The capacity or occupant load permitted in a building or portion thereof may be increased above that specified if the necessary aisles and exits are provided subject to the approval of the building official.

ADD IN TABLE 6-3 AFTER "ASSEMBLY (F)" THE FOLLOWING NEW CLASSIFICATION:

	Without Suppression System Number of Occupants		With Suppression System Number of Occupants	
USE GROUP	Stairways and Ramps	Doors and Corridors	Stairways and Ramps	Doors and Corridors
Assembly (F-6) (Classroom areas)				
1 or 2 stories	90	100	120	150
3 stories or more	75	100	120	150

REPEAL SECTION 609.12 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

609.12 EXITWAYS IN TYPE 1A, 1B, 2A AND 2B, L-2 USE GROUPS: In buildings of type 1A, 1B, 2A and 2B construction a single exitway shall be permitted for every room, or group of less than four (4) rooms used for residential occupancy on multi-family floors, provided that elevator lobbies on all floors except the ground floor are enclosed with self-closing fire doors, so that no entrance door of any room or apartment shall be more than fifty (50) feet from the nearest egress or segregating fire partition. Door from elevator lobbies, doors in segregating fire partitions and doors to stair enclosures, shall not be over two hundred (200) feet apart. Sleeping facilities shall be limited to not

more than six (6) persons beyond the enclosed stairs. Rooms other than bedrooms connected with the same dwelling unit may be permitted.

REPEAL SECTION 610.2 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

610.2 DEAD ENDS: Exitway access passageways and corridors in all stories which serve more than one (1) exitway shall provide direct connection to such exitways in opposite directions from any point in the corridor, insofar as practicable. In no case shall the length of a dead end corridor be more than twenty (20) feet except in type 1A and 1B construction the corridor length may be thirty (30) feet.

REPEAL SECTION 612.41 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

612.41 OPERATION: Locks and fastenings on egress doors shall be readily opened from the inner side without the use of keys. Draw bolts, hooks and other similar devices shall be prohibited. The locking device must be of a type that will be readily distinguishable as locked. These requirements shall apply in any case only during the normal hours of occupancy.

REPEAL SECTION 612.44 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

612.44 MECHANICAL OPERATIONS: Except as may be otherwise provided for openings in fire and fire division walls, all fire doors shall be self-closing and shall be closed during occupancy of the building or part thereof, except that fail safe electromagnetic holders when activated by approved rate of temperature rise and approved smoke detection devices located on both sides of the opening and connected to the central fire alarm stations may be used on all exit and smoke screen doors in horizontal hallways exitways and corridors but not on doors connected to stairwells. Where egress 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 load of not more than fifteen (15) pounds applied in the direction of exitway travel.

REPEAL SECTION 612.51 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

612.51 GRADE EXITWAY DISCHARGE DOORS: Plate glass doors having one or more unframed edges may be used provided they are constructed of tempered glass not less than three-quarter (3/4) inches thick. Glass doors and adjacent lights which may, in the opinion of the building official, constitute a hazard by virtue

of not being readily visible as a barrier, must be of approved safety glazing material.

REPEAL SECTION 624.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

SECTION 624.0 EXITWAY LIGHTS

REPEAL SECTION 624.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

624.1 ARTIFICIAL LIGHTING: In all structures except one and two-family dwellings, all stairways, exitways and passageways appurtenant thereto 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. All means of egress in other than one and two-family dwellings 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. In schoolhouses switches controlling these facilities shall not be accessible to the public; a key switch shall be considered meeting this requirement.

REPEAL SECTION 624.2 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

624.2 INTENSITY OF ILLUMINATION: The intensity of floor lighting shall be not less than three (3) foot candles measured at floor level and maintained everywhere along the required exitway. There shall be adequate overlap of illumination sources to ensure that no area will be left in darkness due to the failure of a light element.

CODE AMENDMENTS

IN SECTION 701.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AFTER THE DEFINITION OF "DEAD LOAD" ADD THE FOLLOWING NEW DEFINITION:

-DURATION OF LOAD: The period of continuous application of a given load, or the aggregate of periods of intermittent application of the same load.

REPEAL SECTION 707.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

SECTION 707.0 UNIT LIVE LOADS

The plans for all buildings and structures intended for other than residential uses shall specify the live and partition loads for which each floor or part thereof has been designed.

IN TABLE 7-1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AS CONTAINED ON PAGES 7-5 and 7-6 MAKE THE FOLLOWING CHANGES:

DELETE THE EXISTING "LIVE LOAD (PSF)" FOR "CORNICES" AND SUBSTITUTE THE FOLLOWING:
Cornices.....60

DELETE "COURT ROOMS" AND "CORRIDORS" AND SUBSTITUTE THE FOLLOWING:
Corridors:
  First Floor.....100
  Other floors, same as occupancy
    served except as indicated
Court rooms.....100

AFTER "DWELLINGS (SEE RESIDENTIAL)" ADD THE FOLLOWING NEW CLASSIFICATION:
Elevator Machine Room.....150

DELETE THE WORD "AASHO" CONTAINED IN THE CLASSIFICATION "GARAGES (PASSENGER CARS ONLY)" AND SUBSTITUTE THE FOLLOWING:

AASHTO

DELETE THE EXISTING CLASSIFICATION AND SUB-CLASSIFICATIONS FOR "SCHOOLS" AND SUBSTITUTE THE FOLLOWING:
Schoolhouses:
  Classrooms.....50
  Corridors.....100
  Flexible and open plan areas.....100

REPEAL NOTE 1 TO TABLE 7-1 OF THE STATE BUILDING CODE AS FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

1) American Association of State Highway and Transportation Officials.

AFTER NOTE 3 TO TABLE 7-1 OF THE STATE BUILDING CODE AS FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW NOTE:

4) Deflections for floors in areas of public assembly shall be limited to 1/360 the span.

REPEAL SECTION 707.2 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

707.2 POSTING OF LIVE LOADS: In every building or other structure or part thereof, used for mechanical, business, industrial or storage purposes, the design and partition loads shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building in a conspicuous place in each space to which they relate. Any plates, lost, removed or defaced shall be replaced by the owner.

REPEAL SECTION 708.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE AS FOLLOWS:

SECTION 708.0 CONCENTRATED LOADS

Floors of buildings used as specified in Table 7-2 shall be designed to support the uniformly distributed live loads prescribed in Table 7-1 or the following concentrated loads in pounds, whichever produces the greater stresses. Unless otherwise specified, the indicated concentration shall be assumed to occupy an area of two and one-half (2 1/2) feet square and shall be so located as to produce the maximum stress conditions in the structural members.

Floors of schoolhouses used as specified in Table 7-2 shall be designed to support the uniformly distributed live loads prescribed in Table 7-1 following concentrated loads in pounds whichever produces the greater stresses. Unless otherwise specified, the indicated concentration shall be assumed to occupy an area of two and one-half (2 1/2) feet square, and shall be so located as to produce the maximum stress conditions in the structural members; except that in steel joist construction, bridged in accordance with the requirements of section 829, the specified concentration shall be assumed as distributed over three (3) of the secondary members and each individual joist shall be capable of sustaining a concentrated load of eight hundred (800) pounds at the panel point.

REPEAL NOTE c) OF TABLE 7-2 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

c) for trucks or buses, maximum wheel load on an area of twenty (20) square inches.

REPEAL SECTION 709.4 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

709.4 ASSEMBLY STRUCTURES: Grandstands, stadiums and similar assembly structures shall be designed to resist a horizontal swaying load applied parallel to the rows of seats, in addition to any wind loads, of not less than twenty-four (24) pounds per lineal foot of seats per row; and of not less than ten (10) pounds per lineal foot of seats applied transversely.

REPEAL SECTION 710.0 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

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. In addition to the requirements of section 711, the following requirements shall also apply.

AFTER SECTION 710.4 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW SUBSECTIONS:

710.5 The following requirements shall apply only to schoolhouses:

710.51 TEMPERATURE LOADS: The design of enclosed buildings more than two hundred fifty (250) feet in plan dimension shall provide for the forces and/or movements resulting from an assumed expansion corresponding to a change in temperatures 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.

REPEAL SECTION 711.51 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSITUTE THE FOLLOWING:

711.51 LANDSCAPED ROOFS: Where roofs are to be landscaped, the design live load shall be the sum of the appropriate uniform live load and the landscaping load shall be considered as a dead load and shall be computed on the basis of saturation of the soil.

REPEAL SECTIONS 712.0, 712.1, 712.2 AND 712.3 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

SECTION 712.0 SNOW LOAD

The basic map snow loads to be assumed in the design of buildings or other structures are given in Figure 7-1 of the reference standards of this article.

712.1 DESIGN SNOW LOAD: The map snow loads of Figure 7-1 shall be used as the basis for deriving design snow loads for all buildings. Where exceptional conditions can be cited as applying to a particular region, the snow load requirements may be altered by the building official upon approval by the State Building Code Commission.

712.2 ROOF SNOW LOADS: The minimum snow loads for the design of ordinary and multiple series roofs, either flat, pitched or curved, shall be determined from Figures 7-2a, 7-2b, 7-2c, 7-3a, 7-3b, 7-4, as applicable. The analysis incorporating snow loading shall be based on the conditions providing the most unfavorable loading result.

REPEAL FIGURES 7-2, 7-3, 7-4 AS CONTAINED ON PAGES 7-44, 7-45, 7-46, RESPECTIVELY, OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE ATTACHED FIGURES 7-2a, 7-2b, 7-2c, 7-3a, 7-3b, AND 7-4.

REPEAL SECTION 714.2 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

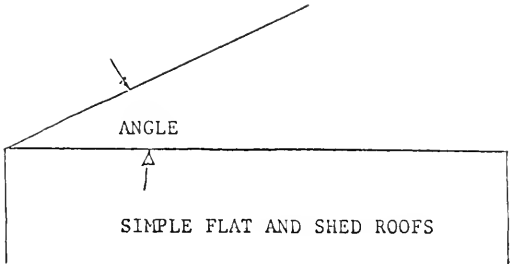
714.2 EXTERIOR SECONDARY WALL FRAMING AND WALL PANELS: Internal wind pressure or suction of thirty (30) percent of the prescribed pressures in section 714.1 shall be assumed to occur simultaneously with the external pressures in section 714.3 and 714.4.

AFTER SECTION 714.4 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW SUBSECTION:

714.5 ROOFS OVER NON-ENCLOSED STRUCTURES: Roofs over non-enclosed structures shall be designed to resist wind loads in accordance with standard engineering practice and the reference standards of this article.

REPEAL SECTION 723.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

723.1 SATISFACTORY FOUNDATION MATERIALS: Satisfactory bearing strata to provide structural support shall be considered to include the following, provided they are of a standard consistent with engineering applications: natural strata of rock, gravel, sand, inorganic clay, or combinations of these materials. Compacted fills when designed and placed under the supervision of a qualified registered professional engineer or architect and certified by him as meeting the design requirements, may be accepted by the building official. Other conditions of unsatisfactory bearing materials which are altered under the supervision of a qualified registered professional engineer or architect and certified by him as meeting the design requirements may be accepted by the building official. Sites involving medium and fine sands, inorganic silt and compacted fills are subject to the additional special requirements in section 723.3.



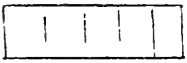
ANGLE	SLOPE	DESIGN SNOW LOAD (lbs/ft^2)		
MAP SNOW LOAD (lbs/ft^2)		25	30	35
0-20	FLAT TO 4/12	25	30	35
20-30	4/12 TO 7/12	25	30	35
30-40	7/12 TO 10/12	20	24	28
40-50	10/12 TO 14/12	15	18	21
50-60	14/12 TO 20/12	10	12	14
60-70	20/12 TO 33/12	5	6	7
70-90	33/12 TO VERTICAL	0	0	0

FIGURE 7-2a

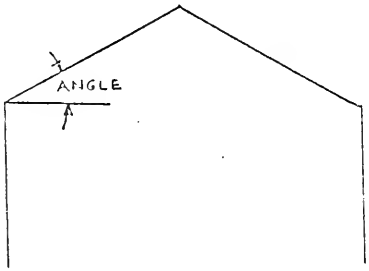
DESIGN SNOW LOADS

CASE I

CASE II



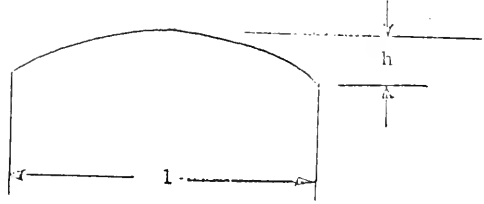
FOR ANGLES > 20°
USE CASES I & II



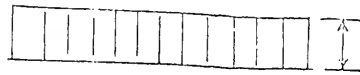
SIMPLE GABLE AND HIP ROOFS

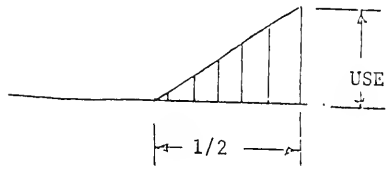
ANGLE	SLOPE	CASE I			CASE II		
MAP SNOW LOAD (lbs/ft²)		25	30	35	25	30	35
		DESIGN SNOW LOAD (lbs/ft²)					
0 - 20	FLAT to 4/12	25	30	35	N/A	N/A	N/A
20 -30	4/12 to 7/12	25	30	35	25	30	35
30 - 40	7/12 to 10/12	20	24	28	25	30	35
40 - 50	10/12 to 14/12	15	18	21	20	23	26
50 - 60	14/12 to 20/12	10	12	14	12	15	18
60 - 70	20/12 to 33/12	5	6	7	8	11	14
70 - 90	33/12 to vertical	0	0	0	0	0	0

FIGURE 7-2b



SIMPLE ARCH AND CURVED ROOFS

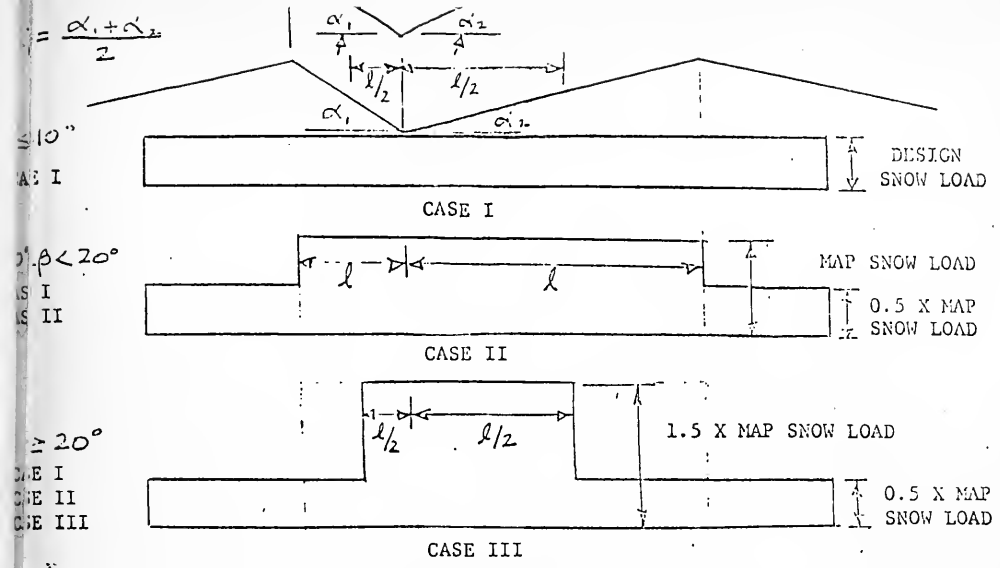
CASE I  USE MAP SNOW LOAD

CASE II  USE 2 X MAP SNOW LOAD

FOR $\frac{h}{\ell} \leq \frac{1}{10}$ USE CASE I ONLY

FOR $\frac{h}{\ell} > \frac{1}{10}$ USE CASE I AND II

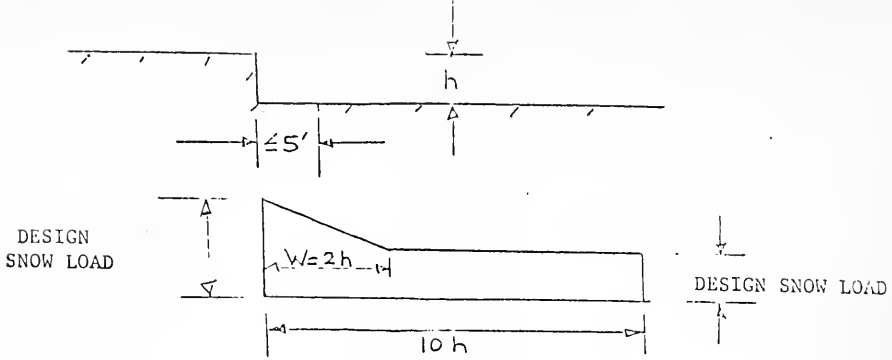
FIGURE 7-2c



VALLEY AREAS OF TWO-SPAN
AND MULTIPLE SERIES SLOPED OR CURVED ROOFS

ANGLE	SLOPE	CASE I		
MAP SNOW LOAD (lbs/ft^2)		25	30	35
		DESIGN SNOW LOAD (lbs/ft^2)		
0 to 10	FLAT to 2/12	25	30	35
10 to 20	2/12 to 4.5/12	25	30	35
20 to 30	4.5/12 to 7/12	25	30	35
30 to 40	7/12 to 10/12	25	30	35
40 to 50	10/12 to 14/12	20	24	28
50 to 60	14/12 to 20/12	10	12	14
60 to 70	20/12 to 33/12	5	6	7
70 to 90	33/12 to vertical	0	0	0

FIGURE 7-3a



LOWER LEVEL OF MULTI-LEVEL ROOFS
(WHEN UPPER ROOF IS PART OF SAME BUILDING OR
ON AN ADJACENT BUILDING NOT MORE THAN 5 FEET AWAY)

MAP SNOW LOADS (lbs/ft^2)	25	30	35	
H IN FEET	DESIGN SNOW LOAD (lbs/ft^2)			W IN FEET
0 - 1.5	25	30	35	10
1.5 - 2.0	30	30	35	10
2.0 - 2.5	38	38	38	10
2.5 - 3.0	45	45	45	10
3.0 - 3.5	53	53	53	10
3.5 - 4.0	60	60	60	10
4.0 - 4.5	70	70	70	10
4.5 - 5.0	75	75	75	10
5.0 - 6.0	75	90	90	W = 2h
6.0 - 15.0	75	90	105	W = 2h
15.0	75	90	105	30

FIGURE 7-3b

Design for:

1. UPPER ROOF LOAD AS REQUIRED FOR LOADS APPLICABLE TO SINGLE-LEVEL ROOFS

   PLUS

2. LOWER ROOF LOAD AS REQUIRED FOR LOADS APPLICABLE TO MULTI-LEVEL ROOFS

   PLUS

3. 50% OF UPPER ROOF LOAD CONSIDERED AS LOADED ONTO LOWER ROOF DUE TO SLIDING

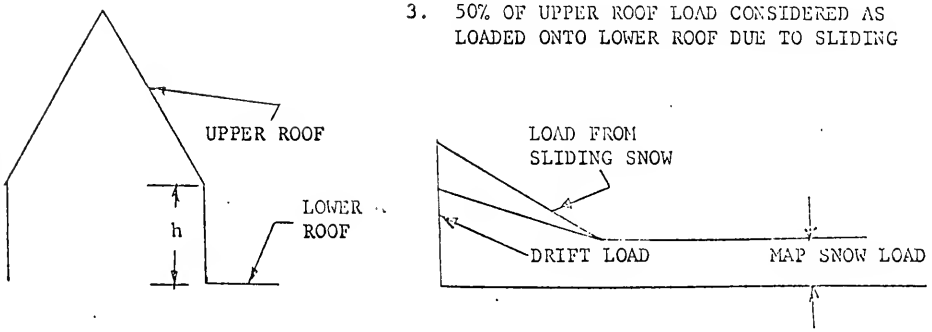


FIGURE 7-4

REPEAL TABLE 7-4 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

TABLE 7-4 PRESUMPTIVE BEARING CAPACITY OF FOUNDATION MATERIALS

	CLASS OF MATERIAL**	TONS PER SQUARE FOOT*
1.	Massive crystalling bedrock including granite, diorite, gneiss, trap rock, and dolomite (hard limestone)	60
2.	Foliated rock including limestone, schist and slate in sound condition	40
3.	Sedimentary rock including hard shales, sandstones, and thoroughly cemented conglomerates	20
4.	Soft or broken bedrock (excluding shale) and soft limestone	20
5.	Compacted, partially cemented gravels, and sand and hardpan overlying rock	10
6.	Gravel, well-graded sand and gravel mixtures	6
7.	Loose gravel, compact coarse sand	4
8.	Loose coarse sand and sand and gravel mixtures and compact fine sand (confined)	2
9.	Loose medium sand (confined)	1
10.	Loose fine sand	(‡)
11.	Hard clay	4
12.	Medium stiff clay, stiff varved silt	2 (t)
13.	Soft clay, soft broken shale	1 (t)
14.	Soft inorganic silt, preloaded material, shattered shale, or any natural deposit of unusual character not provided for herein	(‡)
15.	Disturbed bed varved silt	0
16.	Compacted granular fill	(2-5‡)

* 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 725.0 and 726.0.

** The allowable bearing pressure may be increased by one-third (1/3).

AFTER TABLE 7-4 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW SUBSECTION:

723.21 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 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 Puddingstone).

b) GRANULAR MATERIALS

GRAVEL: a mixture of mineral grains at least seventy (70) percent (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) percent (by weight) of which passes a No. 4 mesh sieve and which contains not more than fifteen (15) percent (by weight) passing a No. 200 mesh sieve.

COARSE SAND: a sand at least fifty (50) percent (by weight) of which is retained on a No. 20 mesh sieve.

MEDIUM SAND: a sand at least fifty (50) percent (by weight) of which passes a No. 20 mesh sieve and at least fifty (50) percent (by weight) is retained on a No. 60 mesh sieve.

FINE SAND: a sand at least fifty (50) percent (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) percent and seventy (70) percent (by weight) passing a No. 4 mesh sieve, between ten (10) and forty (40) percent (by weight) passing a No. 20 mesh sieve, and containing not more than eight (8) percent (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) percent (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 725.0 A copy of all these records and test data shall be filed with the building official.

e) 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) percent 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.

AFTER SECTION 723.21 ADD THE FOLLOWING NEW SECTION:

723.3 LIQUEFACTION: The earthquake liquefaction potential of saturated medium and fine sands shall be evaluated on the basis of Figures 7-7 and 7-8. If the standard penetration resistances, N, in all strata of medium and fine sand lie above the applicable curve in Figure 7-7, the sands at the site shall not be considered subject to liquefaction. If strata not meeting the above criterion exist, but if the total thickness of these non-complying strata and the depth to the top of the uppermost of the non-complying stratum meet the requirements in Figure 7-8 the site shall also be satisfactory from the standpoint of liquefaction. For pressure-injected footings, the ten (10) foot thickness of soil immediately below the bottom of the driven shaft shall not be considered subject to liquefaction.

Compacted granular fills shall not be considered subject to liquefaction provided they are systematically compacted to at least ninety-three (93) percent of maximum dry density as determined in accordance with laboratory test designation ASTM D1557, or a relative density of at least sixty (60) percent in the case of granular soil having less than ten (10) percent by weight passing the No. 200 sieve.

For sites not meeting the above criteria, and for sites involving saturated inorganic non-plastic silts, studies by a qualified registered professional engineer shall be made to determine that the structure loads can be safely supported. Such studies might include:

a) Detailed investigations to establish that the soils at the site are actually not subject to liquefaction during the design earthquake as specified in section 718.7.

b) Providing foundations that will not fail if liquefaction occurs.

c) Replacing or densifying the liquefaction susceptible soils such that liquefaction will not occur.

AFTER SECTION 723.3 ADD THE FOLLOWING NEW SECTION:

723.4 CLASS A AND CLASS B SOILS: For purposes of determining earthquake forces as specified in sections 718.4 and 718.7 Class A soil includes the following classes from Table 7-4: massive igneous rocks and conglomerate; slate, shale in sound conditions, glacial till; gravel or well-graded sand and gravel, if dense to very dense; coarse sand, if dense to very dense; medium sand, if dense to very dense; fine sand, if dense to very dense; medium and hard clay; and compacted granular fill provided that fill soils are systematically compacted throughout under the continuous inspection by a qualified registered professional engineer.

THE ATTACHED NEW FIGURES 7-7, 7-8 and 7-9 ARE TO FOLLOW FIGURE 7-6 CONTAINED ON PAGE 7-48 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974.

REPEAL SECTION 724.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

724.1 WHERE REQUIRED: Borings, tests, drill holes, core borings or any combination shall be required for all structures except the following unless specifically required by the building official:

a) One and two-family dwellings and their accessory buildings.

b) Structures less than 35,000 cubic feet in gross volume.

The borings or tests shall be adequate in number and depth and so located to accurately define the nature of any subsurface material necessary for the support of the structure.

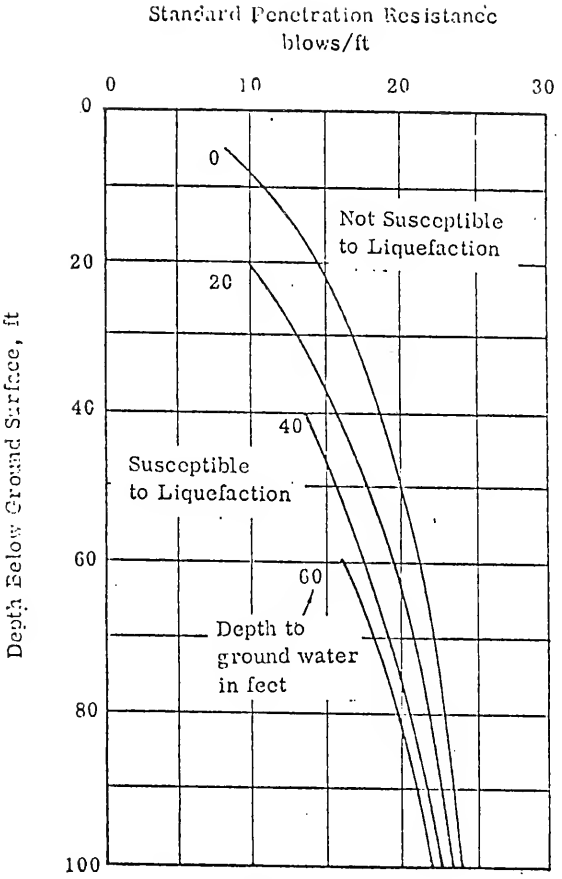


FIGURE 7-7

Penetration Resistance Requirements for Medium and Fine Sands Subjected to Earthquakes for Safety Against Liquefaction

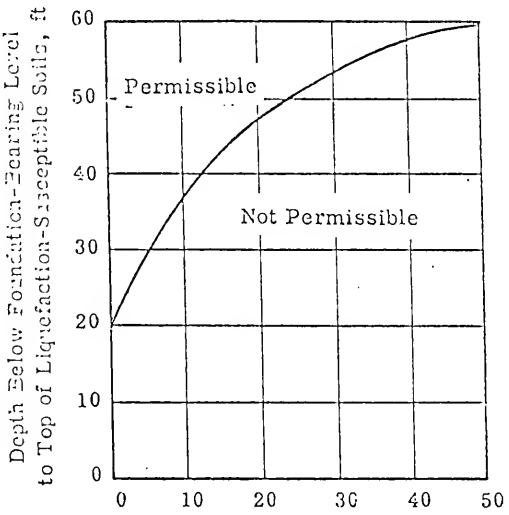


FIGURE 7-8

Permissible thicknesses and depths of soils that are susceptible to liquefaction.

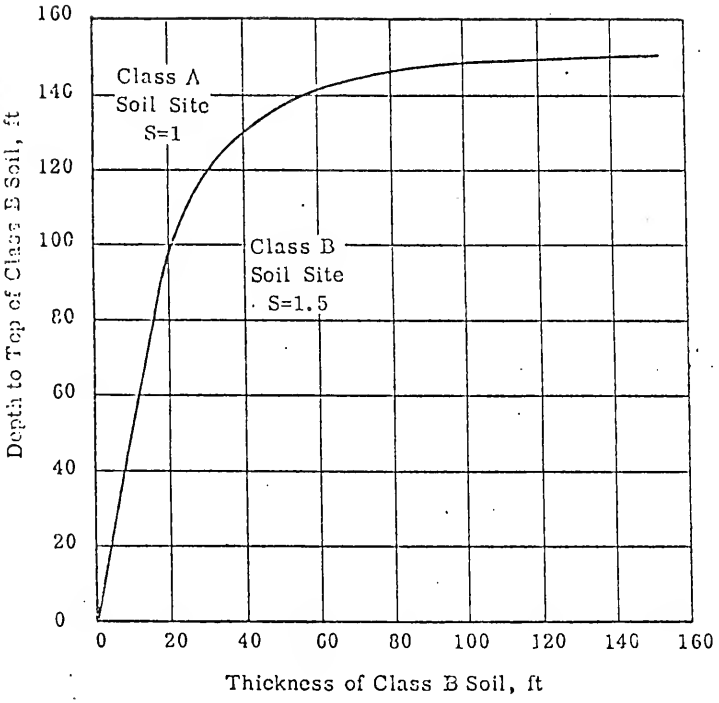


FIGURE 7-9

Determination of Soil Factor S

When it is proposed to support the structure directly on bedrock, the building official shall require rock cores or core borings to be made into the rock, or shall require other evidence satisfactory to prove that the structure shall be adequately founded on bedrock.

REPEAL SECTION 725.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

725.1 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 qualified registered professional engineer who shall have a fully-qualified representative on the site during all test operations.

REPEAL SECTION 725.9 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

725.9 SETTLEMENT ANALYSIS: Whenever a structure is to be supported by medium or soft clay (materials of classes 11 and 12) or other materials which may be subject to settlement or consolidation, the settlements of the structure and of neighboring structures due to consolidation shall be given careful consideration, particularly if the subsurface material or the loading is subject to extensive variation. The building official may require a settlement analysis to be made by a qualified registered professional engineer in case the live and dead loads of the structure, as specified in this article, 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 layer.

AFTER SECTION 726.5 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW SECTION:

726.6 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 by a registered professional engineer and appropriate remedial measures taken, satisfactory to the building official.

REPEAL SECTION 727.21 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

727.21 GRADE BEAMS: Grade beams of all structures may extend not more than two (2) feet below the 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) percent (by weight) passing a No. 200 mesh sieve.

AFTER SECTION 727.21 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW SECTION:

727.22 ISOLATED FOOTINGS: Footings on granular soil of classes 5 to 16 inclusive in Table 7-4 shall be so located that the line drawn between the lower edges of adjoining footings shall not have a steeper slope than thirty (30) degrees with the vertical, unless the material supporting the higher footing is braced or retained or otherwise laterally supported in an approved manner.

REPEAL SECTIONS 729.0, 729.1, and 729.2 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974.

AFTER SECTION 737.41 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW SECTION:

737.42 LIQUEFACTION DURING EARTHQUAKE: The requirements of section 739.2 shall be considered in the design of pile foundations. If pile tips lie above soil which does not meet the criteria in Figures 7-7 and 7-8, special studies shall be made by a qualified registered professional engineer or architect to ensure safety during the design earthquake specified in section 718.7.

REPEAL SECTION 739.6 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

739.6 SPLICES: One splice shall be permitted in precast concrete piles.

REPEAL SECTION 740.21 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

740.21 LOADING: The load on compacted concrete piles shall be limited by the provisions of section 737.41 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 twenty (120) tons.

REPEAL SECTION 746.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

746.1 SURROUNDING MATERIALS: Any soil other than water or fluid soil, including strata of soil not meeting the criterion in Figure 7-7, shall be deemed to afford sufficient lateral support to permit the design of any type of pile as a short column. When piles are driven through soil which will be removed subsequent at the completion of the foundation, the resistance offered by such material shall not be considered to contribute to the lateral supporting capacity.

REPEAL SECTIONS 748.0 AND 748.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

SECTION 748.0 DESIGN REQUIREMENTS FOR FLOODPLAINS AND COASTAL HIGH HAZARD AREAS

748.1 STRUCTURAL REQUIREMENTS: Where a structure is located in an area designated by the authority having jurisdication as a floodplain or coastal high hazard area, such a structure shall be designed to retain its structural integrity and stability for the anticipated flood conditions and to minimize flood damage. Any such structure, including one and two-family dwellings, shall have plans submitted by a registered professional engineer or architect showing only those provisions necessary in the construction of the structure to meet the following performance requirements:

a) structures shall be anchored to prevent movement or collapse.

b) approved flood resistant materials and equipment shall be used.

c) Coastal High Hazard Area structures must be anchored to piles and have space below lowest floor free of construction.

d) non-residential structures built with any occupiable space below the level designated by the authority having jurisdiction as the one hundred (100) year floor level, shall be designed to be floodproof.

AFTER SECTION 748.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 ADD THE FOLLOWING NEW SECTION:

748.2 ELEVATION OF STRUCTURES IN FLOODPLAINS: The building official shall maintain for public inspection and furnish upon request a record of elevations in relation to mean sea level, of the lowest floor (including cellar as defined in the Basic Code) of all new or substantially altered structures located in the special flood hazard areas. Where the lowest floor is below grade on one or more sides, the elevation of the floor immediately above shall also be provided.

ARTICLE 8

CODE AMENDMENTS

REPEAL SECTION 800.41 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

800.41 CONSTRUCTION MATERIALS SAFETY BOARD: The Board will review applications for registration for licensing of individuals and laboratories responsible for inspection, control and testing of construction material, and report to the State Building Code Commission their recommendations. The Board will collect information and review cases where disciplinary action against an existing license, whether an individual, laboratory or firm, has been proposed and make recommendations to the State Building Code Commission. The Commission will issue applications, receive payment of registration and licensing fees, and maintain records for the efficient dispatch of the duties of the Board. The Board shall submit to the Commission reports from time to time as requested by the Commission, but at least annually.

REPEAL SECTION 868.21 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

868.21 REINFORCED CONCRETE: When reinforced concrete is required to resist all stresses, foundation walls shall be not less than eight (8) inches thick.

ARTICLE 9

CODE AMENDMENTS

REPEAL SECTION 905.21 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

905.21 HEIGHTS AND AREAS: Heights and areas of open parking structures shall not exceed the limits in the following table:

HEIGHT AND AREA LIMITATION FOR OPEN PARKING STRUCTURES

Type of Construction	Height	Area
1A, 1B, 2A	Unlimited	Unlimited
2B	100'	Unlimited
2C	75'	Unlimited

The area of structures where in more than twenty-five (25) percent 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 installed in accordance with section 308.1 in types 2-B and 2-C construction, the area may be unlimited. The above limits of height permit parking on the roof.

REPEAL SECTION 917.1 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

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 or 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 L-1 and from hospital rooms (occupancy group H-2), 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.

Doors in Schoolhouse Use Group F-3 and F-4 occupancy except as herein otherwise provided for may be of one and three-quarter (1 3/4) inch solid-core wood doors. Plywood face veneers not more than one twenty-eighth (1/28) inch thick shall be permitted on such doors.

REPEAL SECTION 917.21 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

- CLASS A DOORS: fire wall openings in accordance with section 908.

- CLASS B DOORS: vertical 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.

  In all schoolhouse uses other than F-3 and F-4, openings in corridors, rooms and fireresistive partitions shall conform to the requirements of section 910.

- CLASS D DOORS AND WINDOWS: openings in exterior walls in exposing and exposed buildings of high hazard use (use 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.

REPEAL SECTION 1117.4 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

1117.4 INTEGRAL DUCTS AND PLENUMS: When hot air ducts form an integral part of the structure, the duct walls shall be constructed of not less than one-half (½) hour fireresistance except as provided for herein:

AFTER SECTION 1117.4 ADD THE FOLLOWING TWO NEW SUBSECTIONS:

1117.41 The attic space, if unoccupiable and of incombustible construction, may be used as supply or return air plenums provided the system is mechanical and all return air registers are provided with automatic incombustible dampers or with rate of rise thermostats and/or smoke detectors in the ceiling space or return air chamber of the mechanical unit that would shut down the unit or insolate (seal off) the space. In no case shall the plenum be continuous over exitway corridors, passageways or stairways.

1117.42 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 section 300-22 of the Commonwealth of Massachusetts Electrical Code.

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.

REPEAL SECTION 1218.21 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

1218.21 FIRE ALARM SYSTEM LOCATIONS

REPEAL SECTION 1218.211 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

1218.211 AUTOMATIC FIRE WARNING SYSTEMS IN RESIDENTIAL USES L-1, L-2, AND L-3: Every building or structure not exceeding seventy (70) feet in height above mean grade to be occupied for residential purposes, shall be subject to the following provisions. All systems shall conform with the provisions of NFPA 101 and NFPA 74.

a) L-1 Use Group

1) all buildings less than thirty (30) feet in height above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to audible alarms.

2) all buildings thirty (30) feet in height or more above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to an audible alarm and the system shall be of the supervised type.

b) L-2 Use Group

1) all buildings less than thirty (30) feet in height above mean grade or containing no more than twelve (12) dwelling units shall contain automatic smoke detectors or automatic smoke and heat detectors connected to audible alarms.

2) all buildings thirty (30) feet in height or more above mean grade or containing (13) or more dwelling units shall contain automatic smoke detectors or automatic smoke and heat detectors connected to an audible alarm and the system shall be of the supervised type.

c) L-3 Use Group

1) all buildings less than (30) feet in height above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to audible alarms.

2) all buildings thirty (30) feet in height or more above mean grade shall contain automatic smoke detectors or automatic smoke and heat detectors connected to an audible alarm, and the system shall be of the supervised type.

ARTICLE 19

CODE AMENDMENTS

REPEAL SECTIONS 1905.1 AND 1905.2 OF THE STATE BUILDING CODE FILED AND PROMULGATED ON JULY 1, 1974 AND SUBSTITUTE THE FOLLOWING:

1905.1 REFERENCE STANDARDS FOR MOBILE HOMES: The applicable standard is the 1974 edition of ANSI A119.1, "Standard for Mobile Homes, Body and Frame Design and Construction Requirements, and the Installation of Plumbing, Heating and Electrical Systems," as approved by the American National Standards Institute.

1905.2 EFFECTIVE DATE: All mobile homes manufactured after January 1, 1975 and sold, delivered to or installed on building sites in any jurisdiction of this State shall comply with the provisions of ANSI A119.1 (1974 edition) and with this article and the rules and regulations pursuant thereto.

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION
AMENDMENT MANUFACTURED BUILDINGS, BUILDING COMPONENTS & MOBILE HOMES.

Date Filed OCTOBER 30, 1975

Date Published DECEMBER 18, 1975

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT
5000-12-75-R-298
Estimated cost per copy $ 13

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In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on October 30, 1975.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

MICHAEL S. DUKAKIS
GOVERNOR
CHARLES A. J. THEODORE
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

(617) 7

October 30, 1975

RECEIVED
OCT 30 1975
2:30 p.m.
SECRETARY'S OFFICE

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 7, 1975 at 100 Cambridge Street, Boston on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, Rules and Regulations for Manufactured Buildings, Building Components and Mobile Homes.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:eal

Enclosures

The Rules and Regulations for Manufactured Buildings, Building Components and Mobile Homes are hereby amended in the following manner:

1.4 ADMINISTRATION AND ENFORCEMENT
fourth line: delete "State Administrative Agencies" and substitute "Commission".
eleventh line: delete "State Administrative Agencies" and substitute "Commission".

1.5 AUTHORIZATION OF THIRD PARTY INSPECTIONS
first line: delete "State Administrative Agencies" and substitute "Commission".
seventh line: delete "State Administrative Agencies" and substitute "Commission".

1.6 APPROVALS AND COMPLIANCE
first line: delete "State Administrative Agencies" and substitute "Commission".

2.1 APPROVAL
fourth line: delete "by the State Administrative Agencies".
fifth line: delete entire last sentence and substitute "The State Enforcement Agencies shall notify the Commission of their recommendations of approval or disapproval within twenty (20) calendar days from the date of their receipt of the building system for their evaluation. If the said agencies shall fail to make their recommendations to the Commission within the prescribed time, said Commission may deem the agencies have recommended approval".

2.3 REQUISITES
fourth line: delete "State Administrative Agencies" and substitute "Commission".

2.4 NOTIFICATION OF DISAPPROVAL
second line: delete "State Administrative Agencies" and substitute "Commission".

2.5 APPROVAL - EVIDENCE
second line: delete "State Administrative Agencies" and substitute "Commission".

2.6 APPROVAL - REPORT
first line: delete "State Administrative Agencies" and substitute "Commission".

2.7 APPROVAL - VARIATIONS
third line: delete "State Administrative Agencies" and substitute "Commission".

2.8 AMENDMENTS - PROPOSED
second line: delete "for approvals by the State Administrative Agencies" and substitute "for its approval".

2.9 COMPLIANCE ASSURANCE PROGRAM

first line: delete "State Administrative Agencies" and substitute "Commission"

sixth line: delete "approved by the State Administrative Agencies" and substitute "its approval".

SECTION 3 CERTIFICATION

fourth line: delete "State Administrative Agencies" and substitute "Commission"

3.11 CONTENTS

fourth line: delete "Administrative" and substitute "Enforcement".

3.21 CONTENTS

fourth line of a): delete "State Administrative Agencies" and substitute "Building Code Commission"

first line of f) Date of Manufacture: delete "State Administrative Agencies" and substitute "Commission".

3.22 ISSUANCE

first sentence: delete entire sentence and substitute "The approved label shall be issued by the Commission or its agents in accordance with the following:"

paragraph a): delete entire paragraph and substitute:
a) If the Commission determines the issuance of labels to an inspection agency, the agency shall be required to obtain approval from the Commission for the manner in which they are handled:

paragraph d) line one: delete "State Enforcement Agencies" and substitute "Commission"

paragraph d) line two: delete "Administrative" and substitute Enforcement".

paragraph d) line four: delete "Department" and substitute "Commission".

paragraph d) line nine: delete "Department" and substitute "Commission".

3.3 RECORDS OF LABELS

last sentence: delete entire last sentence and substitute "A copy of such records covering attachment of each label shall be sent to the Commission upon request and the Commission shall forward all such records to the State Enforcement Agencies".

3.5 SUSPENSION AND REVOCATION

paragraph b) line two: delete "Department" and substitute "Commission".

paragraph b) line eight: delete "Department" and substitute "Commisson".

3.6 VARIATIONS OF CERTIFIED UNITS
fifth line: delete "approval of the State Administrative Agencies" and substitute "its approval".
thirteenth line: delete entire line and substitute "Commission or the State Enforcement Agencies as inspection agencies for such purposes".

4.3 INSPECTION OF DAMAGED COMPONENTS
ninth line: delete entire line and substitute "Commission or the State Enforcement Agencies as the inspection agency".

4.4 MONITORING INSPECTION AGENCY
fourteenth line: delete "Administrative" and substitute "Enforcement".
eighteenth line: delete "State Administrative Agencies" and substitute "Commission".

5.6 REPORTING OF VIOLATIONS TO DEPARTMENT OF PUBLIC SAFETY
eighth line: delete entire line and substitute "violations to the Commission and the State Enforcement Agencies".

7.2 NOTIFICATION BY INSPECTION AGENCIES
last sentence: delete "Administrative" and substitute "Enforcement".

SECTION 9 BUILDING SYSTEMS
third line: delete "Administrative" and substitute "Enforcement".

9.11 PLANS, SPECIFICATIONS AND DOCUMENTATION
fifth line: delete "approvals" and substitute "recommendations".

9.12 FORM AND FEES
line one: delete "State Administrative Agencies" and substitute "Commission".

9.17 SPACE FOR STATE ADMINISTRATIVE AGENCIES APPROVAL STAMP
second line: delete "State Administrative Agencies" and substitute "Commission".

12.1 QUALIFICATIONS
first line: delete "State Administrative Agencies" and substitute "the Commission".
fourth line: delete "State Administrative Agencies" and substitute "Commission".

12.3 APPROVALS
first line: delete "State Administrative Agencies" and substitute "Commission".

13.1 GROUNDS
first line: delete "State Administrative Agencies" and substitute "Commission".
eighth line: delete "Administrative" and substitute "Enforcement".

13.21 GENERAL
first line: delete "State Administrative Agencies" and substitute "Commission".

13.23 LABELS
third line: delete "Department" and substitute "Commission".

PART IV RECIPROCITY
first line: delete "State Administrative Agencies find" and substitute "Commission finds".
ninth line: delete "Department" and substitute "Commission".
thirteenth line: delete "Department" and substitute "Commission".
fourteenth line: delete "State Administrative Agencies and so notified the Department. The Department shall notify the State Administrative Agencies of any action taken under this section." and substitue "Commission and State Enforcement agencies and so notified the Commission. The Commission shall notify the State Enforcement Agencies of any action taken under this section."

14.1 EVALUATION
first line: delete "Administrative" and substitute "Enforcement".

14.2 METHOD OF EXTENDING RECIPROCITY
first line: delete "State Administrative Agencies" and substitute "Commission".
fourth line: delete "it may extend reciprocity to that jurisdiction by:" and substitute "upon the recommendation of the State Enforcement Agencies, as provided in section 2.1, it may extend reciprocity to that jurisdiction by:".

SECTION 15 PROCEDURES FOR RECIPROCITY CERTIFYING MANUFACTURED BUILDINGS, BUILDING COMPONENTS OR MOBILE HOMES
fifth line: delete "Administrative" and substitute "Enforcement".

SECTION 16 SUSPENSION AND REVOCATION
thirteenth line: delete "State Administrative Agencies" and substitute "Commission".

SECTION 18 ESTABLISHMENT
first line: delete "State Administrative Agencies" and substitute "Commission".

18.4 LABELS

third line of a): delete "Department" and substitute "Commission".
second line of b): delete "Department" and substitute "Commission".
second paragraph of b): delete entire paragraph and substitute "1) Manufacturers of building components shall be permitted to use any labels as approved by the Commission. If such labels are supplied by any source other than the Commission, there shall be no charge for such labels".
paragraphs numbered c), d) and e): delete in entirety and substitute:

"c) Mutilated labels may be replaced at the option of the Commission at a cost of two ($2.00) dollars each".

"d) Upon satisfactory proof to the Commission of lost or stolen labels, not the result of negligence, labels may be replaced at a cost of two ($2.00) dollars each".

"e) Labels shall be purchased from the Commission by the inspection agency or manufacturer".

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

AMENDMENTS to the COMMONWEALTH OF MASS. STATE BUILDING CODE

Date Filed January 5, 1976

Effective February 1, 1976

Date Published February 2, 1976

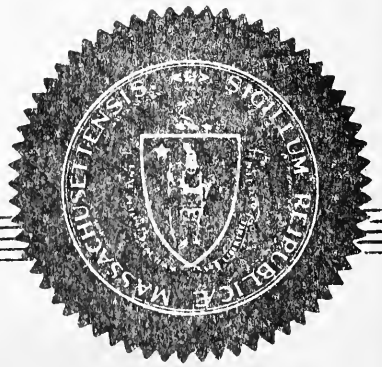
Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH



PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT

(16-6L) $.15

The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

S. DUKAKIS
GOVERNOR
S A. J. THEODORE
CHAIRMAN
RLES J. DINEZIO
CUTIVE DIRECTOR

(617) 727-6816

January 5, 1976

RECEIVED
JAN 5 1976
SECRETARY'S OFFICE

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE COMMONWEALTH OF MASSACHUSETTS STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 7, 1975 at 100 Cambridge Street, Boston on proposed amendments to the State Building Code, has adopted the attached 24 amendments to the Commonwealth of Massachusetts State Building Code, which are to become effective on February 1, 1976.
This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:eal

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles A. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on January 5, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

SECTION 108.1

On the ninth line of Section 108.1 delete the following words: "except as may otherwise be specifically provided for by statutory requirements or as herein provided."; and substitute the following: "established by the legislature but not owned by the Commonwealth, such authorities to include, but not be limited to the Massachusetts Bay Transportation Authority, Massachusetts Turnpike Authority and the Massachusetts Port Authority."

SECTION 108.2

Add the following new sentence to the end of Section 108.2:

All buildings and structures owned by any authority established by the legislature shall be regulated in accordance with section 108.1 of the Basic Code.

SECTION 113.5

After the first paragraph in Section 113.5 add the following new paragraph:

When such application for a permit must comply with the provisions of Article 4 or Article 12 of the Basic Code, the building official shall cause one (1) such set of plans and specifications received by him, to be forwarded simultaneously to the head of the fire department for his file and approval of the items specified in section 1200.0 as they relate to the applicable sections of Article 4 and Article 12. The head of the fire department shall within ten (10) working days from the date of receipt by him approve or disapprove such plans and specifications. Upon request by the head of the fire department, the building official may grant one (1) or more extensions for such review, providing, however, that the total review by said head of the fire department shall not exceed thirty (30) calendar days. If no such approval, disapproval or request for an extension of time shall be received by the building official within said ten (10) working days, the building official may deem the plans and specifications to be in full compliance with the applicable sections of Article 6 and Article 12 and, therefore, approved by the head of the fire department.

SECTION 113.6

Repeal Section 113.6 of the State Building Code in its entirety and substitute the following new section:

113.6 SITE PLAN: There shall also be filed prior to a permit being granted for the excavation or for the erection of any building or structure a site plan showing to scale the size and location of all new construction and all existing structures on the site, distances from lot lines, the established street grades, if they exist (furnished by the owner and verified by the town or city engineer) and proposed finished grades. In the case of demolition, the site plan shall show all construction to be demolished and the location and size of all existing buildings and construction that are to remain on the site or plot. The site plan shall not be changed except as specified in section 115.4.

SECTION 113.61

After Section 113.6, add the following new section:

113.61 EXCEPTIONS: Interior alterations and equipment installations in accordance with the provisions of section 113.0 that do not include change of use or occupancy and do not affect the following items shall be exempt from the requirements of section 113.6:

1) Exterior wall structural strength or stability;

2) Exterior wall fire rating or fireresistance;

3) Exterior wall area of openings.

SECTION 114.1

Delete the second sentence of Section 114.1 in its entirety.

On the eighth line after the words "requirements of" add the following new words: "section 113, other related sections of".

On the ninth line after the word "application" add the words "in writing".

SECTION 403.21 AND TABLE 4-1

Delete the entire Section 403.21, including Table 4-1, and substitute the following:

403.21 OUTSIDE UNDERGROUND SYSTEM: Outside underground tanks shall be subject to compliance with the provisions of Form FPR-8, Rules and Regulations of the Department of Public Safety, Board of Fire Prevention Regulations.

SECTION 407.3

In Section 407.3 change the title 'PROJECTION ROOMS" to "PROJECTION ROOMS USING SAFETY FILM".

In Line 2 following the word "projectors" add the following words: "employing cellulose acetate or other safety film,".

SECTION 407.31

Delete the last sentence of Section 407.31 and substitute the following:

The aggregate of parts and openings for projection equipment shall not exceed twenty-five (25) percent of the area of the wall between the projection room and the auditorium. All openings shall be provided with glass or other approved materials so as to completely close the opening.

SECTION 601.0

Add the following new definition for ELEVATOR LOBBY to Section 601.0:

ELEVATOR LOBBY: That portion of a floor, platform, or alcove immediately adjacent to the elevator shaft opening, used to receive and discharge passengers or freight, or used as a waiting area.

SECTION 609.12

Delete the entire Section 609.12 and substitute the following:

609.12 EXITWAYS IN L-2 USE GROUP FOR TYPES 1-A, 1-B, 2-A AND 2-B CONTRUCTION: In buildings of types 1-A, 1-B, 2-A and 2-B construction, a single exitway shall be permitted for every room, or group of less than four (4) rooms used for residential occupancy on multi-family floors, provided that elevator lobbies on all floors except the ground floor, are enclosed with self-closing smoke doors and partitions. No entrance door of any room or apartment shall be more than fifty (50) feet from the nearest egress or fire partition, exclusive of those used to enclose elevator lobbies. Doors from elevator lobbies, doors in segregating fire partitions, and doors to stair enclosures, shall not be over two hundred (200) feet apart. Sleeping facilities shall be limited to not more than three (3) bedrooms beyond the enclosed stairs.

SECTION 615.0

On the last line of Section 615.0 delete the following words "ten (10)" and substitute the following words "twelve (12)".

SECTION 718.53

Add the following exception to Section 718.53:

EXCEPTION: Structures subject to the provisions of sections 105.2 and 105.3 shall be exempt from meeting the requirements of the Basic Code for mortar.

SECTION 851.5

On the fourth line of Section 851.5 delete "four (4) inches" and substitute "one and one-half (1 1/2) inches".

SECTION 922.3

Delete the first two lines on Page 9-34 and add the following new section:

922.3 INTERIOR FINISH: Interior finish of walls and ceilings shall have a flamespread rating not greater than that designated by the class prescribed for the various occupancy groups listed in Table 9-3 when tested in accordance with the requirements of section 904.

SECTION 1200.0

Delete in Section 1200.0, Paragraph 2, Lines two and three, the following words "must have the approval of the various officials having jurisdiction before installation begins" and substitute the following words "shall be reviewed by the head of the local fire department for approval of the following items".

Add the following new sixteen items after the second paragraph:

1) size of the water main and its capacity.
2) nearest hydrants.
3) access for fire fighting and rescue.
4) location of the siamese connections.
5) provisions for a fire pump, if necessary, and a secondary source of power for same.
6) provisions for dual water supply if needed.

SECTION 1200.0 (CONTINUED)

7) electrical supervisory control of fire pump.
8) size, location, thread size, etc., of standpipes.
9) flow control valves if needed for zone control of sprinklers.
10) fire alarm panel, annunciator and supervisory controls of sprinklers and standpipes and fire alarm systems.
11) location and type of smoke, heat, and combination detectors.
12) necessary pressure gauges on standpipes, sprinklers, etc. to visually supervise systems.
13) locations, types of fire alarm boxes, horns, speakers, and audio visual devices.
14) elevator keys for control during fires, etc.
15) plans for all fire alarm systems.
16) smoke control.

SECTION 2100.11

Delete the first and fifth Paragraphs of Section 2100.11 and substitute the following as the first Paragraph:

2100.11 DOORWAYS AND HALLWAYS: The minimum clear width of any interior doorway, except in closets, storage areas and bathrooms, shall be two (2) feet six (6) inches. There shall be no minimum for clear doorway width in closets, storage areas and bathrooms.

In the second Paragraph, on the first Line, after the word "every" add the word "required".

In the third Paragraph, on the first Line, after the word "minimum" add the word "clear".

SECTION 2100.15

Add the following new sentence to the beginning of Section 2100.15:

"When a city of town requires by ordinance or by-law run-off control, then the provisions of sections 2100.15, 2100.16, and 2100.17 shall apply".

EDITORIAL

Section 201.0

Under Section 201.0 delete the following section referenced in the definition for Group Residence: "(See Section 433.1)" and substitute the following: "(See Section 424.1)".

Table 2-5

In Table 2-5 in items 3 and 4 delete the words "(See Table 16)" and substitute the following: "(See Table 9-1)".

Section 417.0

In Section 417.0 on the tenth line delete "Section 418.0" and substitute the following: "Section 416.0".

In the 11th line delete the following "(F-1)" and substitute the following: "(F-1-B)".

Section 609.11

Delete the title in Section 609.11 and substitute the following: "EXITWAYS IN RESIDENTIAL (L-2) USE GROUP"

Section 1218.215

In the third line of Section 1218.215 delete the word "manual".

Delete the second sentence in its entirety.

In the fifth line delete the word "otherwise".

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

AMENDMENTS TO SECTION 109.11 of the STATE BUILDING CODE

Date Filed January 6, 1976

Date Published January 29, 1976

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.

1 (16-6M) $.15

ICHAEL S. DUKAKIS
GOVERNOR
CHARLES A. J. THEODORE
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission

5th Floor
141 Milk Street, Boston 02109

(617) 727-6916

January 6, 1976

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 7, 1975 at 100 Cambridge Street, Boston on proposed amendments to the State Building Code, has adopted the attached amendment to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:eal

Enclos.

RECEIVED
JAN 6 1976
3:40 P.M.
SECRETARY'S OFFICE

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted the amendments to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on January 6, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence P. O'Malley
Assistant Attorney General

STATE BUILDING CODE COMMISSION

SECTION 109.11

On the first and second lines of Section 109.11 delete the date "January 1, 1976" and substitute the date "July 1, 1977".

On the last line of Section 109.11 delete the date "December 31, 1975" and substitute the date "June 30, 1977".

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet DCA Department DCA Agency State Bldg. Code Comm.
Contact Charles J. Dinezio, Exec. Div. Phone 727-6916
Address 141 Milk Street Boston.

2 - Descriptive title of document: Amendment to Sec. of State Bldg. Code.

3 - Estimate the number of copies that will be purchased in the next six months: 500 By your agency; 1500 By the public.

4 - The document enclosed is best classified as a:
Regulation(30A/1) (✓) Emergency Regulation (___) Other (___)

If "emergency" is checked briefly state the nature of the emergency:

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: MGLA c 30A and c 23B

Was a public hearing required ? Yes(✓) No (___)

If approval of other agencies was required, list approvals and date obtained: None.

6 - Date of public hearing (30A/2): 10/7/75 ; OR
Date of "action" (30A/3) : ___

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes(✓) No (___)

If "no" list the chapter and section of the general laws under which notice was given:

7 - If regulation is to become effective on a date other than the publishing date list effective date:

8 - The enclosed regulation relates to other regulations already filed as follows:
Supersedes regulation(s) ___ filed ___
___ filed ___
___ filed ___
Amends regulation(s) § 109.11 of St. Bldg. Code filed 7/1/74 #1
___ filed ___
___ filed ___

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes(___) No (✓)

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION
AMENDMENTS TO AUTOMATIC FIRE WARNING SYSTEMS IN RESIDENTIAL BUILDINGS.

Date Filed FEBRUARY 5, 1976

Date Published FEBRUARY 5, 1976

Chapter 233 sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

UBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT

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17

The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

S. DUKAKIS
OVERNOR
A. J. THEODORE
HAIRMAN
RES J. DINEZIO
CUTIVE DIRECTOR

(617) 727-3916

February 4, 1976

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on January 20, 1976 at Gardner Auditorium, State House, Boston on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:eal

Enclosures

RECEIVED
FEB 5 1976
SECRETARY'S OFFICE

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on February 4, 1976.

RECEIVED
FEB 5 1976
SECRETARY'S OFFICE

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney

By: _____
Assistant Attorney General

SECTION 201.2

After General Definition of "REQUIRED" add the following Definition:

RESIDENTIAL UNIT: (see section 1201.0)

SECTION 1201.0

After Definition of "PARTIAL SPRINKLER SYSTEM" add the following Definition:

RESIDENTIAL UNIT:
a) In L-2 Multi-Family Use Group, a dwelling unit.
b) In L-2 Dormitory Use Group, a room or group of rooms occupied as a single unit.
c) In L-1 Use Group, a room or group of rooms occupied as a single unit.

SECTION 1218.211

Repeal Section 1218.211 of the State Building Code in its entirety and substitute the following new section:

SECTION 1218.211 AUTOMATIC FIRE WARNING SYSTEMS IN RESIDENTIAL USE GROUPS L-1, L-2, and L-3: Every building, structure or portion thereof for which a permit was issued on or after January 1, 1975 and not exceeding seventy (70) feet in height above mean grade, in Use Groups L-1, L-2 or L-3, shall be subject to the provisions of this section. Buildings or structures which are altered or repaired shall be subject to the provisions of section 106.0. A summary of the requirements is given in Table 12-4.

A) L-1 and L-2 Use Groups: All buildings or portions thereof of L-1 and L-2 use groups shall incorporate automatic fire detectors located as required in items A-6 and A-7 and subject to the following provisions:

1. All buildings of L-1 and L-2 use groups which contain six (6) or less separate residential units shall use a Type III system with multiple station smoke detectors on each level of the common spaces as defined in section 1218.211 A7a; or a Type II system in conformance with section 1218.211 C.

2. All buildings of L-1 and L-2 use groups which contain seven (7) to twelve (12) separate residential units shall be provided with a Type II system in conformance with section 1218.211 C.

3. All buildings of L-1 and L-2 use groups which contain thirteen (13) or more separate residential units, or are three (3) or more stories in height, shall incorporate manual pull stations located in conformance with section 1218.211 D.

USE GROUP	NUMBER OF UNITS	UNIT OCCUPANT PROTECTION	OTHER OCCUPANT PROTECTION	STANDBY POWER	MANUAL STATIONS	ZONED	PROVISION FOR FIRE DEPT. NOTIFICATION
L-3	1-2	YES .211B	-----	-----	-----	-----	-----
L-1, L-2	6 or less	YES .211A	YES .211A	-----	* -----	-----	-----
L-1, L-2	7-12	YES .211A	YES .211A	YES .211C	* -----	-----	-----
L-1, L-2	13-24	YES .211A	YES .211A	YES .211C	YES .211D	YES .211E	-----
L-1, L-2	25 or more	YES .211A	YES .211A	YES .211C	YES .211D	YES .211E	YES .211F

*Manual pull stations required for L-1 and L-2 use groups 3 stories or more in height.

4. All buildings of L-1 and L-2 use groups which contain thirteen (13) or more separate residential units shall be provided with a Type I system in conformance with section 1218.211 C, and zoned in conformance with section 1218.211 E.

5. All buildings of L-1 and L-2 use groups which contain twenty-five (25) or more separate residential units shall incorporate provision for automatic Fire Department notification in conformance with section 1218.211 F.

6. Approved Single or Multiple Station Smoke Detectors shall be located within each residential unit to comply with the following minimum requirements:

   a. MINIMUM NUMBER OF DETECTORS

      i) In residential units less than twelve hundred (1200) square feet in area, at least one (1) permanently wired A.C. powered smoke detector shall be provided.

      ii) In residential units twelve hundred (1200) square feet or more in area, at least one (1) permanently wired multiple station smoke detector shall be provided for each twelve hundred (1200) square feet of area or part thereof.

   b. LOCATION OF DETECTORS

      i) One (1) approved smoke detector shall be located outside of each separate sleeping area, in accordance with the definition for "separate sleeping area" provided in NFPA 74 (1974).

      ii) One (1) approved smoke detector shall be located on the ceiling near the base of, but not within, each stairway.

      iii) No smoke detector shall be located in or within six (6) feet of a kitchen or cooking area.

7. Approved fire detectors also shall be located within the structure to comply with the following minimum requirements:

   a. CORRIDORS, LOBBIES AND EXITWAY DISCHARGE: All lobbies, common corridors, hallways and exitway access and discharge routes shall be provided with approved smoke detectors with no more than a thirty (30) foot spacing between detectors.

   b. INSIDE RESIDENTIAL UNIT ENTRANCE DOORWAYS: All residential unit doorways to corridors or hallways shall be provided with an approved heat detector located no more than six (6) feet inside the doorway and in conformance with the requirements of NFPA 72E (1974).

c. OTHER ROOMS: All rooms of one hundred (100) square feet in area or more, not in residential units, shall be equipped with approved heat detectors or smoke detectors located in accordance with the requirements of their listing and in conformance with NFPA 72E (1974).

8. All detectors in item A-7 shall be arranged to activate the building fire alarms in accordance with section 1218.211 C.

9. Any building of L-1 and L-2 use group that is completely protected by an approved automatic sprinkler system may omit the detectors required in item A-7, provided that waterflow will sound the building fire alarms in accordance with section 1218.211 C.

B) L-3 Use Group, Including Mobile and Manufactured Homes:

1. All buildings which are defined by this Code as one or two-family dwellings shall contain a Type III system in conformance with section 1218.211 C with smoke detectors located as required in item B-2 of this section and in accordance with NFPA 72E (1974).

2. Smoke detectors shall be located to comply with the following minimum requirements:

a) MINIMUM NUMBER OF DETECTORS:

i) No less than one (1) approved smoke detector shall be provided on the highest habitable level and on each floor, story or level below, including basements or cellars.

ii) For any floor, level or story exceeding twelve hundred (1200) square feet in area, one (1) approved smoke detector shall be provided for each twelve hundred (1200) square feet or part thereof.

b) LOCATION OF DETECTORS

i) One (1) approved smoke detector shall be located outside of each separate sleeping area, in accordance with the definition of "separate sleeping area" of NFPA 74 (1974).

ii) One (1) approved smoke detector shall be located on the ceiling near the base of, but not within, each stairway.

iii) No smoke detector shall be located in or within six (6) feet of a kitchen or cooking area.

iv) Detectors shall be ceiling mounted, except in mobile homes, where mounting on an inside wall shall be required.

c) COMBINED COVERAGE: Smoke detectors required by item B-2-a may be used to fulfill the requirements of item B-2-b.

C) TYPES OF SYSTEMS: Systems shall be one (1) of the following types as required by this section:

1. TYPE I: A Type I system shall be installed in conformance with the Massachusetts Electrical Code and NFPA 72A (1974). A Type I system shall include an approved secondary source of power and incorporate an annunciator at the grade level located as directed by the local Fire Department. All detectors shall be ceiling mounted.

2. TYPE II: A Type II system shall be installed in conformance with the Massachusetts Electrical Code and NFPA 72A (1974) and include an approved secondary source of power. All detectors shall be ceiling mounted.

3. TYPE III: A Type III system shall be wired in conformance with the Massachusetts Electrical Code and installation shall be in accordance with NFPA 74 (1974). Power shall be supplied from a permanently-wired connection directly to an A.C. primary source of power or monitored batteries. Power for A.C. powered detectors shall be taken from a branch circuit serving a habitable area, with no more than two (2) required smoke detectors on the same branch circuit; and the power source for the detectors shall be on the supply side, ahead of any switches. All required smoke detectors shall be provided with a visible power-on indication. All required smoke detectors shall be interconnected so that when one actuates all will sound to meet the requirements of NFPA 74 (1974) section 2-2.3. All required smoke detectors shall conform with section 1218.211 G, 1 and 5.

D) MANUAL PULL STATIONS: Where required, manual pull stations shall be located on the corridor side of, and within six (6) feet of each entrance to an exitway. Manual pull stations shall be connected to the building fire alarm system in conformance with NFPA 72A (1974).

E) ZONES: Where required, each floor, level or story shall be separately zoned. The length of any zone on any floor, level or story shall not exceed two hundred (200) feet in any direction.

F) AUTOMATIC FIRE DEPARTMENT NOTIFICATION: Where required to provide automatic fire department notification, the system shall be connected to the Fire Department Alarm Headquarters if so directed by the head of the local Fire Department, in conformance with NFPA 72B (1974), NFPA 72C (1974), or NFPA 71 (1974).

G) APPROVED DEVICES:

1. Single station and multiple station smoke detection devices: Smoke detectors of single station and multiple station types shall meet the requirements of U. L. 217 (1976) and be listed or approved by a nationally-recognized fire testing laboratory.

   Exception: Until July 1, 1976, when listing of smoke detectors can be obtained under U. L. 217 (1976) the following smoke detectors shall be accepted:

   Devices tested and listed under U. L. 167 and U. L. 168, provided that the room fire test of U. L. 167 is met by both optical or ionization type smoke detectors.

2. Smoke detectors, other than single-station and multiple station devices, shall meet the reliability tests of U. L. 217, and the room fire test provision of U. L. 167 in addition to carrying a listing or approval as meeting U. L. 167 or U. L. 168.

   Exception: Until July 1, 1976, units meeting all of the above requirements, but not meeting the U. L. 217 reliability test shall be accepted.

3. All heat detectors shall be listed or approved for a spacing no less than thirty (30) feet.

4. All other alarm equipment used in this section shall be listed or approved by a nationally-recognized fire testing laboratory.

5. The State Building Code Commission shall withdraw the approval from any device or equipment which repeatedly fails to perform under this section.

H) MAINTENANCE AND TESTING:

1. It shall be the responsibility of the owner to properly maintain the system.

2. All Type I and Type II systems shall be tested at least annually in conformance with the NFPA 72A (1974) with the performance of each initiating device and indicating device recorded with the head of the Fire Department.

3. In addition to the above, all Type I systems connected to the Fire Department shall be tested with advance notice as required by the head of the Fire Department.

ARTICLE 12 (REFERENCE STANDARDS)

Add the following to the end of "Reference Standards - Article 12"

NFPA	No. 74	1974	Household Fire Warning Equipment
NFPA	No. 72E	1974	Standard for Automatic Fire Detectors

Repeal from the following "Reference Standards - Article 12" the year "1972" and substitute the year "1974" so as to read as follows:

NFPA	No. 72A	1974	Local Protective Signaling Systems
NFPA	No. 72B	1974	Auxiliary Signaling Systems
NFPA	No. 72C	1974	Remote Station Signaling Systems
NFPA	No. 72D	1974	Proprietary Signaling Systems

SECTION 2100.18

Repeal Section 2100.18 of the State Building Code in its entirety and substitute the following new section:

2100.18 AUTOMATIC FIRE WARNING SYSTEMS IN RESIDENTIAL USE GROUP L-3: Every building or structure for which a permit was issued on or after January 1, 1975, and not exceeding seventy (70) feet in height above mean grade shall be subject to the provisions of this section. Buildings or structures which are altered or repaired shall be subject to the provisions of section 106.0.

A. All buildings which are defined by this code as one or two-family dwellings, including mobile and manufactured homes, shall contain a Type III system in conformance with item C of this section with smoke detectors located as herein required and in conformance with NFPA 72E (1974).

B. Smoke detectors shall be located to comply with the following minimum requirements:

1. Minimum Number of Detectors:

a. No less than one (1) approved smoke detector shall be provided on the highest habitable level and on each floor, story or level below, including basements or cellars.

b. For any floor, level or story exceeding twelve hundred (1200) square feet in area, one (1) approved smoke detector shall be provided for each twelve hundred (1200) square feet or part thereof.

2. Location of Detectors:

a. One (1) approved smoke detector shall be located outside of each separate sleeping area, in accordance with the definitio of "Separate Sleeping Area" of NFPA 74 (1974).

b. One (1) approved smoke detector shall be located on the ceiling near the base of, but not within, each stairway.

c. No smoke detector shall be located in or within six (6) feet of a kitchen or cooking area.

d. Detectors shall be ceiling mounted, except in mobile homes where mounting on an inside wall shall be required.

3. Combined Coverage: Smoke detectors required by item B-1 of this section may be used to fulfill the requirements of item B-2 of this section.

C. Type III: A Type III system shall be wired in conformance with the Massachusetts Electrical Code and installation shall be in accordance with NFPA 74 (1974). Power shall be supplied from a permanently-wired connection directly to an A.C. primary source of power or monitored batteries. Power for A.C. powered detectors shall be taken from a branch circuit serving a habitable area, with no more than two (2) required smoke detectors on the same branch circuit; and the power source for the detectors shall be on the supply side, ahead of any switches. All required smoke detectors shall be provided with a visible power-on indication. All required smoke detectors shall be interconnected so that when one actuates all will sound to meet the requirements of NFPA 74 (1974) section 2-2.3. All required smoke detectors shall conform with the requirements for approved devices in item D of this section.

D. Approved Devices:

1. Single station and multiple station smoke detection devices: Smoke detectors of single station and multiple station types shall meet the requirements of U.L. 217 (1976) and be listed or approved by a nationally-recognized fire testing laboratory.
Exception: Until July 1, 1976, when listing of smoke detectors can be obtained under U.L. 217 (1976) the following smoke detectors shall be accepted:

Devices tested and listed under U.L. 167 and U.L. 168, provided that the room fire test of U.L. 167 is met by both optical or ionization type smoke detectors.

E. Maintenance and Testing:

1. It shall be the responsibility of the owner to properly maintain the system.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

RECEIVED
FEB 5 1976
SECRETARY'S OFFICE

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet Com. of Dev. Department DCA Agency State Building Code Commn.
Contact Charles J. Dinezio Phone Exec. Dir. 727-6946
Address 141 Milk Street Boston 02109

2 - Descriptive title of document: Amend. State Bldg. Code

3 - Estimate the number of copies that will be purchased in the next six months: 4000. By your agency: 6,000 By the public.

4 - The document enclosed is best classified as a:
Regulation(30A/1) (V) Emergency Regulation (___) Other (___)

If "emergency" is checked briefly state the nature of the emergency:

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: Chap 23B § 20 Chap 30A § 5 Chap 30 § 37 Chap 23B § 20

Was a public hearing required ? Yes(V) No (___)

If approval of other agencies was required, list approvals and date obtained: None.

6 - Date of public hearing (30A/2): 1/20/76 ; OR
Date of "action" (30A/3) : ___

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes(V) No (___)

If "no" list the chapter and section of the general laws under which notice was given: ___

7 - If regulation is to become effective on a date other than the publishing date list effective date: ___

8 - The enclosed regulation relates to other regulations already filed as follows:

~~Supersedes~~ regulation(s) State Bldg. Code filed 1/1/75 *
2nd Amends
Amends regulation(s) ___ filed ___
___ filed ___
___ filed ___
___ filed ___
___ filed ___

9 - Does the enclosed regulation bear any other relation to any other

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION
AMENDMENTS to the BUILDING CODE - SECTION 108.15 INSPECTION - & CERTIFICATION ... SPECIFIED USE GROUPS

Date Filed February 12, 1976

Date Published FEB 19 1976

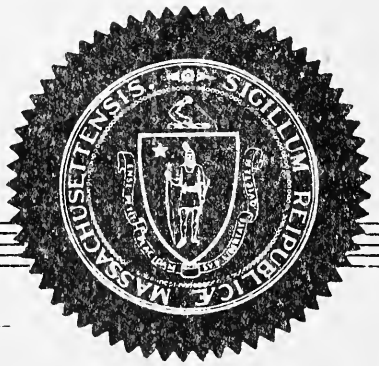
Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH



PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
(16-6 0) $.15

The Commonwealth of Massachusetts
State Building Code Commission
5th Floor
141 Milk Street, Boston 02109

ICHAEL S. DUKAKIS
GOVERNOR
HARLES A. J. THEODORE
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

(617) 727-6916

February 12, 1976

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on January 20, 1976 at Gardner Auditorium, State House, Boston on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which will become effective on March 8, 1976.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

RECEIVED
2:30 P.M.
FEB 12 1976
SECRETARY'S OFFICE

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on February 12, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney

By: _____
Assistant Attorney General

SECTION 108.15

Repeal Section 108.15 of the State Building Code in its entirety and substitute the following new section:

108.15 INSPECTION AND CERTIFICATION - SPECIFIED USE GROUPS: The building official shall periodically inspect and certify buildings and structures or parts thereof in use groups F, H, L-1, and L-2, according to Table 1-1. No certificate of inspection as herein specified shall be issued until an inspection is made certifying that the building or structure, or parts thereof, complies with all the applicable requirements of the Basic Code, and until the fee is paid as specified in Table 1-1. Municipalities may waive only in its entirety, the fees as specified in Table 1-1 for buildings and structures, or parts thereof; municipalities may not revise or modify, or waive in part said fees, except those fees for buildings or structures, or parts thereof, owned by the municipality or county and for buildings and structures or parts thereof, used solely for religious purposes. All state-owned buildings and structures are exempt from said fees. A copy of said certificate shall be kept posted as specified in section 121.2.

TABLE 1-1

Repeal Table 1-1 of the State Building Code in its entirety and substitute the attached new Table.

NOTES TO TABLE 1-1

Following Table 1-1, add the following "Notes to Table 1-1":

NOTES TO TABLE 1-1

General:

The maximum certification period specified on Table 1-1 is intended to provide administrative flexibility. For those buildings and structures or parts thereof allowing more than a one-year, maximum certification period, the building official may determine the length of validity of the certificate issued. For example, a building in the L-2 Use Group could be issued a certificate valid for 1, 2, 3, 4, or 5 years. The total amount of fees charged for a certificate or certificates issued during the maximum certification period cannot exceed the fee listed or referenced in

NOTES TO TABLE 1-1 (CONTINUED)

column 4 of Table 1-1. For example, if the building official issues a certificate valid for two (2) years for a building in the L-2 Use Group, then the fee charged would be 2/5 times the FEE PER MAXIMUM CERTIFICATION PERIOD as determined for the building in question using the formula in note f below.

Specific:

Note a: For all buildings or structures, or parts thereof, in the F-3+ Use Group, the fee to be charged for the maximum certification period of one (1) year is $50 for accommodations for up to five thousand (5,000) persons, plus $10 for the accommodations for each additional one thousand (1,000) persons or fraction thereof.

Note b: For all buildings or structures, or parts thereof, in the F-5 Use Group, the fee to be charged for the maximum certification period of one (1) year is $25 for seating accommodations for up to five thousand (5,000) persons, plus $5 for the accommodations for each additional one thousand (1,000) persons or fraction thereof.

Note c: For all buildings and structures, or parts thereof, in the H-1 Use Group, the fee to be charged for the maximum certification period of two (2) years is $50 for each structure containing up to one hundred (100) beds, plus a $1 charge for each additional ten (10) beds or fraction thereof over the initial one hundred (100) beds.

Note d: For hospitals, nursing homes, sanitariums, and orphanages in the H-2 Use Group, the fee to be charged for the maximum certification period of two (2) years is $50 for each structure containing up to one hundred (100) beds, plus a $1 charge for each additional ten (10) beds or fraction thereof over the initial one hundred (100) beds. All other buildings or structures or parts thereof in the H-2 Use Group classification shall be charged a fee of $50 for a two (2) year maximum certification period.

Note e: For all buildings and structures or parts thereof in the L-1 Use Group, the fee to be charged for the maximum certification period of one (1) year shall be $25 for up to five (5) units plus $1 per unit for all over five (5) units. A unit shall be defined as follows:

two (2) hotel guest rooms
two (2) lodging house guest rooms
two (2) boarding house guest rooms
four (4) dormitory beds

Note f: For all buildings and structures or parts thereof in the L-2 Use Group, the fee to be charged for the maximum certification period of five (5) years shall be $50, plus $1 per dwelling unit, except three (3) family dwelling units shall be exempt from such fees.

Note g: For purposes of determining the required number of inspections, the maximum certification period, and the fees, as specified on Table 1-1, dormitories are included in the L-1 Use Group classification rather than the L-2.

TABLE 1-1 -- REQUIRED MINIMUM INSPECTIONS AND CERTIFICATION FOR SPECIFIED USE GROUPS
(See ARTICLE 2 for complete descriptions of use groups.)

REVISED FEBRUARY, 1976

USE GROUP			MINIMUM INSPECTIONS	MAXIMUM CERTIFICATION PERIOD	FEES PER MAXIMUM CERTIFICATION PERIOD
F-1-A+	Assembly Theatres (accommodating over 400)	With stage and scenery	Semi-Annually	One Year	$50
F-1-B+		Movie Theatre	"	"	"
F-2+	Assembly -- Night clubs and similar uses (accommodating over 400)		"	"	"
F-3+	Assembly -- Lecture halls, recreation centers, terminals, etc. (accommodating over 400)		"	"	note a
F-1-A	Assembly Theatres (accommodating 400 or less)	With stage and scenery	Annually	One Year	$25
F-1-B		Movie Theatre	"	"	"
F-2	Assembly -- Night clubs and similar uses (accommodating 400 or less)		"	"	"
F-3	Assembly -- Lecture halls, recreation centers, terminals, etc. (accommodating 400 or less)		"	"	"
F-4	Assembly -- Churches, low density recreation and similar uses		Prior to the issuance of each new certificate	Five Years	$25
F-5	Assembly -- stadiums, bleachers, etc.			One Year	note b
F-6	Assembly -- Schools: 10 or more students		"	One Year	$25
F-7	Assembly -- All places of assembly accommodating between 20 and 49 persons		"	One Year	"
H-1	Institutional -- Restrained--Jails, prisons, etc.		"	Two Years	note c
H-2	Institutional -- Incapacitated--Hospitals, etc.		"	Two Years	note d
L-1	Residential -- Hotels, lodging houses, etc. note g		"	One Year	note e
L-2	Residential -- Multi-Family note g		"	Five Years	note f

EDITORIAL

NOTES TO TABLE 2-5

On Page 2-33, the Note h references should be "Section 903.62 and Section 903.7".

SECTION 417.2

On the last line of Section 417.2 delete "Section 421.7" and substitute "Section 419.0".

SECTION 424.51

On the last line of Section 424.51 delete "Section 6" and substitute "Section 424.6".

SECTION 605.31

On the second line of Section 605.31 delete the word "construction" and substitute "constructed".

SECTION 905.63

On the fourth line of Section 905.63 delete the words "ceilings and enclosure walls" and substitute "floor/ceiling assembly and enclosure walls".

SECTION 910.43

On the first line of Section 910.43 delete the words "structures or" and substitute "structures of".

ARTICLE 10 (REFERENCE STANDARDS)

On line 9 under "Reference Standards - Article 10" change the year from "1964" to "1971" to read as follows:

ULI	103	1971	Factory-Built Chimneys

SECTION 1908.0

On the last line of Section 1908.0 delete "Section 127" and substitute "Section 126".

FIGURE 2100-1

In Figure 2100-1 delete the words "stairway shall be not less than 2'-6" wide" and substitute "stairway shall be not less than 3'-0" wide".

SECTION 2101.9

In Section 2101.9, Item b), second line, under EXCEPTIONS delete "(1/500)" and substitute "(1/1500)".

FIGURE 2107-1

In Figure 2107-1, on the last line delete "NOTE: The fireplace ashpit and cleanout shown is optional" and substitute "NOTE: The fireplace ashpit and cleanout location shown is optional".

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet Com.&Dev. Department DCA Agency State Bldg. Code Commission
Contact Charles J. Dinezio, Exec. Director Phone 727-6916
Address 141 Milk St., Boston, Mass. 02109

2 - Descriptive title of document: Amend State Building Code

3 - Estimate the number of copies that will be purchased in the next six months: 2,000 By your agency; 6,000 By the public.

4 - The document enclosed is best classified as a:
Regulation(30A/1) (X) Emergency Regulation ( ) Other ( )

If "emergency" is checked briefly state the nature of the emergency:
--

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: MGLA Chapt. 23B, S. 20; Chap. 30A, S. 5; Chap. 30, S. 37.

Was a public hearing required ? Yes(X) No ( )

If approval of other agencies was required, list approvals and date obtained: None

6 - Date of public hearing (30A/2): 1/20/76 ; OR
Date of "action" (30A/3) :

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes(X) No ( )

If "no" list the chapter and section of the general laws under which notice was given:

7 - If regulation is to become effective on a date other than the publishing date list effective date: 3/8/76

8 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)		filed	
		filed	
		filed	
Amends regulation(s)	State Bldg. Code	filed	7/1/74
		filed	
		filed	

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes( ) No (X)

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

NATIVE MILL LUMBER - TYPE 4 STRUCTURE ONLY

Date Filed May 5, 1976

Date Published May 5, 1976

Chapter 233 sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

Publication of this Document Approved by Alfred C. Holland, State Purchasing Agent.
(16-6P) $.15

The Commonwealth of Massachusetts
State Building Code Commission

JOHN W. MC CORMACK STATE OFFICE BUILDING

ROOM 1305

ONE ASHBURTON PLACE, BOSTON 02108

chael S. Dukakis
GOVERNOR

les A. J. Theodore
CHAIRMAN

ARLES J. DINEZIO
ECUTIVE DIRECTOR

May 5, 1976

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

Re: AMENDMENT TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 4, 1976 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendment to the Commonwealth of Massachusetts State Building Code.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosure

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted this amendment to the Commonwealth of Massachusetts State Building Code.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on May 5, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

Effective April 17, 1976, Sections 851.1 and 2102.2 of the Commonwealth of Massachusetts State Building Code are suspended until July 1, 1976 to allow the following:

Native mill lumber, which is ungraded, shall be acceptable with the approval of the building official for type 4 structures only.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet DCA Department DCA Agency STATE BUILDING CODE COMM.
Contact Charles J. Dinezio, Exec. Dir. Phone 727 - 6916
Address Room 1305 1 Ashburton Place, Boston, 02108

2 - Descriptive title of document: Amendment to State Building Code

3 - Estimate the number of copies that will be purchased in the next six months: 1,000 By your agency; 2500 By the public.

4 - The document enclosed is best classified as a:
Regulation(30A/1) (X) Emergency Regulation ( ) Other ( )

If "emergency" is checked briefly state the nature of the emergency:

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: Chapter 23b MGLA and chapter 30A, MGLA

Was a public hearing required ? Yes (X) No ( )

If approval of other agencies was required, list approvals and date obtained: none

6 - Date of public hearing (30A/2): May 4, 1976
Date of "action" (30A/3) :

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes (X) No ( )

If "no" list the chapter and section of the general laws under which notice was given:

7 - If regulation is to become effective on a date other than the publishing date list effective date: April 17, 1976

8 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)		filed
		filed
		filed
Amends regulation(s)	SBCC Section 851.1	filed 7/1/74
	SBCC Section 2102.2	filed 7/1/74
		filed

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes ( ) No (X)

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

SS 201.2, 460.25, 460.251, 2100.10, 2107.24 & 2107.25

Date Filed June 14, 1976

Date Published June 23, 1976

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT
(16-60) $.15

2

EL S. DUKAKIS
GOVERNOR
S A. J. THEODORE
CHAIRMAN
LES J. DINEZIO
UTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

June 8, 1976

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

Re: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 4, 1976 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on August 1, 1976.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on August 1, 1976.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on June 8, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney

By: Mitchell S. Sikora, Jr.
Assistant Attorney General

SECTION 201.2

Add the following new definition after the definition for "Raised Platform":

RAISED PLATFORM, ENCLOSED: A raised portion of a floor, to be used for simple stage purposes that involve a minimum of fire hazard, has a ceiling which extends not more than five (5) feet above the top of the proscenium opening, contains a proscenium opening curtain, contains no gridiron, fly gallery or other apparatus above or below the stage for the movement of scenery, does not extend more than eight (8) feet beyond the curtain line and has two (2) separate and independent means of egress such that no point behind the curtain shall be more than fifty (50) feet from an egress doorway. The curtain shall be in conformance with the requirements of section 416.67.

TABLE 2-6

Amend Table 2-6 for F-6 Use, 4B Type Construction as follows:

Delete "NP" and insert in its place "1 ST 20'"
" 4,800 "

Change Table 2-6 for F-6 Assembly as Follows:

Add reference to Note o.

Add the following note to the Notes for Table 2-6 after Note n:

Note o The tabular area for use group F-6 Schoolhouse, Type 4B Construction shall be limited to four thousand eight hundred (4,800) square feet. (No increase allowed for sprinklers or accessibility.)

SECTION 460.25

Add the following new Section after Section 460.24

460.25 UNPROTECTED FRAME (4B) CONSTRUCTION: Buildings for F-6 Use, of Type 4B Construction shall be limited, within the allowable fire area of four thousand eight hundred (4,800) square feet in accordance with Table 2-6, to a total of four (4) classrooms.

SECTION 460.251

Add the following new Section after Section 460.25.

460.251: AUTOMATIC ALARM SYSTEMS: Approved smoke detectors shall be installed as follows:

1) One for each twelve hundred (1,200) square feet of area in each classroom, connected to the school alarm system.

2) In exitway access hallways, with a spacing of no more than thirty (30) feet between detectors, connected to the school alarm system.

TABLE 9-3

Add to Table 9-3 the following:

Use Groups	Exitways	Corridors	Rooms
F-6 Schools and Classrooms	I	II	III

SECTION 2100.10

Delete the second paragraph and substitute the following:

Sleeping rooms shall have at least one (1) openable window or exterior door to permit emergency exit or rescue. A required window must be openable from the inside without the use of separate tools, and shall conform to the following:

a) The sill height shall be not more than thirty-six (36) inches above the finish floor; and,

b) Shall provide a minimum net clear opening area of 3.3 square feet on the lower half of a double hung unit with a rectangle having minimum net clear opening dimensions of twenty (20) inches by twenty-four (24) inches.

SECTION 2107.24

Delete after the word "laboratory", the words: "and approved by the State Building Code Commission" so that the paragraph reads:

Factory-built fireplaces that consist of a fire chamber assembly, one or more chimney section, a roof assembly and other parts as tested and listed as an assembly by a nationally recognized testing laboratory may be installed when complying with all the following provisions.

SECTION 2107.25

Delete after the word "laboratory", the words: "and approved by the State Building Code Commission" so that the paragraph reads:

Factory-built fireplace stoves, consisting of a free-standing fire chamber assembly, that have been tested and are listed by a nationally-recognized testing laboratory, may be installed, in accordance with the requirements of said listing.

EDITORIAL CHANGES

SECTION 605.32

On the fourth and fifth line delete the word "enclosed" and substitute the word "unenclosed".

INDEX

The section referenced for 'spray booths' should be Section 410.22 not 412.22.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

- Cabinet DCD Department DCA Agency SBCC
  Contact C. [illegible] Phone 727 6916
  Address Rm 1305 1 Ash.
- Descriptive title of document: Amendments to State Building Code
- Estimate the number of copies that will be purchased in the next six months: 1,000 By your agency; 3,000 By the public.
- The document enclosed is best classified as a:
  Regulation(30A/1) (✓) Emergency Regulation (___) Other (___)

  If "emergency" is checked briefly state the nature of the emergency:

  If "other" is checked do not complete the rest of this form.
- List statutory, regulatory and other authority for this promulgating action: MGLA c 30A s 5; MGLA c 23B s 20; MGLA c 30 s. 3,

  Was a public hearing required ? Yes(✓) No (___)

  If approval of other agencies was required, list approvals and date obtained: None
6 - Date of public hearing (30A/2): 5/4/76; OR
  Date of "action" (30A/3) :

  Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
  Yes(✓) No (___)

  If "no" list the chapter and section of the general laws under which notice was given: 16-6 9
7 - If regulation is to become effective on a date other than the publishing date list effective date: August 1, 1976
8 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)		filed		
		filed		
		filed		
Amends regulation(s)	State Building Code	filed	7/1/74	5a
	Table 12-6	filed	10/30/74	9c
	2100.10	filed	1/9/75	10

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes(___) No (✓)

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

AMENDMENTS - SS 127.32, 127.33, 201.0, 426.0, etc. Effective 9/1/76.

Date Filed June 30, 1976

Date Published July 8, 1976

Chapter 233 sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT
(16-6R) $.30

2

IAEL S. DUKAKIS
GOVERNOR
ES A. J. THEODORE
CHAIRMAN
RLES J. DINEZIO
CUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

June 29, 1976

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 4, 1976 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on September 1, 1976.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on September 1, 1976.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on June 29, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney

By: _____
Assistant Attorney General

SECTION 127.32

Add the following new Section after Section 127.31:

127.32 CONCRETE TESTING LABORATORIES: On and after the first day of September, 1976, no person shall engage in the activities of a Testing Laboratory, Branch Laboratory, and/or Project Laboratory for the purpose of testing concrete and concrete materials for use in buildings and structures subject to the Basic Code and unless licensed by the Commission in accordance with the Basic Code and the rules and regulations promulgated pursuant thereto.

SECTION 127.33

Add the following new Section after Section 127.32:

127.33 NATIVE LUMBER: On and after the first day of September, 1976, no person shall engage in the producing of native lumber for use in buildings or structures within the Commonwealth of Massachusetts unless registered by the Commission in accordance with the Basic Code and the rules and regulations promulgated pursuant thereto.

SECTION 201.0

Add the following new definition to Section 201.0:

NATIVE LUMBER: Native lumber is wood processed in the Commonwealth of Massachusetts by a mill registered in accordance with the regulations of the State Building Code Commission. Such wood is ungraded but is stamped or certified in accordance with the requirements of Section 851.11 of the Code. For the purpose of this definition, native lumber shall be restricted to use in one and two-story dwellings, barns, sheds, agricultural and accessary buildings and structures, and other low-stress uses.

SECTION 426.0

Delete the existing introductory paragraph to Section 426.0 and insert the following:

Buildings in use group H-2 shall conform to the applicable provisions of the Basic Code, and this section and the following reference standards: Buildings used as nursing homes, rest homes, charitable homes for the aged and convalescent homes shall meet the provisions of NFPA 101 Life Safety Code, 1967: Buildings used as Hospitals shall meet the provisions of NFPA 101 Life Safety Code, 1973.

851.11

Add the following new Section after Section 851.1:

851.11 NATIVE LUMBER: Native lumber, as defined in this code, shall be acceptable for use in one and two-story dwellings, barns, sheds, agricultural and accessory buildings and structures and other low-stress uses. Each piece of native lumber produced shall be stamped with the name and registration number of the producer in accordance with the rules and regulations of the State Building Code Commission. In addition, all native lumber shall bear an approved mark identifying the species of wood. In lieu of the stamp bearing the name and registration number and species identification, a certificate bearing the same information may be provided by the producer for pre-cut or remanufactured lumber in accordance with the rules and regulations of the State Building Code Commission. When native lumber is used, it shall be subject to the following requirements:

1) For lumber sized in accordance with the American Softwood Lumber Standard PS-20-70, figures for maximum fiber stress and modulus of elasticity for framing grade No. 2 will be used in establishing span and spacing characteristics for all structural members.

2) Lumber which is sized in excess of the dimensions established by the American Softwood Lumber Standard PS-20-70 for the given nominal size referenced shall be allowed to have a maximum fiber stress increase above that provided in paragraph 1 above in proportion to the increased bearing capacity of the cross section as provided in Table 2100-2 or as calculated.

SECTION 1218.211

Under Item G) "Approved Devices", change the date listed under Subitem 1. "Exception" from July 1, 1976 to October 1, 1976.

SECTION 2100.10

Add the following new paragraph after the first paragraph of Section 2100.10 as follows:

Access to grade at termination of the required means of egress may be provided by the use of both side-hinged swinging doors or sliding glass doors. Swinging doors provided to meet this requirement may swing inward.

SECTION 2100.19

Add the following new section after Section 2100.18:

2100.19 NATIVE LUMBER: Native lumber, as defined in this code, shall be acceptable for use in one and two-story dwellings, barns, sheds, agricultural and accessory buildings and structures and other low-stress uses. Each piece of native lumber produced shall be stamped with the name and registration number of the producer in accordance with the rules and regulations of the State Building Code Commission. In addition, all native lumber shall bear an approved mark identifying the species of wood. In lieu of the stamp bearing the name and registration number and species identification, a certificate bearing the same information may be provided by the producer for pre-cut or remanufactured lumber in accordance with the rules and regulations of the State Building Code Commission. When native lumber is used, it shall be subject to the following requirements.

1) For lumber sized in accordance with the American Softwood Lumber Standard PS-20-70, figures for maximum fiber stress and modulus of elasticity for framing grade No. 2 will be used in establishing span and spacing characteristics for all structural members.

2) Lumber which is sized in excess of the dimensions established by the American Softwood Lumber Standard PS-20-70 for the given nominal size referenced shall be allowed to have a maximum fiber stress increase above that provided in paragraph 1 above in proportion to the increased bearing capacity of the cross section as provided in Table 2100-2 or as calculated.

SECTION 2102.2

The following new EXCEPTION is to be inserted immediately following the section heading "2102.2 WOOD":

EXCEPTION: NATIVE LUMBER: Items a) IDENTIFICATION and b) GRADE of this section shall be subject to the provisions of section 2100.19 for native lumber.

SECTION 2104.2

The following new EXCEPTION is to be inserted immediately following the section heading "2104.2 WOOD":

EXCEPTION: NATIVE LUMBER: Items a) IDENTIFICATION and b) GRADE of this section shall be subject to the provisions of section 2100.19 for native lumber.

SECTION 2105.2

The following new EXCEPTION is to be inserted immediately following the section heading "2105.2 WOOD":

EXCEPTION: NATIVE LUMBER: Items a) IDENTIFICATION and b) GRADE of this section shall be subject to the provisions of section 2100.19 for native lumber.

STATE BUILDING CODE COMMISSION

RULES AND REGULATIONS CONTROLLING THE USE OF NATIVE LUMBER

PART I GENERAL

SECTION 1 ADMINISTRATION

1.1 TITLE

As authorized by Chapter 802 of the Acts of 1972, and in accordance with Section 127 of the State Building Code establishing the Construction Materials Safety Board, the following Rules and Regulations are adopted for Controlling the Use of Native Lumber.

1.2 DEFINITIONS

Unless otherwise expressly stated in the State Building Code, the following terms shall, for the purpose of these Rules and Regulations, have the meaning indicated in this section:

BOARD: Construction Materials Safety Board

CODE: Commonwealth of Massachusetts State Building Code

COMMISSION: Commonwealth of Massachusetts State Building Code Commission

NATIVE LUMBER: Native lumber is wood processed in the Commonwealth of Massachusetts by a mill registered in accordance with the regulations of the State Building Code Commission. Such wood is ungraded but is stamped or certified in accordance with the requirements of Section 851.11 of the Code. For the purpose of this definition, native lumber shall be restricted to use in one and two-story dwellings, barns, sheds, agricultural and accessary buildings and structures and other low-stress uses.

PERSON: Individual, partnership, corporation, trust, joint venture, etc.

WOOD PRODUCERS: Persons or corporations in the business of milling wood into native lumber within the Commonwealth of Massachusetts.

1.3 REGISTRANTS

No person shall engage in the producing of native lumber foruse in buildings or structures within the Commonwealth of Massachusetts unless registered by the State Building Code Commission.

1.4 APPLICATION FOR REGISTRATION

Each person desiring to obtain registration as wood producer of native lumber shall make application to the Commission upon such form and in such manner as the Commission shall prescribe and shall furnish evidence satisfactory to the Commission that he is qualified to be registered in accordance with these rules and regulations.

1.5 APPLICATION FEE

Applications shall be accompanied by a registration fee of twenty-five ($25.00) dollars. This initial registration fee shall be for two (2) years. Registration shall be reviewed every two (2) years in accordance with the Rules and Regulations of the Commission. The fee thereafter for a two (2) year renewal shall be ten (10) dollars.

1.6 RENEWALS

Registration shall be valid for two (2) years and shall be renewed biennially. Within ninety (90) days before the expiration date of any such registration, the Executive Director of the Commission shall forward to each person so registered an application form for renewal. The said Executive Director, upon receipt of the completed form and fee, shall renew the registration for a period of two (2) years or notify such applicant of his refusal with reasons thereof. Any application for renewal of registration which has expired shall require the payment of a new registration fee.

1.7 PRE-QUALIFYING AGENCY

The Commission hereby designates the Massachusetts Wood Producers' Association as its pre-qualifying agency, provided however, that the Commission may revoke such designation at any time, and may designate any other agency or agencies which it deems qualified, from time to time, to act as its pre-qualifying agency for pre-examination registration.

1.8 PENALTIES

Any such person who fails to comply with the requirements of these rules and regulations or who files a false report shall be subject to the penalties and actions as prescribed in Section 122 of the Code.

SECTION 2 REGISTRATION

2.1 STAMP

Each person registered by the Commission shall be issued a name and number for use in stamping or certifying the native lumber which he produces.

2.2 STAMP CONTENTS

Each stamp filed with this Commission shall be a minimum of two inches by four inches (2" x 4"), with a minimum of thirty-six (36) pt. letters and shall contain the following information.

a) Name of native lumber producer

b) Registration Number

c) Specie of wood

2.3 STAMP USE

Each piece of native lumber produced shall bear the stamp so registered with this Commission.

2.4 STAMP - UNLAWFUL USE

Each registered mill shall be assigned an individual number. It shall be unlawful to use such registration number in any mill other than the mill so registered.

2.5 STAMP - MANUFACTURE

Each producer shall be responsible for the manufacture and use of his stamp in accordance with the requirements of the Commission and these rules and regulations.

SECTION 3 REVOCATION AND SUSPENSION PROCEDURES

3.1 REVOCATION AND SUSPENSION

The State Building Code Commission on its own initiative or upon the recommendation of the Construction Materials Safety Board, may suspend or revoke the registration of any such mill registered in accordance with these rules and regulations, the state building code or the standards of good practice. Notice of suspension or revocation of such registration shall be in writing with the reasons for suspension or revocation clearly set forth therein, and served in accordance with Section 122.12 of the Basic Code.

3.2 NOTICE AND CONFERENCE

Prior to suspension or revocation of the registration of any such mill so registered, written notice of such intent shall be served by the Construction Materials Safety Board in accordance with Section 122.12 of the Basic Code. Within ten (10) calendar days of receipt of such notice, the affected mill may request a conference before a three (3) member panel designated by the chairman of the Construction Materials Safety Board, who will hear facts and make their recommendations to the Construction Materials Safety Board.

3.3 EFFECT OF

Upon suspension or revocation of the registration of any such mill so registered, such mill shall immediately cease engaging in the stamping or certifying of native lumber. The filing of an appeal with the State Building Code Appeals Board shall stay such suspension or revocation subject to Section 126.32 of the Basic Code.

SECTION 4 APPEALS

4.1 BUILDING CODE APPEALS BOARD

Any one aggrieved by the decision of the Commission, the Construction Materials

Safety Board, the Massachusetts Wood Producers' Association or others may appeal to the State Building Code Appeals Board in accordance with Section 126 of the Code.

SECTION 5 QUALIFICATION

5.1 EVALUATION

Evaluation by the pre-qualifying agency shall be required prior to registration of a mill subject to these rules and regulations. The agency shall examine and evaluate the application of all mills and make its recommendations to the Construction Materials Safety Board. The Construction Materials Safety Board shall make its recommendations to the Commission who shall act on the application of the mill so requesting registration.

STATE BUILDING CODE COMMISSION

RULES AND REGULATIONS FOR LICENSING OF CONCRETE LABORATORIES

PART I GENERAL

SECTION 1 ADMINISTRATION

1.1 TITLE

As authorized by Chapter 802 of the Acts of 1972, and in accordance with Section 127 of the State Building Code establishing the Construction Materials Safety Board, the following Rules and Regulations are adopted for Licensing of Concrete Laboratories.

1.2 DEFINITIONS

Unless otherwise expressly stated in the State Building Code, the following terms shall, for the purpose of these Rules and Regulations, have the meaning indicated in this section:

ACCREDITED LABORATORY: A laboratory which has been licensed in accordance with these regulations by the State Building Code Commission.

AGENCY: Reference definition for "Testing Laboratory".

BOARD: Construction Materials Safety Board

BRANCH LABORATORIES: A branch of a Testing Laboratory physically removed from the location of the headquarters or main testing facility of the Testing Laboratory.

CODE: Commonwealth of Massachusetts State Building Code

COMMISSION: Commonwealth of Massachusetts State Building Code Commission

LABORATORIES: Testing Laboratory, branch laboratory, and project laboratory.

PERSON: Individual, partnership, corporation, trust, joint venture, etc.

PROJECT LABORATORY: A temporary on-site facility providing concrete testing services for a specific project in accordance with these licensing regulations.

TESTING LABORATORY: A proprietorship, corporation, partnership or agency which conforms to the requirements of ASTM E 329-72 as modified in these regulations.

1.3 LICENSING

All laboratories defined by these regulations as Testing Laboratories, Branch Laboratories and Project Laboratories which are engaged in the testing of concrete and concrete materials for use in buildings and structures subject to the provisions of the Massachusetts State Building Code shall be licensed by the State Building Code Commission in accordance with these regulations.

1.4 APPLICATION FOR LICENSING

Each person desiring to obtain such license shall make application to the Commission upon such form and in such manner as the Commission shall prescribe and shall furnish evidence satisfactory to the Commission that he is qualified to be licensed in accordance with these rules and regulations.

1.5 APPLICATION FEE

Applications shall be accompanied by a fee in accordance with the fee schedule established from time to time by the Commission.

1.6 RENEWALS

Licenses shall be valid for three (3) years. Within ninety (90) days before the expiration date of any such license, the Executive Director of the Commission shall forward to each person so licensed an application form for renewal. The said Executive Director, upon receipt of the completed form and fee, shall renew the license for a period of three (3) years or notify such applicant of the Commission's refusal with reasons thereof. Any application for renewal of a license which has expired shall require the payment of a new license fee.

1.7 PRE-QUALIFYING AGENCY

The Commission hereby designates the Construction Materials Safety Board as its pre-qualifying agency, provided however, that the Commission may revoke such designation at any time, and may designate any other agency or agencies which it deems qualified, from time to time, to act as its pre-qualifying agency for pre-examination licensing.

1.8 PENALTIES

Any such person who fails to comply with the requirements of these rules and regulations or who files a false report shall be subject to the penalties and actions as prescribed in Section 122 of the Code.

1.9 NUMBER

Each person licensed by the Commission shall be issued a number.

SECTION 2 REVOCATION AND SUSPENSION PROCEDURES

2.1 REVOCATION AND SUSPENSION

The State Building Code Commission on its own initiative or upon the recommendation of the Construction Materials Safety Board, may suspend or revoke the license of any Testing Laboratory, Branch Laboratory, or Project Laboratory found to be in non-compliance with these rules and regulations, the state building code, or the standards of good practice. Notice of suspension or revocation of such license shall be in writing with the reasons for suspension or revocation clearly set forth therein, and served in accordance with Section 122.12 of the Basic Code.

2.2 NOTICE AND CONFERENCE

Prior to suspension or revocation of the license of an accredited laboratory, written notice of such intent shall be served by the Construction Materials Safety Board in accordance with Section 122.12 of the Basic Code. Within ten calendar days of receipt of such notice, the affected accredited laboratory may request a conference before a three member panel designated by the chairman of the Construction Materials Safety Board, who will hear facts and make their recommendations to the Construction Materials Safety Board.

2.3 EFFECT OF

Upon suspension or revocation of the license, the accredited laboratory shall immediately cease engaging in the testing of concrete and concrete materials for use in buildings and structures which are subject to the provisions of the Massachusetts State Building Code and no action brought before the Board of Appeals as specified in Section 3.1 of these regulations or in any court of competent jurisdiction shall stay the said suspension or revocation unless said Board of Appeals or court shall issue an order for a stay of the Commission's suspension or revocation.

SECTION 3 APPEALS

3.1 BUILDING CODE APPEALS BOARD

Any laboratory or individual aggrieved by the suspension or revocation of their license or by an interpretation, order, requirement, direction or failure to act under these Rules and Regulations may appeal to the State Building Code Appeals Board as provided in Section 126; however, entry of an appeal from the Commission's order of revocation or suspension shall not stay such revocation or suspension unless so ordered by the State Building Code Appeals Board in a preliminary hearing conducted expressly for the purpose of a stay in accordance with that part of Section 126.32 of the Basic Code dealing with the procedure required for a hearing on such stay.

SECTION 4 PREQUALIFICATION REQUIREMENTS FOR LABORATORIES

4.1 EVALUATION

a) Testing and Branch laboratories subject to these regulations shall be examined and evaluated by the Cement and Concrete Reference Laboratory

of the National Bureau of Standards at least once every three (3) years. This requirement may be waived or modified by the State Building Code Commission if it is deemed advisable.

b) Project laboratory equipment which is used in the testing of concrete materials for use in buildings and structures subject to the provisions of the Massachusetts State Building Code Commission shall conform to the requirements of ASTM E-329-72.

b) Reports of Evaluations by the Cement and Concrete Reference Laboratory shall be filed with the State Building Code Commission within ten (10) days of receipt by the laboratory.

c) Laboratory deficiencies cited in the report of the Cement and Concrete Reference Laboratory shall be corrected within two (2) months of the date of issue of the report and shall be so certified by an affidavit submitted by the laboratory on a form supplied by the State Building Code Commission.

4.2 REVIEW OF DEFICIENCIES

Laboratories which fail to meet the requirements of item (c) shall be subject to review of their license by the State Building Code Commission.

4.3 TESTING MACHINES

Compression testing machines used for testing materials subject to these regulations shall be calibrated and verified at least annually or as required by the State Building Code Commission, and the results submitted to the Commission.

SECTION 5 PERSONNEL

5.1 QUALIFICATIONS

The management and supervision of all laboratories subject to these regulations shall be in accordance with paragraph 4.1 of ASTM E 329-72 with the following exception:

Exception: The testing services of the accredited laboratory shall be under the direction of a full-time employee of the company who shall be qualified in accordance with any one (1) of the following three (3) sets of requirements:

a) He shall be a Professional Engineer, registered in the Commonwealth of Massachusetts with at least five (5) years of engineering experience in responsible charge of work related to structural engineering, construction engineering or construction materials testing; or

b) He shall have a degree in Civil or Mechanical Engineering from an accredited institution and an additional total of three (3) years experience in concrete and concrete materials testing which shall include two (2) years as a laboratory technician; or

c) He shall have at least eight (8) years experience including five (5) years experience as a supervisory laboratory technician and three (3) years experience as a supervisory field technician and shall be required to successfully pass those examinations as deemed necessary by the State Building Code Commission.

5.2 FILING OF QUALIFICATIONS

The qualifications of supervisory field and supervisory laboratory personnel of licensed laboratories shall be filed with the State Building Code Commission within 60 days of employment for such duties. Such personnel shall have the necessary accreditation and qualifications to perform such duties as prescribed in paragraphs 4.2 and 4.3 of ASTM E 329-72 and shall be subject to certification by oral, written or practical examinations in accordance with the requirements of the State Building Code Commission.

SECTION 6 LABORATORY LICENSING REQUIREMENTS

6.1 ASTM TESTING REQUIREMENTS

Except as modified in these regulations, all testing laboratories including branch laboratories shall conform to Sections 5 and 6 of the ASTM E 329-72 standard requirements for testing of concrete and its constituent materials.

Exception: The following sections of ASTM E 329-72 shall not apply:

Sections 2.2; 2.3; 2.7; 3.2.7; 3.3; 3.4; C 360 of 6.2; 7; 8; 9; and 10.

6.2 ASTM EQUIPMENT AND PERSONNEL REQUIREMENTS

All laboratories subject to these regulations shall be approved and licensed in accordance with the ASTM E 329-72 standard only for the performance of those functions for which the laboratory can comply with the recommendations of the Standard ASTM E 329-72 for equipment and personnel, as modified in these regulations.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet DCD Department DCA Agency State Building Code Comm.
Contact Charles J. Dinezio, Exec. Dir. Phone 727 - 6916
Address Room 1305, McCormack State Office Building

2 - Descriptive title of document: Amendments to State Building Code

3 - Estimate the number of copies that will be purchased in the next six months: 1,000 By your agency; 3,000 By the public.

4 - The document enclosed is best classified as a:
Regulation (30A/1) (X) Emergency Regulation ( ) Other ( )

If "emergency" is checked briefly state the nature of the emergency:

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: MGLA c.30A, s.5; c 23B s. 20; c30 s. 37

Was a public hearing required ? Yes (X) No ( )

If approval of other agencies was required, list approvals and date obtained: None

6 - Date of public hearing (30A/2): 5/4/76 ; OR
Date of "action" (30A/3) :

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes (X) No ( )

If "no" list the chapter and section of the general laws under which notice was given:

7 - If regulation is to become effective on a date other than the publishing date list effective date: September 1, 1976

8 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s) ______ filed ______
______ filed ______
filed ______

Amends regulation(s) State Bldg. Code filed 7/1/74
filed
filed

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes ( ) No (X)

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

AMENDMENTS TO SS 413.1, 413.2, ETC.

Date Filed July 30, 1976

Date Published August 5, 1976

Chapter 233 sec. 75

Printed co ɔies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
(16-6S) $.15

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

CHAEL S. DUKAKIS
GOVERNOR
RLES A. J. THEODORE
CHAIRMAN
HARLES J. DINEZIO
XECUTIVE DIRECTOR

July 30, 1976

RECEIVED
4:00
JUL 30 1976
SECRETARY'S OFFICE

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 4, 1976 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on September 1, 1976.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusets, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on September 1, 1976.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on July 30, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney

By: Terence P. O'Malley
Assistant Attorney General

SECTION 413.1

In Line 4 following the word "shall" add the following new words: "conform to the height and area limitations of Table 2-6, except as herein specifically provided. The areas used for dispensing gasoline in such buildings shall"; so as the entire section reads:

413.1 CONSTRUCTION: All group one (1) public garages hereafter erected shall be classified as storage buildings, moderate hazard (use group B-1) and all Group 2 public garages shall be classified as storage buildings, low hazard (use group B-2), and shall conform to the height and area limitations of Table 2-6, 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 414.0.

SECTION 413.2

In line 4 following the figure "(10,000)" add the following new words: "or one-tenth of one percent" and after the figure (.01 percent) add the following new words: "or the concentration of gasoline vapors in excess of twenty (20) percent of the lower"; so as the entire section reads:

413.2 VENTILATION: All public garages and airplane hangars shall be provided with mechanical or natural ventilation adequate to prevent the accumulation of carbon monoxide or exhaust fumes in excess of one (1) part in ten thousand (10,000) or one-tenth of one percent (.01 percent) or the concentration of gasoline vapors in excess of twenty (20) percent of the lower explosive limit. the building official may require a test by a qualified testing laboratory to determine the adequacy. The cost of such test shall be borne by the owner. The building official may require certification of the adequacy of the system by a qualified registered professional engineer.

SECTION 413.21

Repeal Section 413.21 of the State Building Code in its entirety and substitute the following new section:

413.21 BELOW GRADE: Enclosed and below grade public garages shall be equipped with mechanical ventilation adequate to provide six (6) air changes per hour. The ventilation system shall be operated at all times wherein the garage areas are occupied by human beings.

SECTION 607.4

Repeal Section 607.4 of the State Building Code in its entirety.

TABLE 6-2

Add a new line to Table 6-2 under "Storage (B)" so that it reads as follows:

Storage (B).....	100	150
Public Garages: Group 1 and 2.....	150	200

REFERENCE STANDARDS - ARTICLE 8 (PART B)

Repeal reference standard "USDC CS31 1952 Wood Shingles (Red Cedar, Tidewater, Red Cypress and California Redwood)" and substitute the following:

"Red Cedar Shingle and Handsplit Shake Bureau	1975	Grading Rules for Certigrade Red Cedar Shingles"

EDITORIAL CHANGES

SECTION 2100.11

In Paragraph 4 after the words "three (3) feet" delete the words "eight (8) inches"; so that the entire section reads:

2100.11 DOORWAYS AND HALLWAYS: The minimum clear width of any interior doorway, except in closets, storage areas and bathrooms, shall be two (2) feet six (6) inches. There shall be no minimum requirement for clear doorway width in closets, storage areas and bathrooms.

The minimum clear width of every required exitway doorway to or from a stairway shall be thirty-six (36) inches.

The minimum clear height of required egress doorways shall be six (6) feet six (6) inches.

The minimum width of a hallway or exitway access shall be three (3) feet.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet DCD Department DCA Agency State Bldg. Code Commission
Contact Charles J. Dinezio, Exec. Dir. Phone 727-6916
Address 1 Ashburton Place, Rm. 1305, Boston.

2 - Descriptive title of document: Amendments to the State Building Code

3 - Estimate the number of copies that will be purchased in the next six months: _____ By your agency; 3,000 By the public.

4 - The document enclosed is best classified as a:
Regulation(30A/1) (X) Emergency Regulation (___) Other (___)

If "emergency" is checked briefly state the nature of the emergency:

_____

_____

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: MGLA, C. 30A, S.5; C. 23B, S. 20; C. 30, S. 37.

Was a public hearing required ? Yes(X) No (___)

If approval of other agencies was required, list approvals and date obtained: None

6 - Date of public hearing (30A/2): 5/4/76 ; OR
Date of "action" (30A/3) : _____

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes(X) No (___)

If "no" list the chapter and section of the general laws under which notice was given: _____

7 - If regulation is to become effective on a date other than the publishing date list effective date: September 1, 1976

8 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)	_____	filed _____
	_____	filed _____
	_____	filed _____
Amends regulation(s)	State Bldg. Code	filed 7/1/74
	2100.11	filed 4/11/75 & 1/5/76
	_____	filed _____

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes(___) No (X)

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

SS 1218.211A6bi, 1218.211B2bi, 1218.211B2biii, 1218.211C3, 2100.18B2a, 2100.18B2c & 2100.18C

Date Filed November 1, 1976

Date Published November 12, 1976

Chapter 233 sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
(16-6T) $.15

MICHAEL S. DUKAKIS
GOVERNOR

CHARLES A. J. THEODORE
CHAIRMAN

CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

October 29, 1976

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, MA 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 5, 1976 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which will become effective on December 1, 1976.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to become effective on December 1, 1976.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on October 29, 1976.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

by: _____
Assistant Attorney General

SECTION 1218.211A6bi

Repeal in its entirety and substitute the following:

i) One (1) approved smoke detector shall be located outside of each separate sleeping area, in accordance with the definition for "separate sleeping area" provided in paragraph B2bi of this section.

SECTION 1218.211B2bi

Repeal in its entirety and substitute the following:

i) One (1) approved smoke detector shall be located outside of each separate sleeping area. By sleeping area is meant the area or areas of the family living unit in which the bedrooms (or sleeping rooms) are located. Bedrooms (or sleeping rooms) separated by other use areas, such as kitchens or living rooms (but not bathrooms), shall be considered as separate sleeping areas for the purposes of this regulation.

SECTION 1218.211B2biii

Repeal in its entirety and substitute the following:

iii) No smoke detector may be required to be located in or within six (6) feet of a kitchen, cooking area or garage.

SECTION 1218.211C3

Repeal in its entirety and substitute the following:

3. TYPE III: A Type III system shall be wired in conformance with the Massachusetts Electrical Code and installation shall be in accordance with NFPA 74 (1974). Power shall be supplied from a permanently-wired connection directly to an A.C. primary source of power or monitored batteries. All power for A.C. powered detectors shall be taken from a single branch circuit serving a habitable area; and the power source for the detectors shall be on the supply side, ahead of any switches. All required smoke detectors shall be provided with a visible power-on indication. All required smoke detectors shall be interconnected so that when one actuates all will sound to meet the requirements of NFPA 74 (1974) section 2-2.3. All required smoke detectors shall conform with section 1218.211 G, 1 and 5.

SECTION 2100.18B2a

Repeal in its entirety and substitute the following:

a. One (1) approved smoke detector shall be located outside of each separate sleeping area, in accordance with the definition of "separate sleeping area" in section 1218.211, paragraph B2bi.

SECTION 2100.18B2c

Repeal in its entirety and substitute the following:

c. No smoke detector may be required to be located in or within six (6) feet of a kitchen, cooking area or garage.

SECTION 2100.18C

Repeal in its entirety and substitute the following:

C. Type III: A Type III system shall be wired in conformance with the Massachusetts Electrical Code and installation shall be in accordance with NFPA 74 (1974). Power shall be supplied from a permanently-wired connection directly to an A.C. primary source of power or monitored batteries. All power for A.C. powered detectors shall be taken from a single branch circuit serving a habitable area; and the power source for the detectors shall be on the supply side, ahead of any switches. All required smoke detectors shall be provided with a visible power-on indication. All required smoke detectors shall be interconnected so that when one actuates all will sound to meet the requirements of NFPA 74 (1974) section 2-2.3. All required smoke detectors shall conform with the requirements for approved devices in Item D of this section.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet C & D Department DCA Agency State Building Code C
Contact Charles J. Dinezio Phone 727-8900
Address 1 Ashburton Place, Boston

2 - Descriptive title of document: Amend. to State Bldg Code.

3 - Estimate the number of copies that will be purchased in the next six months: 1800. By your agency: 5,000 By the public.

4 - The document enclosed is best classified as a:
Regulation (30A/1) (✓) Emergency Regulation ( ) Other ( )

If "emergency" is checked briefly state the nature of the emergency:

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: Chap 802 of the Acts of 1972

Was a public hearing required ? Yes (✓) No ( )

If approval of other agencies was required, list approvals and date obtained: N/A

6 - Date of public hearing (30A/2): 10/5/76; OR
Date of "action" (30A/3) :

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes (✓) No ( )

If "no" list the chapter and section of the general laws under which notice was given:

7 - If regulation is to become effective on a date other than the publishing date list effective date: December 1, 1976

8 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s) filed
filed
filed

Amends regulation(s) [illegible] filed 7/1/74
1712.2 [illegible] filed 2/5/76
1715.211B [illegible], 1718.211B [illegible] 1717.[illegible] filed
2100.18 Bva, 2100.18 Bvc, 2100.18C.

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes ( ) No ( )

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

ss 122.12, 420.11, 911.0, 18.1, 18.3, etc.

Date Filed January 6, 1977

Effective February 1, 1977

Date Published January 13, 1977

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
(16-6U) $.15

MICHAEL S. DUKAKIS
GOVERNOR
CHARLES A. J. THEODORE
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-69

January 6, 1977

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, MA 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 5, 1976 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which will become effective on February 1, 1977.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to become effective on February 1, 1977.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on January 6, 1977.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence P. O'Malley
Assistant Attorney General

SECTION 122.12

Under Item c) after the word "registered" add the following new words: "or certified"; so that Item c) reads:

c) by sending him a copy of the order by registered or certified mail, return receipt requested, if he is within the Commonwealth; or

SECTION 420.11

Add the following new Section after Section 420.1:

420.11 REQUIREMENTS FOR FLAME RESISTANT TREATMENT: Every tent used as a place of assembly composed of combustible fabric material shall have submitted to the building official a certificate signed and stamped by a Registered Professional Engineer, showing that the material has been tested and approved for flame resistance in accordance with the recommendations of NFPA No. 701 within a period of twelve (12) months of the date on which the use will terminate under any building permit issued.

SECTION 911.0

On the third line change the section numbered "618" to "616"; so as the entire section reads:

SECTION 911.0 VERTICAL SHAFTS AND HOISTWAYS

The provisions of this section shall apply to all vertical shaft enclosures, except as provided for stairway enclosures in section 616, flue enclosures in section 1009, incinerator chutes in sections 1014 and 1015, duct shafts in sections 1016 and 1017, and pipe shafts in section 1115.

ARTICLE 18 REFERENCE STANDARDS

The provisions of FPR-11, the Massachusetts Electrical Code, shall be applied whenever NFPA 90A references the National Electrical Code.

FIGURE 2107-1

Delete the following Note: "NOTE: The fireplace ashpit and cleanout location shown is optional" and subsitute the following two new notes:

3. Fireplaces - ashpits and cleanouts are optional; however, whenever an ashpit is installed, a cleanout shall be required.

4. Chimneys - cleanouts shall be required when heating appliances are tied into chimney flues.

RULES AND REGULATIONS FOR MANUFACTURED BUILDINGS, BUILDING COMPONENTS, AND MOBILE HOMES

SECTION 18.1

In Line 5 delete the words "one hundred ($100.00) dollars per" and substitute the following new words: "five hundred ($500.00) dollars for the"; so as the entire section reads:

18.1 COMPLIANCE ASSURANCE PROGRAMS AND BUILDING SYSTEMS

a) An initial fee of five hundred ($500.00) dollars shall be charged each manufacturer for its certified compliance assurance program for each plant desiring certification. There shall be an additional charge of five hundred ($500.00) dollars for the certified building system, except that there shall be no such additional charge per building component. The maximum fee charged under this section shall be one thousand ($1,000.00) dollars for each manufacturing plant.

SECTION 18.3

In the fourth and fifth line delete the words "two hundred and fifty ($250.00) dollars" and substitute the following new words: "five hundred ($500.00) dollars"; so as the entire section reads:

18.3 ANNUAL RENEWAL FEES

a) One year from the date of certification of the manufacturer and the third party inspection agency, and every year thereafter certification is in effect, there shall be paid an annual renewal fee of five hundred ($500.00) dollars for each such certification.

EDITORIAL CHANGE

INDEX

On Page I-16, Repeal the reference to "Hoists for Construction Operation, 1316.0" in its entirety.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH, REGULATIONS DIVISION

UNIFORM FILING FORM

This form has been prepared to simplify and make uniform the procedure for submitting materials with the Rules and Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation and to chapter 30A of the general laws which set forth the basic filing requirements.

1 - Cabinet DCD Department DCA Agency State Bldg. Code Commission
Contact Charles J. Dinezio, Executive Dir Phone 727-6916
Address 1 Ashburton Place, Room 1305, Boston

2 - Descriptive title of document: Amendments to the State Building Code

3 - Estimate the number of copies that will be purchased in the next six months: _____ By your agency; 3,000 By the public.

4 - The document enclosed is best classified as a:
Regulation (30A/1) (X) Emergency Regulation ( ) Other ( )

If "emergency" is checked briefly state the nature of the emergency:

If "other" is checked do not complete the rest of this form.

5 - List statutory, regulatory and other authority for this promulgating action: MGLA, C. 30A, S.5; C. 23B, S. 20; C. 30, S. 37.

Was a public hearing required ? Yes (X) No ( )

If approval of other agencies was required, list approvals and date obtained: None

6 - Date of public hearing (30A/2): 10/5/76 ; OR
Date of "action" (30A/3) : _____

Was 30 days notice to the State Secretary and 21 days notice to the public and specifically required persons given?
Yes (X) No ( )

If "no" list the chapter and section of the general laws under which notice was given:

7 - If regulation is to become effective on a date other than the publishing date list effective date: February 1, 1976

8 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)		filed	
		filed	
		filed	
Amends regulation(s)	State Building Code	filed	7/1/74
	Figure 2107-1	filed	2/12/76
		filed	

9 - Does the enclosed regulation bear any other relation to any other regulation except as stated in number 8 ? Yes ( ) No (X)

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

49 AMENDMENTS - ss 109.11, 427.0, 428.0, etc.

Date Filed June 3, 1977

Date Published June 9, 1977

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
(16-6V) $.30

MICHAEL S. DUKAKIS
GOVERNOR
RAYMOND D. CARAVATY
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission

John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-69

June 3, 1977

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, MA 02133

JUN 3 11 35 AM '77

SECRETARY OF STATE
RULES AND REGULATIONS
DIVISION

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 3, 1977 at 1 Ashburton Place, Boston, on proposed amendments to the Commonwealth of Massachusetts State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code. The effective dates of the attached amendments are as follows:

CODE SECTIONS AND TABLES	EFFECTIVE DATES
Table 1-1	June 9, 1977
Table 1-1 Notes	June 9, 1977
Section 428.0 in its entirety	June 9, 1977
Table 6-1	June 9, 1977
Section 109.11	July 1, 1977
Table 2-6	July 1, 1977
Table 2-6 Notes	July 1, 1977
Section 427.0 in its entirety	July 1, 1977
Section 460.311	July 1, 1977
Section 1218.213	July 1, 1977
Reference Standards to Article 12	July 1, 1977
Section 2100.10	July 1, 1977
Section 868.1 (Editorial Change)	July 1, 1977
Section 1011.2 (Editorial Change)	July 1, 1977

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code. The effective dates of the attached amendments are as follows:

CODE SECTIONS AND TABLES	EFFECTIVE DATES
Table 1-1	June 9, 1977
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Section 428.0 in its entirety	June 9, 1977
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Reference Standards to Article 12	July 1, 1977
Section 2100.10	July 1, 1977
Section 868.1 (Editorial Change)	July 1, 1977
Section 1011.2 (Editorial Change)	July 1, 1977

A true copy attest:

Charles J. Dinezio

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on June 3, 1977.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence P. O'Malley
Assistant Attorney General

TABLE 1-1

Amend Table 1-1 by adding Summer Camps for Children to the L-2 use group and indicating that minimum inspection and maximum certification will be on a yearly basis, to read as follows:

L-2	Residential--Multi-Family	note g		
	Summer Camps for Children		Annually	one year note h

TABLE 1-1 NOTES

Add the following new Note h:

Note h: (1) Summer camps for children in use group L-2 shall be inspected and certified annually prior to the beginning of each season.

(2) The annual fee shall be $10.00 for first twenty-five (25) residential units; $5.00 for each additional twenty-five (25) residential units; and $10.00 for each assembly, building or use. (A residential unit for this purpose shall be defined as four (4) beds.)

SECTION 109.11

On the first and second lines of Section 109.11 delete the date "July 1, 1977" and substitute the date "July 1, 1978".

On the last line of Section 109.11 delete the date "June 30, 1977" and substitute the date "June 30, 1978".

TABLE 2-6

Add note "p" to F-6 Type 4B construction and also to H-2 Type 4B construction.

TABLE 2-6 NOTES

Add the following new Note p:

Note p: See Section 427.3 for applicable height and area limitations.

SECTION 427.0

Repeal Section 427.0 of the State Building Code in its entirety and substitute the following sections:

SECTION 427.0 DAY CARE CENTERS

Day Care Centers shall be subject to the applicable provisions of the Basic Code and the special requirements of this section. Day Care Centers licensed by the Office of Children may be subject to compliance with the rules and regulations of that authority. These provisions shall apply to new and existing Day Care Centers.

427.1 HIGH HAZARD RESTRICTION: No Day Care Center shall occupy the same building with or be located within two hundred (200) feet of a high hazard occupancy.

427.2 DAY CARE CENTER USE GROUPS

427.21 LESS THAN TWO (2) YEARS AND NINE (9) MONTHS: Buildings and portions thereof licensed by the Office of Children as Day Care Centers for children two (2) years and nine (9) months in age or younger shall be classified as H-2 use group.

427.22 OVER TWO (2) YEARS AND NINE (9) MONTHS: Buildings and portions thereof licensed by the Office of Children as Day Care Centers for children over two (2) years and nine (9) months in age shall be classified as F-6 use group.

427.3 HEIGHT AND AREA LIMITATIONS

427.31 H-2 Day Care use group (209.2), when of type 4 construction, shall be limited to buildings not more than three (3) stories and forty (40) feet in height. The Day Care Center shall be restricted to the first floor and cellar or basement use and not more than two thousand four hundred (2,400) square feet per floor. All required egresses shall be directly to grade.

427.32 F-6 Day Care use group (208.6), when of type 4 construction, shall be limited to buildings not more than three (3) stories and forty (40) feet in height. The Day Care Center shall be restricted to the first two (2) stories and the basement or cellar use and not more than four thousand eight hundred (4,800) square feet per floor.

427.33 No increase in height or area shall be allowed for F-6 or H-2 Day Care Center use groups.

427.4 DAY CARE CENTERS CLASSIFIED AS H-2 USE GROUP

427.41 BASEMENT AND CELLAR USE IN TYPE 3C AND 4B CONSTRUCTION BUILDINGS

427.411 BASEMENT USE: A basement, as defined in the Basic Code, of a type 3C or 4B construction structure, may be used for a Day Care Center in accordance with the following requirements; there shall be two (2) separate and independent means of egress, remote from each other:

a) leading to grade; or,

b) leading to a one (1) hour fire-rated enclosed stairway not more than four (4) feet in height vertically which leads directly to grade and is separated from any other use as an egress by one (1) hour fire-rated partitions and self-closing doors.

427.412 CELLAR USE: A cellar, as defined in the Basic Code, of a type 3C or 4B construction may be used for a Day Care Center in accordance with the following requirements:

a) There shall be at least two (2) separate and independent interior means of egress, remote as possible from each other and leading directly to grade or to a one (1) hour fire-rated enclosed stairway not more than four (4) feet in height, vertically. Any such stairway serving as a required means of egress from a Day Care Center shall serve only the Day Care Center.

b) Smoke detectors shall be located in the story of use and in the story below, if one exists, directly beneath the area being used for the Day Care Center.

c) Interior stairways used as required means of egress shall contain smoke detectors connected to alarms audible throughout the Day Care Center.

427.5 EGRESS REQUIREMENTS FOR H-2 AND F-6 DAY CARE CENTER USE GROUPS

427.51 BELOW GRADE: All Day Care Centers or parts thereof located below grade, except for H-2 Day Care Center Use in type 3C and 4B construction, as provided in Section 427.411 and 427.412, shall conform to the following requirements:

a) There shall be at least two (2) separate and independent means of egress, remote as possible from each other, at least one (1) of which shall lead directly to grade.

b) Required interior stairways shall be of at least one (1) hour fire-rated construction enclosed with self-closing fire doors.

c) Required interior stairways shall contain smoke detectors connected to alarms audible throughout the Day Care Center.

427.52 EGRESS ON FLOORS OTHER THAN BASEMENT OR CELLAR: Each story of the day care center shall be provided with not less than two (2) independent means of egress, remote as possible from each other, and such additional approved egresses leading from the occupied spaces so that to reach an egress it will not be necessary to pass through a common corridor or space.

427.521 BUILDINGS OF TYPE 1, 2A and 2B CONSTRUCTION: In buildings of type 1, 2A or 2B construction, except for L-2 use group, equipped with a fire suppression system in compliance with section 1212.0, a single common corridor shall be acceptable for providing access to two (2) means of egress as required in this section.

427.522 COMMON CORRIDORS USED AS EXITWAYS: Common corridors may be subdivided, for the purpose of section 427.52 to provide separate and independent exitways by using smoke stop partitions complying with the provisions of the Basic Code. The doors in the smoke stop partitions may be equipped with an automatic hold open device connected to smoke or smoke and heat detectors and designed to close automatically by activation of the detector system.

427.53 EGRESS FROM EACH ROOM: Two (2) approved egresses located as remotely as possible from each other shall be required for each occupied room. One (1) such required egress may be by communicating door.

427.54 ROOF EGRESS: Where the roof is used by a Day Care Center, two (2) enclosed stairways shall be provided, one (1) leading directly to an enclosed exitway system and one (1) leading to a corridor on a floor below that leads to two (2) remote and independent exitways. The stairways shall comply with all the provisions of section 427.0 and the Basic Code.

427.55 EGRESS LIGHTING: Egress lighting shall be provided in conformance with article 6, including requirements for emergency lighting.

427.6 DOORWAYS: All required exitway doorways shall be at least thirty-six (36) inches in width. All other egress doorways shall be at least thirty-two (32) inches in width.

427.7 HANDRAILS: All required egress stairways shall be provided with double handrails on both sides, and these shall be continuous including all runs and platforms and shall be built as follows:

a) The upper rail shall be not less than thirty (30) inches nor more than thirty-three (33) inches, measured vertically, above the nosing of the treads.

b) The lower rail shall be installed at approximately twenty (20) inches high measured vertically at the face of the riser.

427.8 HEATING SYSTEM: Any portable or permanent heater in spaces occupied by children shall be separated from the occupied space by partitions, guards, screens, or other means. Space and unit heaters using combustible fuels shall be prohibited.

427.9 BOILER ROOMS: Boilers, furnaces or other fire units shall be enclosed as required in section 1113. No boiler room door shall open into an occupied area.

427.10 ROOFS: Where a roof is used by a Day Care Center, there shall be a solid, smooth non-climbable fence or barrier a minimum of seven (7) feet high on all sides and separating the Day Care Center area from any other uses. Fences shall be set back at least three (3) feet from the outside edge of the exterior wall below. A weatherproof telephone or equivalent means of communication shall be provided for use in emergencies and shall be openable without keys, coins, etc.

427.101 FIRE ALARM SYSTEMS: Fire alarm systems shall be provided in Day Care Centers, in addition to those required in Sections 427.32 and 427.33, in accordance with the requirements of this Section. The requirements of Sections 427.412 and 427.51 may be combined with the requirements of this section.

a) Facilities for up to twenty-four (24) children shall be provided with a manual alarm system which will sound an alarm audible throughout the Day Care Center.

b) Facilities for twenty-five (25) or more children shall be provided with an automatic alarm system consisting of approved smoke detectors located as provided in Section 427.20 and audible throughout the Day Care Center or throughout each floor of the Center. In addition, there shall be at least one (1) manual alarm on each floor of the Day Care Center which will sound on all floors when actuated.

427.20 LOCATION OF DETECTORS: Smoke detectors shall be installed on the ceiling of each story occupied by the Day Care Center in front of the doors to the stairways and at no greater than thirty (30) foot spacing in the corridor providing required means of egress on all floors of the Day Care Center. Smoke detectors shall also be installed in all accessory spaces of the Day Care Center not used for children, including storage over one hundred (100) square feet in area. All required detectors shall be located on the same circuit and interconnected so that when one (1) sounds, all will sound. Required detectors shall be U.L. approved and have alarm decibel ratings of at least 85.

427.30 FLOOR AND CEILING PROTECTION: When the floor occupied by the Day Care Center is above any useable space, the floor shall have a minimum of three quarter (3/4) hour fire rating. When the floor occupied by the Day Care Center is below any useable space, the ceiling shall have at least a three quarter (3/4) hour fire rating or the floor above shall be equipped with smoke detectors.

SECTION 428.0

Add the following new sections after Section 427.30:

SECTION 428.0 SUMMER CAMPS FOR CHILDREN

428.1 DEFINITION: A premise, operated solely between April and October of each year for recreational or other purposes, and having residential facilities. The use of such accommodations for purposes of inspection, certification and inspection fees shall be considered as being similar to a dormitory in L-2 use group and subject to the following provisions.

428.2 NEW AND EXISTING OCCUPANCIES: These regulations shall apply to existing and new summer camps for children as defined in Section 428.1 of this Code.

428.3 MEANS OF EGRESS: All one-story, one-room buildings having one thousand (1,000) square feet or less and having twenty-five (25) occupants or less shall require only one (1) means of egress provided that:

a) The length of travel does not exceed fifty (50) feet from any point in the building to the outside at grade; and,

b) The minimum width for aisles and corridors shall be three (3) feet.

428.31 EMERGENCY ESCAPE: Every sleeping room shall have at least one (1) exterior door or openable window to permit emergency exit or rescue; the windows shall conform to the following restrictions:

a) Must be openable from the inside without the use of separate tools.

b) The sill height shall not be more than thirty-six (36) inches above the finish floor and with a maximum six (6) foot drop from the window sill to grade below the window.

c) Provide a minimum net clear opening area of 3.3 square feet with a rectangle having minimum net clear opening dimensions of twenty (20) inches by twenty-four (24) inches.

428.4 FIRE PROTECTION: Smoke detectors shall be required for existing and new residential units in accordance with Section 2100.18 of this Code and may be either A.C. wired or battery-operated.

428.41 If camps are heated, then the building must conform to all applicable basic code sections and specialized codes, notwithstanding any of the provisions in Section 428.0.

428.5 ENFORCEMENT AND INSPECTIONS: Enforcement shall be by the local building official who shall inspect and certify the summer camps yearly, prior to season opening. Fees charged shall be in accordance with Table 1-1 of the basic code.

SECTION 460.311

Repeal Section 460.311 of the State Building Code in its entirety and substitute the following:

SECTION 460.311 All classrooms used for students below grade 7, and a minimum of fifty (50) percent of all other classrooms shall be provided with natural lighting, at the rate of six (6) percent of the floor area of the classroom, from transparent glass windows in outside walls. Colleges and universities are exempt from this requirement.

TABLE 6-1

Add to Table 6-1 the following words "sleeping rooms .....40 Net/Person" under Residential 200 Gross; so that it reads:

Residential.....	200 Gross
Sleeping Rooms	40 Net/Person

SECTION 1218.213

Repeal Section 1218.213 in its entirety with no substitution.

ARTICLE 12 REFERENCE STANDARDS

Repeal all the reference standards in Article 12 of the State Building Code and substitute the following:

NFPA	No. 10	1975	Portable Fire Extinguishers
NFPA	No. 12A	1973	Halon 1301 Systems
NFPA	No. 13	1976	Sprinkler Systems, Installation
NFPA	No. 14	1976	Standpipe and Hose Systems
NFPA	No. 17	1975	Dry Chemical Systems
NFPA	No. 20	1976	Centrifugal Fire Pumps
NFPA	No. 71	1974	Central Station Signaling Systems
NFPA	No. 72A	1975	Local Protective Signaling Systems
NFPA	No. 72B	1975	Auxiliary Signaling Systems
NFPA	No. 72C	1975	Remote Station Signaling Systems
NFPA	No. 72D	1975	Proprietary Signaling Systems
NFPA	No. 72E	1974	Automatic Fire Detectors
NFPA	No. 74	1974	Household Fire Warning Equipment
NFPA	No. 101	1967	Life Safety Code
NFPA	No. 101	1971	Life Safety Code
NFPA	No. 101	1973	Life Safety Code
FPR-4		1975	Construction and Maintenance of Buildings or Other Structures Used for Garages, etc.
FPR-11		1975	Massachusetts Electrical Code

SECTION 2100.10

Under Item a) after the word "floor;" delete the word "and" and substitute the following new words: "except in below-grade sleeping rooms, it shall be not more than forty-four (44) inches: and; so that Item a) reads:

a) The sill height shall be not more than thirty-six (36) inches above the finish floor; except in below-grade sleeping rooms, it shall be not more than forty-four (44) inches; and,

EDITORIAL CHANGES

SECTION 868.1

Delete that part of Section 868.1 as appears on Page 8-49, since the complete section appears on Page 8-50.

SECTION 1011.2

In second paragraph, first line, delete the following numbers: "5, 6, 7, and 8" and substitute the following letters: "e, f, g, and h".

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH

UNIFORM FILING FORM

This form has been prepared to simplify & make uniform the procedure for submitting materials with the Rules & Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation & to M. G. L. Chapter 30A, as amended by Chapter 459 of the Acts of 1976, which set forth the basic filing requirements.

1 - Date June 3, 1977

2 - Cabinet C & D Department DCA Division State Building Code Comm.
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 1305
727-6916

3 - Descriptive title of document: Amendments to the State Building Code

4 - Estimate the number of copies that will be purchased in the next six months: By your agency 1,000 By the public 2,000

(Note: If you need bulk quantities for your agency, please submit a purchase order form or call 727-2834 to place your order for printing.)

5 - The document attached is best classified as a:

[X] Ch. 30A Regulation

[ ] Ch. 30A Emergency Regulation - If this box is checked, state nature of emergency.

[ ] Other - If this box is checked, do not complete the rest of the form.

6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): May 3, 1977 ; or

Date of "action" (Ch. 30A/3)_____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given:_____

8 - Regulation will be effective:

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of *See below pursuant to M. G. L. Ch. 30A

Section(s) 6

9 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)_____ filed_____

_____ filed_____

_____ filed_____

_____ filed_____

_____ filed_____

Amends regulation(s) State Bldg. Code filed 7/1/74

Table 1-1 + Table 1-1 Notes filed 2/12/76

Tab. No. 2-6 + Table 2-6 Notes filed 6/14/76

109.11 filed 1/6/76

427.0 filed 7/11/75

460.311 12/30/74

Table 6-1 12/30/75

S. 2100.10 6/30/76

EFFECTIVE JUNE 9, 1977

*Table 1-1, Table 1-1 Notes, Section 428.0 in its entirety, and Table 6-1

EFFECTIVE JULY 1, 1977

*Section 109.11, Table 2-6, Table 2-6 Notes, Section 427.0 in its entirety, Section 460.311, Section 1218.213, Ref. Standards to Article 12, Section 2100.10 and editorial changes to Sections 868.1 and 1011.2

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

AMENDMENTS TO SS 114.8, 122.12, 605.0 & 621.0

Date Filed June 8, 1977

Date Published June 16, 1977

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
(16-6W) $.15

MICHAEL S. DUKAKIS
GOVERNOR
RAYMOND D. CARAVATY
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-69

2

June 8, 1977

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

JUN 8 2 59 PM '77

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 3, 1977 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on July 1, 1977.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on July 1, 1977.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on June 8, 1977.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terrence P. O'Malley
Assistant Attorney General

SECTION 114.8

Repeal Section 114.8 of the State Building Code in its entirety and substitute the following new section:

114.8 POSTING OF PERMIT: A copy of the building permit provided by the building department shall be kept in view and protected from the weather on the site of operation during the entire time the work is under execution and until the certificate of use and occupancy shall have been issued. The building permit shall serve as an inspection record card to allow the building official conveniently to make entries thereon regarding inspection of the work.

SECTION 122.12

In Item d), first line, after the word "unknown" delete the words "or outside the Commonwealth"; so that Item d) reads:

d) if his last and usual place of abode is unknown, by posting a copy of the order or notice in a conspicuous place on or about the premises in violation and by publishing it for at least three (3) out of five (5) consecutive days in one or more newspapers of general circulation wherein the building or premises affected is situated.

SECTION 605.0

Repeal Section 605.0 of the State Building Code in its entirety and substitute the following new sections:

605.0 EXISTING BUILDINGS

605.1 OWNER RESPONSIBILITY: In accordance with Section 104.0 of the Code, the owner of every existing building structure shall be responsible for the safety of all persons in, or occupying such premises with respect to the means of egress therefrom.

605.2 UNSAFE MEANS OF EGRESS: In any existing building or structure not now provided with safe means of egress facilities as herein prescribed for new buildings and in which the exitways are deemed inadequate for safe egress by the building official, such additional provision shall be made for safe means of egress as he shall order.

605.21 TESTING AND CERTIFICATION: All exterior bridges, steel or wooden stairways, fire escapes and egress balconies shall be tested and certified for structural adequacy and safety every five (5) years by a Massachusetts Registered Professional Engineer, or others qualified and acceptable to the building official, who shall then submit an affidavit to the building official.

605.3 OBSTRUCTIONS: It shall be unlawful to obstruct or reduce in any manner, the clear widths of any doorway, hallway, passageway or any other part of a means of egress required by the provisions of this Code.

605.4 MAINTENANCE: All required means of egress components shall at all times be maintained in a safe useable condition. All exterior stairways, fire escapes, egress balconies and bridges shall be kept free of snow and ice. All corrodible structural parts thereof shall be kept painted, or otherwise protected against rust and corrosion both before and after erection. All wood structural members shall be maintained to prevent rotting and decaying. Where these elements tie directly into the building structural system, all joints shall be sealed to prevent water from damaging or corroding the structural elements.

SECTION 621.0

Repeal Section 621.0 of the State Building Code in its entirety and substitute the following:

SECTION 621.0 FIRE ESCAPES

621.1 WHERE PERMITTED: Fire escapes shall not be permitted as an element of a required means of egress except on existing buildings when more adequate egress facilities cannot be provided. Fire escapes shall not provide more than fifty (50) percent of the required exit capacity.

621.2 LOCATION: When located on the front of the building and projecting beyond the building line, the lowest landing shall not be less than seven (7) nor more than twelve (12) feet above grade and shall be equipped with a counterbalance stairway to the street. In alleyways and thoroughfares less than thirty (30) feet wide, the clearance under the lowest landing shall be not less than twelve (12) feet.

621.3 CONSTRUCTION: The fire escape shall be designed to support a live load of one hundred (100) pounds per square foot (psf), and shall be constructed of steel or other approved noncombustible materials. Fire escapes may be constructed of wood not less than two (2) inches nominal thickness on buildings of Type 4 construction, as specified in Section 851.21 of the Code

621.31 CONNECTIONS: All structural connections to and through the face of the building shall be designed to be corrosion and deterioration resistant.

621.32 DIMENSIONS: Stairs shall be at least twenty-two (22) inches wide with risers not more and treads not less than eight (8) inches and landings at foot of stairs not less than forty (40) inches wide by thirty-six (36) inches long, located not more than eight (8) inches below the access window or door.

621.33 CAPACITY: The capacity shall provide for the intended occupancy load as specified in Section 608.1 of this Code, but in no case may the width be less than twenty-two (22) inches.

621.34 OPENING PROTECTIVES: Doors and windows along the fire escape shall be protected with three-quarter (3/4) hour fire resistance rated opening protectives.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH

UNIFORM FILING FORM

This form has been prepared to simplify & make uniform the procedure for submitting materials with the Rules & Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation & to M. G. L. Chapter 30A, as amended by Chapter 459 of the Acts of 1976, which set forth the basic filing requirements.

1 - Date June 8, 1977

2 - Cabinet C & D Department DCA Division State Building Code Comm.
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 1305
727-6916

3 - Descriptive title of document: Amendments to the State Building Code

4 - Estimate the number of copies that will be purchased in the next six months: By your agency 1,000 By the public 2,000

(Note: If you need bulk quantities for your agency, please submit a purchase order form or call 727-2834 to place your order for printing.)

5 - The document attached is best classified as a:

[X] Ch. 30A Regulation

[ ] Ch. 30A Emergency Regulation - If this box is checked, state nature of emergency.

[ ] Other - If this box is checked, do not complete the rest of the form.

6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): May 3, 1977 ; or

Date of "action" (Ch. 30A/3) _____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given: _____

8 - Regulation will be effective:

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of July 1, 1977 pursuant to M. G. L. Ch. 30A

Section(s) 6

9 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)		filed
		filed
		filed
		filed
		filed
Amends regulation(s)	State Bldg. Code	filed July 1, 1974
	605.0	filed Feb. 12, 1976 & June
		filed 14, 197
	122.12	filed Jan. 6, 1977

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

12 AMENDMENTS - SS 816.31, 903.61, 113.5, etc.

Date Filed August 1, 1977

Date Published August 11, 1977

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT
(16-6X) $.15

28

CHAEL S. DUKAKIS
GOVERNOR
MOND D. CARAVATY
CHAIRMAN
HARLES J. DINEZIO
XECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

August 1, 1977

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 3, 1977 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on September 1, 1977.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on September 1, 1977.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on August 1, 1977.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence P. O'Malley
Assistant Attorney General

NOTES TO TABLE 2-5

Repeal Note h of Table 2-5 of the State Building Code in its entirety and substitute the following new Note h:

Note h Fire retardent treated wood, complying with Section 903.71, may be used as provided in Section 903.72.

SECTION 816.31

Add the following new Section after Section 816.3:

816.31 Alternative methods of constructing masonry walls may be used, providing that the structural requirements of Article 7 are fully satisfied by the assembly.

SECTION 816.32

Add the following new Section after the new Section 816.31:

816.32 Masonry walls that are laid dry and are bonded on each side with a formulation of portland cement and alkali-resistant glass fibers with or without sand and mixed with water shall be permitted, providing the following allowable working stresses, based on gross area, are not exceeded:

Compression:	
Standard Hollow Block	45 p.s.i.
Ground Hollow Block	85 p.s.i.
Solid Block:	
1800 + p.s.i.	110 p.s.i.
1200 - 1800 p.s.i.	80 p.s.i.
Shear	10 p.s.i.
Flexural Tension-Vertical Span	18 p.s.i.
Flexural Tension-Horizontal Span	30 p.s.i.

Bearing walls so constructed shall have a minimum wall thickness of six (6) inches.

SECTION 903.61

Repeal Section 903.61 of the State Building Code in its entirety and substitute the following new section:

903.61 NONCOMBUSTIBLE MATERIALS: The following tests shall serve as criteria for acceptance of building materials (when tested in the form and thickness in which they are used) as set forth in Sections 215.0, 216.0, and 217.0 governing the combustibility of building materials for use in Types 1, 2 and 3 construction.

a) Materials which pass the test procedure for defining noncombustibility of elementary materials set forth in ASTM E 136 and listed in the reference standards of this article 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 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 1 above, 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 as set forth in ASTM E 84 and listed in the reference standards of this article.

The term noncombustible does not apply to the flamespread characteristics of interior finish or trim materials. A material shall not be classed as noncombustible building construction material which is subject to increase in combustible or flame spread rating beyond the limits herein established through the effects of age, moisture or other atmospheric conditions.

SECTION 903.62

Repeal Section 903.62 of the State Building Code in its entirety.

SECTION 903.7

Repeal Section 903.7 of the State Building Code in its entirety and substitute the following new section:

903.7 FIRE-RETARDANT TREATED WOOD

SECTION 903.71

Repeal Section 903.71 of the State Building Code in its entirety and substitute the following new section:

903.71 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 the reference standards of this article 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, without evidence of significant progressive combustion. The material shall bear the identification of an accredited authoritative testing or inspection agency showing the performance rating thereof.

SECTION 903.72

Add the following new Section after Section 903.71:

903.72 USE LIMITATIONS: Wood that has been pressure treated with fire-retardant chemicals in accordance with the standards for pressure treatment of lumber or plywood in buildings listed in the reference standards of this article or treated by other approved means during manufacture may be used in Types 1 and 2 construction for partitions, structural elements and roof framing and sheathing as indicated by Note h in Table 2-5, provided that the assembly in which such material is used shall produce the required fire-resistance rating when tested in accordance with the standard method of fire test for building construction and materials listed in the reference standards. Where the material is to be subjected to sustained high humidity or exposed to the weather, it shall be further identified to indicate that there is not an increase in listed fire hazard classification after being subjected to the Underwriters' Laboratories (ULI) Standard Rain Test. Where used as a structural element, such material shall meet the requirements of Section 903.71. Where used as interior finish, such material shall meet the requirements of Section 904.0.

APPENDIX A

In Appendix A, Page A-10, under Fire Testing Laboratories and Flame-spread Testing Laboratories add U. S. Testing Company, Inc., as an accredited Authoritative Agency for those tests listed in Appendix G, Page A-38, with the exception of ASTM E-119, ASTM E-152, and ASTM E-163; so that it reads:

U. S. Testing Company, Inc.
1415 Park Avenue
Hoboken, New Jersey 07030 .....UST
(For all tests listed in Appendix G, except ASTM E-119, E-152, E-163.)

EDITORIAL CHANGES

SECTION 113.5

In the second paragraph of Section 113.5, last sentence, the words "Article 6" should be "Article 4".

SECTION 114.6

On the last line of Section 114.6 the words "application of the plans" should read "application or the plans".

SECTION 616.8

On the fifth line of Section 616.8 change "Section 418.22" to "Section 416.22".

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH

UNIFORM FILING FORM

This form has been prepared to simplify & make uniform the procedure for submitting materials with the Rules & Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation & to M. G. L. Chapter 30A, as amended by Chapter 459 of the Acts of 1976, which set forth the basic filing requirements.

1 - Date August 1, 1977

2 - Cabinet C & D Department DCA Division State Building Code Comm.
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 1305
727-6916

3 - Descriptive title of document: Amendments to the State Building Code

4 - Estimate the number of copies that will be purchased in the next six months: By your agency 1,000 By the public 2,000

(Note: If you need bulk quantities for your agency, please submit a purchase order form or call 727-2834 to place your order for printing.)

5 - The document attached is best classified as a:

[X] Ch. 30A Regulation

[ ] Ch. 30A Emergency Regulation - If this box is checked, state nature of emergency.

[ ] Other - If this box is checked, do not complete the rest of the form.

6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): May 3, 1977 ; or

Date of "action" (Ch. 30A/3) _____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given: _____

8 - Regulation will be effective: September 1, 1977

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of Sept. 1, 1977 pursuant to M. G. L. Ch. 30A

Section(s) 6

9 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)	State Bldg. Code.	filed	7/1/74
	Table 2-5	filed	1/5/76
	113.5	filed	1/5/76
		filed	
		filed	
Amends regulation(s)		filed	
		filed	
		filed	
		filed	

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

ARTICLE 22 - BUILDING CODE PROVISIONS FOR ENERGY CONSERVATION

Date Filed August 1, 1977

Date Published August 11, 1977

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.

(16-6Y) $.75

29

CHAEL S. DUKAKIS
GOVERNOR
YMOND D. CARAVATY
CHAIRMAN
HARLES J. DINEZIO
XECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

August 1, 1977

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE, ARTICLE 22 - BUILDING CODE PROVISIONS FOR ENERGY CONSERVATION

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 3, 1977 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on January 1, 1978.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, Article 22 - Building Code Provisions for Energy Conservation, which are to be effective on January 1, 1978.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on August 1, 1977.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence O'Malley
Assistant Attorney General

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ARTICLE 22 ENERGY CONSERVATION

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ARTICLE 22 (Cont.)

ARTICLE 22

BUILDING CODE PROVISIONS FOR ENERGY CONSERVATION

Contained within this article of the State Building Code are provisions which shall regulate energy conservation for buildings. These provisions are supplied to provide a single comprehensive basic reference for energy conservation for buildings.

The requirements for the use of energy for buildings are also supplied in other articles of the Basic Code on a performance-oriented basis. This article supplies far more extensive information on acceptable specifications, details, and methods of construction for the use of energy for buildings.

The provisions supplied within Article 22, as they apply to the use of energy for buildings, shall be considered as being applicable as stated, independently of the rest of the Basic Code. Any requirements for which provision is not made within this article, shall be subject to the provisions of the other articles of the Basic Code.

GLOSSARY OF SYMBOLS

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
Btu	British thermal unit
cfm	cubic feet per minute
COP	coefficient of performance
F	Fahrenheit
gpm	gallons per minute
h	hour
HVAC	heating, ventilating, and air conditioning
OTTV	overall thermal transfer value
R	thermal resistance
RS	Reference Standard
SC	shading coefficient
SF	solar factor value
Std.	standard
t	temperature
ΔT	temperature differential
TD_{EQ}	temperature difference equivalent
U	thermal transmittance
U_o	overall thermal transmittance
W	watts

ARTICLE 22

ENERGY CONSERVATION

SECTION 2200.0 SCOPE

This article sets forth requirements for buildings and structures or portions thereof, additions, and alterations, hereafter designed primarily for human occupancy, covering their exterior envelopes and selection of their HVAC, service water heating, electrical distribution, and illuminating systems and equipment for effective use of energy.

SECTION 2201.0 ADMINISTRATIVE

2201.1 COMPLIANCE: Buildings shall be in compliance with this article when they are designed according to the provisions of the following:

a) Component Design (see Section 2204.0); or,

b) Building design by systems analysis (see Section 2205.0); or,

c) Buildings utilizing non-depletable energy sources (see Section 2206.0).

2201.11 Nothing in this article shall require the removal, alteration, or abandonment of, or prevent the continuance of the use and occupancy of, a lawfully existing building, unless provided otherwise specifically by this article.

2201.2 EXEMPT BUILDINGS: The following buildings are exempt from the provisions of this article:

a) Buildings and structures or portions thereof whose peak design rate of energy usage is less than one (1) watt per square foot or three and four tenths (3.4) Btu/h per square foot of floor area for all purposes.

b) Buildings which are neither heated nor cooled.

2201.3 EXISTING BUILDINGS

2201.31 ADDITIONS TO EXISTING BUILDINGS: Additions to existing buildings or structures may be made without making the entire building or structure comply. The new construction shall conform to the provisions of this article as they relate to the addition only.

2201.32 ALTERATIONS TO EXISTING BUILDINGS: Alterations to existing buildings shall comply with this article on a component basis. When

there are alterations to the building enclosure elements (wall, roof, or floor), mechanical systems, service water heating systems, electrical power distribution or lighting, those components only shall comply.

2201.4 PLANS AND SPECIFICATIONS

2201.41 PERMITS: Any construction, additions, alterations, or repairs subject to the provisions of this article shall require a building permit.

2201.42 DETAILS: In addition to the requirement of section 113.5, the data submitted shall show all pertinent information and features to be incorporated into the building, including but not limited to: the exterior envelope component materials, the R values of the respective elements, the U values of the overall assembly; the size and type of apparatus and equipment; calculations of the OTTV and overall U_o of the walls, roof/ceiling, and floors; controls, and other pertinent data to indicate conformance to this article.

2201.5 INSPECTIONS

2201.51 GENERAL: All construction for which a permit is required shall be subject to inspections by the building official as specified in sections 108.14 and 111.0.

2201.6 MATERIALS AND EQUIPMENT

2201.61 IDENTIFICATION: Where practicable, all materials and equipment referenced in section 2201.42 shall be marked in order to show compliance with the approved plans and specifications.

2201.62 ALTERNATE MATERIALS - METHOD OF CONSTRUCTION, DESIGN, OR INSULATING SYSTEMS: The provisions of this article are not intended to prevent the use of any material, method of construction, design, or insulating system not specifically prescribed herein, provided that such construction, design, or insulating system has been approved by the Commission as determined by section 108.13.

2201.63 MAINTENANCE INFORMATION: Service systems which require preventive maintenance to maintain efficient operation shall be furnished with complete necessary maintenance information. Required routine maintenance actions, as specified by the manufacturer, shall be stated clearly and incorporated on a readily accessible label on the equipment. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.

2201.631 MAINTENANCE RESPONSIBLITY: The owner or his designated agent shall be responsible for the proper maintenance of the building or structure and its service systems.

SECTION 2202.0 DEFINITIONS

AIR CONDITIONING: The process of treating air so as to control simultaneously the temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space.

AIR TRANSPORT FACTOR: The ratio of the rate of useful sensible heat removal from the conditioned space to the energy input to the supply and return fan motor(s), expressed in consistent units and under the designated operating conditions.

AUTOMATIC: Self-acting, operating by its own mechanism when actuated by some impersonal influence such as a change in electric current, pressure, temperature, or mechanical configuration. (See definition of manual)

BOILER CAPACITY: The amount of heat output in Btu/h at the design temperature rise and rated input.

BUILDING ENVELOPE: The elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior.

COEFFICIENT OF PERFORMANCE (COP): See section 2204.34 for the definitions of COP as appropriate:

Electrically Operated HVAC Equipment - Cooling

Applied HVAC System Components - Cooling

Heat Operated HVAC System Equipment - Cooling

Heat Pump - Heating

COMFORT ENVELOPE: The area on a psychrometric chart enclosing all those conditions described in Std RS-4, as being comfortable.

COMPONENT: An integral part of a building or its mechanical systems; an element of a building envelope.

CONDITIONED FLOOR AREA: All portions of interior gross floor area which are contained within exterior walls and which are conditioned directly or indirectly by an energy-using system. (See gross floor area)

DEGREE DAY, HEATING: A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day, when the mean temperature is less than $65^{o}F$ there exists as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and $65^{o}F$.

EFFICIENCY, OVERALL SYSTEM: For a designated time period, the ratio of useful energy at the point of use to the thermal energy input expressed in percent.

ENERGY: The capacity for doing work. Energy takes a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (motion), electrical, and chemical. In customary units, energy is measured in kilowatt-hours (kwh) or British thermal units (Btu).

ENERGY EFFICIENCY RATIO (EER): The ratio of net cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions.

FENESTRATION: Any light-transmitting devices in the building envelope admitting natural light.

FUEL: A solid, liquid, or gaseous substance with a high energy content that can be burned to release the energy.

GROSS FLOOR AREA: The floor area within the perimeter of the outside walls of the building, with no deduction for hallways, stairs, closets, thickness of walls, columns, or other features.

GROSS WALL AREA: The exterior wall area bounding interior space which is conditioned by an energy-using system. It includes the opaque wall, and window and door areas.

HEAT: The form of energy that is transferred by virtue of a temperature difference.

HEATED SPACE: Space, within a building, that is provided with a positive heat supply to maintain air temperature of $50^{o}F$ or higher.

HUMIDISTAT: An instrument which measures changes in humidity and controls a device(s) for maintaining a desired humidity.

HVAC: Heating, ventilating, and air conditioning.

HVAC SYSTEM: A system that provides either collectively or individually the processes of comfort heating, ventilating, and/or air conditioning within or associated with a building.

ILLUMINATION: The density of the luminous flux incident on a surface; it is the quotient of the luminous flux and the area of the surface when the latter is uniformly illuminated.

INFILTRATION: The uncontrolled inward air leakage through cracks and interstices in any building element and around windows and doors of a building, caused by the pressure effects of wind and/or the effect of differences in the indoor and the outdoor air density.

MANUAL: Capable of being operated by personal intervention. (see automatic)

NON-DEPLETABLE ENERGY SOURCES: Sources of energy (excluding minerals) derived from incoming solar radiation including photosynthetic processes; from phenomena resulting therefrom including wind, waves and tides, lake or pond thermal differences; and energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

OPAQUE AREAS: All exposed areas of a building envelope which enclose conditioned space, except openings for windows, skylights, doors, and building service systems.

OUTSIDE AIR: Air taken from the outdoors and, therefore, not previously circulated through the system.

OVERALL THERMAL TRANSFER VALUE, OTTV: Overall heat gain through the building wall.

PACKAGED TERMINAL AIR-CONDITIONER: A factory-selected combination of heating and cooling components, assemblies, or sections, intended to serve a room or zone.

POSITIVE HEAT SUPPLY: Heat supplied to a space by design.

POWER: In connection with machines, power is the time rate of doing work. In connection with the transmission of energy of all types, power refers to the rate at which energy is transmitted; in customary units, it is measured in watts (W) or British thermal units per hour (Btu/h).

READILY ACCESSIBLE: Capable of being reached quickly for operation, maintenance, or inspection, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc.

RECOVERED ENERGY: Energy utilized which would otherwise be wasted from a system that utilizes energy for any purpose.

REHEAT: The application of sensible heat to the supply air that has been previously cooled below the temperature of the conditioned space by either mechanical refrigeration or the introduction of outdoor air.

RESET: Adjustment of the set point of a control instrument to a higher or a lower value, either automatically or manually in order to conserve energy.

ROOM AIR CONDITIONER: An encased assembly designed as a unit for mounting in a window or through a wall, or as a console. It is designed primarily to provide free delivery of conditioned air to an enclosed space, room or zone. It includes a prime source of refrigeration for cooling and dehumidification and means for circulating and cleaning air, and may also include means for ventilating and heating.

SENSIBLE HEAT: Heat added or removed which can be measured by a change in temperature of the substance.

SEQUENCE: A consecutive series of operations.

SERVICE SYSTEMS: All energy-using systems in a building that are operated to provide services for the occupants or processes housed therein, including HVAC, service water heating, illumination, transportation, cooking or food preparation, laundering or similar functions.

SERVICE WATER HEATING: Supply of hot water for domestic or commercial purposes other than comfort heating.

SERVICE WATER HEATING DEMAND: The maximum design rate of heated water withdrawal from a service water heating system in a designated period of time (usually an hour or a day).

SHADING COEFFICIENT: The ratio of the solar heat gain through a glazing system corrected for external and internal shading to the solar gain through an unshaded single light of double strength sheet glass under the same set of conditions.

SOLAR ENERGY SOURCE: Source of thermal, chemical or electrical energy derived directly from conversion of incident solar radiation.

SYSTEM: A combination of equipment and/or controls, accessories, interconnecting means, and terminal elements by which energy is transformed and delivered to desired areas so as to perform a special function, such as HVAC, service water heating, or illumination.

TEMPERATURE DIFFERENCE EQUIVALENT, TD_{EQ}: Total heat flow through the structure caused by solar radiation and outside temperature.

TERMINAL ELEMENT: The means by which the transformed energy from a system is finally delivered; i.e., registers, diffusers, lighting fixtures, faucets, etc.

THERMAL RESISTANCE, R: A measure of the ability to retard the flow of heat. The R value is the reciprocal of the heat transfer coefficient. $R = 1/U$

THERMAL TRANSMITTANCE, U: Coefficient of heat transmission (air to air) expressed in units of Btu per hour per square foot per degree F. It is the time rate of heat flow. The U value applies to combinations of different materials used in series along the heat flow path, single materials used in series along the heat flow path, single materials that comprise a building section, cavity air spaces, and surface air films on both sides of a building element.

THERMAL TRANSMITTANCE OVERALL, U_o or Overall U_o: Overall (average) heat transmission of a gross area of the exterior building envelope, expressed in units of Btu per hour per square foot per degree F. The U_o value applies to the combined effect of the time rate of heat flows through the various parallel paths, such as windows, doors, and opaque construction areas, comprising the gross area of one or more exterior building components, such as walls, floors, or roof/ceiling.

THERMOSTAT: An instrument which measures changes in temperature, and controls device(s) for maintaining a desired temperature.

UNITARY COOLING AND HEATING EQUIPMENT: One or more factory-made assemblies which normally include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

UNITARY HEAT PUMP: One ore more factory-made assemblies which normally include an indoor conditioning coil, compressor(s) and outdoor coil or refrigerant-to-water heat exchanger, including means to provide both heating and cooling functions. It is designed to provide the functions of air-circulation, air cleaning, cooling, and heating with controlled temperature, and de-humidifying, and may optionally include the function of humidifying. When such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

VENTILATION AIR: That portion of supply air which comes from outdoors, plus any recirculated air that has been treated to maintain the desired quality of air within a designated space. (See Std. RS-3 and section 2203.3 of this article).

ZONE: A space or group of spaces within a building with heating and/or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device.

SECTION 2203.0 DESIGN CONDITIONS

2203.1 GENERAL: The criteria of this section establish the minimum requirements for the thermal design of the exterior envelope of buildings and for HVAC systems and their parts.

2203.11 A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements as provided in this article when requirements differ.

2203.12 The design of buildings for energy conservation shall not create conditions of accelerated deterioration from moisture condensation.

2203.2 DESIGN PARAMETERS: The following design parameters shall be used for calculations required under this section.

a) Table 22-1 Design Temperatures and Degree Days

	Heating Degree Days	Heating Degrees F.	Cooling Degrees F. Dry Bulb	Cooling Degrees F. Wet Bulb
Boston	5634	+10	88	74
Clinton	6517	+2	85	74
Fall River	5774	+9	86	74
Framingham	6144	+3	89	74
Lawrence	6195	+1	88	74
Lowell	6056	+3	89	74
New Bedford	5395	+13	84	73
Pittsfield	7578	+1	84	74
Springfield	5844	+1	88	74
Taunton	6184	+5	86	75
Worcester	6969	+1	87	73

b) Indoor design temperature shall be 72 deg. F for heating and 78 deg. F for cooling.

c) Indoor design relative humidity for heating shall not exceed 30 percent. For cooling, the actual design relative humidity within the comfort envelope as defined in Std. RS-4 shall be selected for minimum total HVAC system energy use in accordance with accepted practice.

2203.3 VENTILATION: Ventilation air shall conform to Std. RS-3. The minimum value for each type of occupancy shall be used for design. The ventilation quantities specified are for 100 percent outdoor air ventilating systems. A reduction to 33 percent of the specified outdoor values for recirculating HVAC systems is permitted. In no case shall the outdoor air quantity be less than 5 cfm per person. The air quality shall conform with the requirements of Std. RS-3.

EXCEPTION: If outdoor air quantities other than those specified are used or required because of special occupancy or process requirements, source control of air contamination, or other standards, the required outdoor air quantities shall be used as the basis for calculating the heating and cooling design loads.

SECTION 2204.0 COMPONENT DESIGN

2204.1 GENERAL: All buildings that are heated or mechanically cooled shall be constructed so as to provide the required thermal performance of the various components.

2204.2 BUILDING ENCLOSURE ELEMENTS

2204.21 GROSS WALL AREA: For the purposes of this article, the gross area of exterior walls consists of all opaque wall areas, including foundation walls above grade, between floor spandrels, peripheral edges of floors, window areas including sash, and door areas, where such surfaces are exposed to outdoor air and enclose a heated or mechanically cooled space including interstitial areas between two such spaces.

2204.22 ROOF ASSEMBLY: For the purposes of this article, a roof assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thereby creating a building transmission heat loss or gain, where such assembly is exposed to outdoor air and encloses a heated or mechanically cooled space.

The gross area of a roof assembly consists of the total interior surface of such assembly, including skylights exposed to the heated or mechanically cooled space.

Where air ceiling plenums are employed, the roof/ceiling assembly shall:

a) For thermal transmittance purposes, not include the ceiling proper nor the plenum space as part of the assembly; and,

b) For gross area purposes, be based upon the interior face of the upper plenum surface.

2204.23 BUILDING INSULATION

a) Materials used for insulation shall be of proven effectiveness and adequate durability to assure that required design conditions concerning heat losses or fire rating are attained. Insulation in contact with the ground shall not be adversely affected by soil, vermin, or water.

b) Conditions of Use:

1) Foam plastic insulation shall have a flame spread rating of

0-75 tested in accordance with ASTM E 84. In habitable and nonhabitable areas foam plastic insulation shall be covered and protected by an interior finish material having a finish rating of at least 15 minutes.

2) When blown or poured type of insulation is installed in attics, caution shall be exercised to assure complete and adequate application of insulation. When eave vents are installed, adequate baffling must be provided so as to deflect the incoming air above the surface of the insulation. Baffles shall be installed prior to insulation, shall be of durable material and shall be installed over the exterior wall at an angle to provide a 2 in. clearance under the roof deck for upward flow of ventilation air to the fixed vents in the upper portion of the attic.

2204.24 CRITERIA FOR RESIDENTIAL BUILDINGS

a) The requirements herein shall apply to all buildings and structures or portions thereof in use groups L-1, L-2 and L-3 (hotels, multi-family, and one- and two-family) that are heated or mechanically cooled when not more than three (3) stories or forty (40) feet in height.

b) Insulation may be omitted from floors over unheated areas when foundation walls are insulated.

c) In the case of slab on grade floors, the insulation shall extend downward from the top of the slab for a minimum of 24 inches below exterior grade or downward to the bottom of the slab then horizontally beneath the slab for a minimum total distance of 24 inches.

d) Air leakage (see section 2204.27).

e) The following table gives thermal transmittance values for all buildings in these classes.

An overall U_o value of 0.20 for the combination of walls, doors and windows may be used in lieu of the separate U values listed for "walls", "foundation walls", and "doors and windows". The overall U_o of 0.20 must be used when the fenestration exceeds 20 percent of the gross exterior wall area. See equation 1 for the calculation of the overall U_o.

TABLE 22-2

MAXIMUM U VALUES OF WALLS, ROOF/CEILINGS, AND FLOORS FOR RESIDENTIAL BUILDINGS OF SECTION 2204.24

ELEMENT	DESCRIPTION	U VALUE
Walls, except foundation walls	All Construction	0.08 Note 1
Foundation walls	All Construction	0.17
Roof/Ceiling	All Other Roof/Ceilings	0.05 Note 2
Doors and Windows	All Construction	0.65 Note 3
Floors	Floor Sections Over Areas Exposed to Outside Air	0.08
	Unheated Slab on Grade	5.50 Note 4
	Heated Slab on Grade	7.75 Note 4

Note 1: This value may be used when the fenestration does not exceed 20 percent of the gross exterior wall area.

Note 2: Exception: Roof/Ceiling assemblies in which the finished interior surface is essentially the underside of the roof deck, such as a wooden cathedral ceiling, may have a maximum U value of 0.08.

Note 3: Double glazing or permanently installed storm windows will satisfy the required U value of 0.65.

Note 4: R value for perimeter insulation.

2204.25 CRITERIA FOR ALL BUILDINGS OTHER THAN THOSE COVERED BY SECTION 2204.24:

a) L_1, L_2, and L_3 residential building over three stories or over forty feet high, and all non-residential buildings shall have an overall thermal transmittance value (U_o) based upon the following formula (Equation 1) and not exceeding the values shown in Table 22-3.

TABLE 22-3

MAXIMUM OVERALL U_o VALUES OF WALLS, ROOF AND FLOORS FOR BUILDINGS OF SECTION 2204.25

ELEMENT	DESCRIPTION	OVERALL U_o VALUE
Walls Note 1	3 Stories and Under	0.25
	Over 3 Stories	0.30
Roof	All Construction	0.07
Floors	Over Unheated Spaces	0.08
	Unheated Slab on Grade	5.50 Note 2
	Heated Slab on Grade	7.75 Note 2

Note 1: For cooling see section 2204.25b.

Note 2: R-Value for Perimeter Insulation.

$$U_o = \frac{U_w A_w + U_g A_g + U_d A_d}{A} \qquad \text{(Equation 1)}$$

Where

U_o = the average or combined transmittance of the gross exterior wall, floor, or roof/ceiling assembly.
A = the gross exterior wall, floor, or roof/ceiling assembly area.
U_w = the thermal transmittance of the components of the opaque wall, floor, or roof/ceiling assembly.
A_w = opaque wall, floor, or roof/ceiling assembly area.
U_g = the thermal transmittance of the glazing (window or skylight).
A_g = glazing area.
U_d = the thermal transmittance of the door or similar opening.
A_d = the door area.

NOTE: Where more than one type of wall, window, roof/ceiling, door, and skylight is used, the U and A terms for those items shall be expanded into sub-elements as U_{w1}, A_{w1} and U_{w2}, A_{w2}, etc.

b) Where cooling is a consideration, the formula (Equation 2) for overall thermal transfer value for exterior walls (OTTV) applies for all buildings except L_3 residential buildings. The maximum allowable values for OTTV shall be 34.2 Btu/h/sq. ft. of gross area of exterior walls for the portion of building being cooled.

$$OTTV = \frac{(U_w A_w TD_{eq}) + (A_f SFSC) + (U_f A_f \Delta T)}{A} \qquad \text{(Equation 2)}$$

Where

OTTV = overall thermal transfer value for exterior walls.
A = gross exterior wall.
U_w = U value of opaque wall (all elements)
A_w = opaque wall area.
U_f = U value of fenestration area.
A_f = fenestration area.
TD_{EQ} = temperature difference value (from Table 22-4).
SC = shading coefficient of the fenestration (see definition).
ΔT = temperature difference between exterior and interior design conditions, degrees Fahrenheit.
SF = solar factor value (130 Btu/h/sq. ft.)

NOTE: Where more than one type of wall and/or fenestration is used, the respective terms for those elements shall be expanded into sub-elements.

TABLE 22-4

TEMPERATURE DIFFERENCES FOR USE WITH EQUATION 2

WEIGHT OF WALL CONSTRUCTION LBS/FT.^{2}	TD_{EQ} FACTOR
0-25	44
26-40	37
41-70	30
71 and above	23

2204.26 ALTERNATES: The stated U_o (or U) value of any one assembly, such as roof/ceiling, wall or floor, may be increased and the U_o (or U) value for other components decreased provided that the overall heat gain or loss for the entire building envelope does not exceed the total resulting from conformance to the stated U_o (or U) values.

2204.27 AIR LEAKAGE FOR ALL BUILDINGS

a) The requirements of this section shall apply to all buildings and structures and apply to those locations separating outdoor ambient conditions from interior spaces that are heated or mechanically cooled and are not applicable to the separation of interior conditioned spaces from each other.

b) Exterior joints around windows and door frames; openings between walls and foundations, between walls and roof and between wall panels; openings at penetrations of utility services through walls, floors and roofs; and all other such openings in the building envelope shall be caulked, gasketed, weatherstripped, or otherwise sealed.

c) All exterior doors and windows shall be designed to limit air leakage into or from the building envelope, and shall have air infiltration rates no greater than those shown in Table 22-5.

TABLE 22-5 ALLOWABLE AIR INFILITRATION RATES

WINDOWS	RESIDENTIAL DOORS		COMMERCIAL DOORS
(cfm per linear foot of operable sash crack)	(cfm per square foot of door area)		(cfm per linear foot of crack)
	Sliding Glass	Entrance	Swinging, sliding, Revolving
0.5	0.5	1.25	11.0

1) When tested at a pressure differential of 1.567 lb./sq. ft. which is equivalent to the impact pressure of a 25 mph wind.

2) Compliance with the criteria for air leakage of all types of doors shall be determined by Std. RS-2.

EXCEPTION: Required fire doors with a fire resistive rating over one (1) hour, and fire windows are exempt from this section.

2204.3 MECHANICAL SYSTEMS

SCOPE: This section covers the determination of heating and cooling loads, design requirements, and equipment and component performance and control requirements. Criteria are established for insulating HVAC systems and for duct construction.

EXCEPTION: Special application, including but not limited to hospitals, laboratories, rooms containing thermally sensitive equipment such as computers, may be exempted from the requirements of this section. Certification of special needs shall be submitted under section 2201.4.

2204.31 CALCULATION OF HEATING AND COOLING LOADS

CALCULATION PROCEDURES: For the purpose of sizing HVAC systems, heating and cooling design loads shall be determined in accordance with techniques recommended in the appropriate ASHRAE publications.

The design parameters specified in section 2203.0 shall apply for all computations.

Infiltration for heating and cooling design loads shall be calculated using techniques recommended in the appropriate ASHRAE publications. Infiltration rates shall not exceed those of Table 22-5.

SYSTEM DESIGN HEATING/COOLING CAPACITY: The rated capacity of the heating/cooling system at design conditions shall not be greater than 125% of the design output load calculated in accordance with this article. Equipment designed for standby purposes is not included in the capacity limitation requirement. The cooling cycles of heat pumps are exempt from this requirement.

2204.32 SIMULTANEOUS HEATING AND COOLING

Simultaneous heating and cooling by reheating or recooling supply air or by concurrent operation of independent heating and cooling systems serving a common zone shall be restricted as delineated below.

a) Recovered energy, provided the new energy expended in the recovery process is less than the amount recovered, may be used for control of temperature and humidity. (New energy is defined as energy, other than recovered, utilized for the purpose of heating or cooling.)

b) New energy may be used, when necessary, to prevent relative humidity from rising above 60 percent for comfort control or to prevent condensation on terminal units or outlets.

c) New energy may be used for control of temperature if minimized as delineated in paragraphs (d) through (h).

d) Reheat Systems: Systems employing reheat and serving more than one zone, other than those employing variable air volume for temperature control, shall be provided with controls that will automatically reset the system cold air supply. The temperature shall be the highest level that will satisfy the zone requiring the coolest air. Reheat systems serving only one zone shall be controlled to sequence reheat and cooling.

e) Dual Duct and Multi Zone Systems: These systems shall be provided with controls that will automatically reset: (1) the cold deck air supply to the highest temperature that will satisfy the zone requiring the coolest air, and (2) the hot deck air supply to the lowest temperature that will satisfy the zone requiring the warmest air.

f) Recooling Systems: Systems in which heated air is recooled, directly or indirectly, to maintain space temperature shall be provided with controls that will automatically reset the temperature to which the supply air is heated. The temperature shall be the lowest level that will satisfy the zone requiring the warmest air.

g) For systems with multiple zones, one or more zones may be chosen to represent a number of zones with similar heating/cooling characteristics. A multiple zone HVAC system that employs reheating or recooling for control of not more than 5,000 cfm, or 20 percent of the total supply air of the system, whichever is less, shall be exempt from the supply air temperature reset requirement of paragraphs (d) through (f).

h) Concurrent operations of independent heating and cooling systems serving common spaces and requiring the use of new energy for heating or cooling shall be minimized by one or both of the following:

1) By providing sequential temperature control of both heating and cooling capacity in each zone.

2) By limiting the heating energy input through automatic reset control of the temperature of the heating medium to only that necessary to offset heat loss due to transmission and infiltration and, where applicable, to heat the ventilation air supply to the space.

2204.33 ENERGY RECOVERY

Consideration shall be given to the use of recovery systems which will conserve energy (provided the amount expended is less than the amount recovered) when the energy transfer potential and the operating hours are considered.

2204.34 HVAC EQUIPMENT PERFORMANCE REQUIREMENTS

a) The requirements of this section apply to equipment and component performance for heating, ventilating, and air conditioning systems. Where equipment efficiency levels are specified, data furnished by the equipment supplier, or certified under a nationally-recognized certification program or rating procedure, shall be used to satisfy these requirements.

b) HVAC-System Heating Equipment, Heat Pumps-Heating Mode: Heat pumps whose energy input is entirely electric shall show a coefficient of performance (COP heating, as defined herein) not less than the values shown in Table 22-6.

1) These requirements apply to, but are not limited to, unitary heat pumps (air source and water source) in the heating mode, and to heat pumps in the packaged terminal air-conditioner and room air-conditioner forms in the heating mode. Field assembled unitary heat pumps, consisting of one or more components, shall show compliance with this section.

2) Coefficient of Performance Heating: The ratio of the rate of net heat output to the rate of total energy input, expressed in consistent units and under designated rating conditions.

The rate of net heat output shall be defined as the change in the total heat content of the air between entering and leaving the equipment (not including supplementary heat).

Total energy input shall be determined by combining the energy inputs to all elements of the heat pump except supplementary heaters. This includes, but is not limited to, compressor(s), pump(s), supply-air fan(s), return-air fan(s), outdoor-air fan(s), cooling-tower fan(s), and the HVAC-system equipment control circuit.

3) Supplementary Heater: The heat pump shall be installed with a control to prevent supplementary heater operation when the heating load can be met by the heat pump alone.

Supplementary heater operation is permitted during transient periods, such as start-ups, following room thermostat setpoint advance, and during defrost.

A two-stage thermostat, which controls the supplementary heat on its second stage, shall be accepted as meeting this requirement. The cut-on temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat, and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat. Supplementary heat may be derived from any source of electric resistance heating or combustion heating.

c) HVAC-System Combustion Heating Equipment: All gas and oil fired comfort heating equipment shall show a minimum combustion efficiency of 75 percent at maximum rated output. Combustion efficiency is defined as 100 percent minus stack losses in percent of heat input. Stack losses are:

1) Loss due to sensible heat in dry flue gas.

2) Loss due to incomplete combustion.

3) Loss due to sensible and latent heat in moisture formed by combustion of hydrogen in the flue.

d) Mechanical Ventilation: Each mechanical ventilation system (supply and/or exhaust) shall be equipped with a readily accessible means for either shut-off or volume reduction, and shut-off when ventilation is not required.

e) HVAC-System Equipment, Electrically Operated Cooling Mode: HVAC-system equipment as listed below whose energy input in the cooling mode is entirely electric, shall show a Coefficient of Performance (COP) cooling as defined herein not less than the values shown in Table 22-7.

1) These requirements apply to, but are not limited to, unitary cooling equipment (air-cooled, water-cooled and evaporatively-cooled); the cooling mode of unitary heat pumps (air source and water source); packaged terminal air-conditioners; and room air-conditioners.

EXCEPTION: These requirements do not apply to equipment used in areas having open refrigerated food display cases.

2) Coefficient of Performance Cooling: The ratio of the rate of net heat removal to the rate of total energy input, expressed in consistent units and under designated rating conditions.

The rate of net heat removal shall be defined as the change in the total heat content of the air between entering and leaving the equipment (without re-heat).

Total energy input shall be determined by combining the energy inputs to all elements of the equipment, including, but not limited to, compressor(s), pump(s), supply-air fan(s), return-air fan(s), condenser-air fan(s), cooling-tower fan(s), and pump(s), and the HVAC-system equipment control circuit.

f) Applied HVAC-System Components, Electrically Operated, Cooling Mode: HVAC-system components, as listed in Table 22-8, whose energy input is entirely electric, shall show a Coefficient of Performance (COP) cooling, as defined herein, and not less than the values shown in Table 22-8.

1) Coefficient of Performance (COP) Cooling: The ratio of the rate of net heat removal to the rate of total energy input, expressed in consistent units and under designated rating conditions.

The rate of net heat removal is defined as the difference in total heat content of the water or refrigerant entering and leaving the component.

Total energy input shall be determined by combining the energy inputs to all elements and accessories of the component, including but not limited to compressor(s), internal circulating pump(s), condenser-air fan(s), evaporative-condenser cooling water pump(s), purge, and the HVAC-system component control circuit.

g) HVAC-System Equipment - Heat Operated Cooling Mode. Efficiency Limitation, Equipment: Heat operated cooling equipment shall show a (COP) cooling not less than the values shown in Table 22-9. These requirements apply to, but are not limited to absorption equipment, engine driven equipment, and turbine drive equipment.

1) Where the refrigeration components are supplied by different manufacturers, it shall be the responsibility of the system designer to determine compliance with these requirements, using data provided by the suppliers of the elements.

2204.35 ENERGY FOR AIR DELIVERY

The air transport factor for each all-air HVAC system shall not be less than 4.0. The factor shall be based on design system air flow for constant volume systems. The factor for variable air volume systems may be based on average conditions of operation. Energy for transfer of air through heat recovery devices shall not be included in determining the factor; however, such energy shall be included in the evaluation of the effectiveness of the heat recovery system.

$$\text{Air Transport Factor} = \frac{\text{Space Sensible Heat Removal}^*}{(\text{Supply + Return Fan(s) Power Input})^*}$$

*Expressed in Btu/h

2204.36 CONTROLS

a) Temperature Control: Each HVAC system shall be provided with at least one thermostat for the regulation of temperature. Each thermostat shall be capable of being set as follows:

1) Where used to control heating only 55-75°F.

2) Where used to control cooling only 70-85°F.

3) Where used to control both heating and cooling it shall be capable of being set from 55-85°F and shall be capable of operating the system heating and cooling in sequence. It shall be adjustable to provide a temperature range of up to 10°F between full heating and full cooling, except as allowed in 2204.32(h).

b) Humidity Control: If an HVAC system is equipped with a means for adding moisture to maintain specific selected relative humidities in spaces or zones, a humidistat shall be provided. This device shall be capable of being set to prevent new energy from being used to produce space relative humidity above 30 percent relative humidity. Where a humidistat is used in an HVAC system for controlling moisture removal to maintain specific

selected relative humidities in spaces or zones, it shall be capable of being set to prevent new energy from being used to produce a space relative humidity below 60 percent relative humidity.

c) Zoning for Temperature Control

1) One and Two-Family Dwellings: At least one thermostat for regulation of space temperature shall be provided for each separate HVAC system. In addition, a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to each zone or floor.

EXCEPTION: Non-conditioned basements and garages.

2) Multi-Family Dwellings: For multi-family dwellings, each individual dwelling unit shall be considered separately and shall meet the above requirements. Spaces other than living units shall meet the requirements of paragraph 3 below.

3) All Other Types of Buildings or Occupancies: At least one thermostat for regulation of space temperature shall be provided for:

a) Each separate HVAC system.

b) Each separate zone as defined in section 2202. As a minimum each floor of a building shall be considered as a separate zone. In a multi-story building where the perimeter system offsets only the transmission losses of the exterior wall, an entire side of uniform exposure may be zoned separately. A readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input (for the exposure) to each floor.

4) Control Setback and Shut-Off

a) Residential Occupancy (Groups L_2, L_3): The thermostat required in paragraphs (c) 1 & 2, or an alternate means such as a switch or clock, shall provide a readily accessible, manual or automatic means for reducing the energy required for heating and cooling during periods of non-use or reduced need, such as, but not limited to, unoccupied periods and sleeping hours.

b) Other Buildings and Occupancies: Each HVAC system shall be equipped with a readily accessible means of shutting off or reducing the energy used for HVAC during periods of non-use or alternate uses of the building spaces or zones served by the system. The following are examples that meet this requirement:

1) Manually adjustable automatic timing devices.

2) Manual devices for use by operating personnel.

3) Automatic control systems.

c) Lowering thermostat set points to reduce energy consumption of heating systems shall not cause energy to be expended to reach the reduced setting.

2204.37 DUCT CONSTRUCTION

All duct work shall be constructed and erected in accordance with the Basic Code and Std. RS-5.

a) High-pressure and medium-pressure ducts shall be leak-tested in accordance with Std. RS-5.

b) When low pressure supply air ducts are located outside of the conditioned space (except return air plenums), all transverse joints shall be sealed using mastic or mastic plus tape. For fibrous glass duct-work, pressure sensitive tape may be used.

c) Automatic or manual dampers installed for the purpose of shutting off outside air intakes for ventilation air shall be designed with tight shut-off characteristics to minimize air leakage.

2204.38 AIR HANDLING DUCT SYSTEM INSULATION:

All ducts, plenums and enclosures installed in or on buildings shall be thermally insulated as follows:

a) All duct systems, or portions thereof, shall be insulated to provide a thermal resistance, excluding film resistances of:

$$R = \frac{\Delta t}{15} \text{ (hr) (F) } (ft^2)/Btu$$

where Δt = the design temperature differential between the air in the duct and the surrounding air in ^{o}F.

EXCEPTION: Duct insulation (except where required to prevent condensation) is not required in any of the following cases:

1) Where Δt is $25^{o}F$ or less for hot air only ducts.

2) Supply or return air ducts installed in crawl-spaces with insulated walls, and basements or cellars with insulated walls in one- and two-family dwellings.

3) When the heat gain or loss of the ducts, without insulation, will not increase the energy requirements of the building.

4) Within HVAC equipment.

5) Exhaust air ducts.

b) Vapor Barriers shall be provided (where required) to prevent condensation.

2204.39 COOLING WITH OUTDOOR AIR (ECONOMIZER CYCLE)

Each fan system shall be designed to use up to and including 100 percent of the fan system capacity for cooling with outdoor air automatically whenever its use will result in lower usage of new energy. Activation of economizer cycle shall be controlled by sensing outdoor air enthalpy and dry-bulb temperature jointly or outdoor air dry-bulb temperature alone to accomplish the above.

EXCEPTIONS: Cooling with outdoor air is not required under any one or more of the following conditions:

a) Fan system capacity less than 5,000 cfm or 134,000 Btu/h total cooling capacity.

b) The quality of the outdoor air is so poor as to require extensive treatment of the air.

c) The need for humidification or dehumidification requires the use of more energy than is conserved by the outdoor air cooling.

d) The use of outdoor air cooling may affect the operation of other systems so as to increase the overall energy consumption of the building.

e) Internal/external zone heat recovery or other energy recovery is used.

f) When all space cooling is accomplished by a circulating liquid which transfers space heat directly or indirectly to a heat rejection device such as a cooling tower without the use of a refrigeration system.

TABLE NO. 22-6
MINIMUM COP FOR HEAT PUMPS, HEATING MODE

SOURCE AND OUTDOOR TEMPERATURE (°F.)	MINIMUM COP
Air Source - 47 dB/43WB	2.2
Air Source - 17 dB/15WB	1.2
Water Source - 60 Entering	2.2

TABLE NO. 22-7 MINIMUM EER AND COP FOR ELECTRIC HEATING, VENTILATING AND AIR CONDITIONING SYSTEM EQUIPMENT

STANDARD RATING CAPACITY	EER	COP
Under 65,000 BTU/hr (19,050 watts)	6.1	1.8
65,000 BTU/hr (19,050 watts) and over	6.8	2.0

TABLE NO 22-8 MINIMUM COP FOR ELECTRICALLY DRIVEN HEATING, VENTILATING AND AIR CONDITIONING SYSTEM COMPONENTS

COMPONENT	CONDENSING MEANS	AIR		WATER		EVAPORATOR	
		EER	COP	EER	COP	EER	COP
	Centrifugal	7.5	2.2	12.9	3.8		
Self-contained Water chillers	Positive Displacement	7.2	2.1	10.9	3.2		
Condenserless Water chillers	Positive Displacement	8.9	2.6	10.9	3.2		
Compressor and Condenser units 65,000 BTU/hr (19,050 watts and over)	Positive Displacement	7.8	2.3	11.3	3.3	11.3	3.3

TABLE NO.22-9-MINIMUM COP FOR HEATING, VENTILATING AND AIR CONDITIONING SYSTEM HEAT OPERATED COOLING EQUIPMENT

HEAT SOURCE	MINIMUM COP
Direct fired (gas, oil)	0.40
Indirect fired (steam, hot water)	0.65

TABLE NO. 22-10
MINIMUM PIPE INSULATION

PIPING SYSTEM TYPES	FLUID TEMPERATURE RANGE, F.	INSULATION THICKNESS IN INCHES FOR PIPE SIZES					
		RUN-OUTS UP TO 2"	1" AND LESS	1-1/4 TO 2"	2-1/2 TO 4"	5" TO 6"	8" AND LARGER
HEATING SYSTEMS							
Steam and Hot Water							
High Pressure/Temp	306-450	1-1/2	1-1/2	2	2-1/2	3-1/2	3-1/2
Med. Pressure/Temp	251-305	1-1/2	1-1/2	2	2-1/2	3	3
Low Pressure/Temp	201-250	1	1	1-1/2	1-1/2	2	2
Low Temperature	120-200	1/2	3/4	1	1	1	1-1/2
Steam Condensate (for Feed Water)	Any	1	1	1	1-1/2	1-1/2	2
COOLING SYSTEMS							
Chilled Water	40-55	1/2	1/2	3/4	1	1	1
Refrigerant, or Brine	Below 40	1	1	1-1/2	1-1/2	1-1/2	1-1/2

2204.310 BALANCING

The HVAC system design shall provide means for balancing the air and water systems such as but not limited to dampers, temperature and pressure test connections, flow measuring stations or meters, and balancing valves. The HVAC systems shall be field balanced to achieve conditions stated in the plans and specifications.

2204.311 PIPING INSULATION

All piping installed to serve buildings and within buildings shall be thermally insulated in accordance with Table 22-10, except as stated herein (for service water heating systems see section 2204.4).

a) Other Insulation Thickness: Insulation thickness in Table 22-10 are based on insulation having thermal resistance in the range of 4.0 to 4.6 per inch of thickness on a flat surface at a mean temperature of 75°F. Minimum insulation thickness shall be increased for materials having R values less than 4.0, or may be reduced for materials having R values greater than 4.6.

   1) For materials with thermal resistance greater than R = 4.6, the minimum insulation thickness may be reduced as follows:

   $$\frac{4.6 \times \text{Table 22-10 Thickness}}{\text{Actual R}} = \text{New Minimum Thickness}$$

   2) For materials with thermal resistance less than R = 4.0, the minimum insulation thickness shall be increased as follows:

   $$\frac{4.0 \times \text{Table 22-10 Thickness}}{\text{Actual R}} = \text{New Minimum Thickness}$$

b) Vapor barriers shall be provided to prevent condensation where required.

c) EXCEPTIONS: Piping insulation is not required in any of the following cases:

   1) Piping installed within HVAC equipment.

   2) Piping for fluids at temperatures between 55°F and 120°F.

   3) When the heat loss and/or heat gain of the piping, without insulation, does not increase the heating and/or cooling energy requirements of the building.

   4) Piping, installed in crawl spaces with insulated walls, and basements or cellars with insulated walls in one- and two-family dwellings.

2204.4 SERVICE WATER HEATING

2204.41 SCOPE: The purpose of this section is to provide criteria for design and equipment selection that will produce energy savings when applied to service water heating.

2204.42 WATER HEATERS, STORAGE TANKS, BOILERS, AND PIPING

a) Performance Efficiency.

1) All automatic, electric, storage water heater(s) shall have a stand-by loss not exceeding 4 W/ft.^{2} of tank surface area; when tested in accordance with Std. RS-7.

2) All gas and oil fired, automatic storage heaters shall have a recovery efficiency (E_r) not less than 75 percent and a stand-by loss percentage (S) not exceeding:

$$S = 2.3 + 67/V$$

Where

V = rated volume in gallons

When tested in accordance with Std. RS-7.

EXCEPTION: When using Std. RS-7, oil fired units have a CF = 1.0;Q equals total gallons of oil consumed; and H equals total heating value of oil in Btu/gal.

3) Insulation: Heat loss from unfired hot water storage tanks shall be limited to a maximum of 15 Btu/h/sq. ft. of external tank surface area. The design ambient temperature shall be no higher than 65°F for calculating heat losses.

4) Combination Service Water Heating/Space Heating Boilers: Service water heating equipment shall not be dependent upon year round operation of space heating boilers (that is, boilers that have winter space heating as another function).

EXCEPTIONS:

a) Exempt from these requirements are systems with service/space heating boilers having a stand-by loss in Btu/h less than:

$$\frac{13.3\ \text{pmd} + 400}{n}$$

pmd = probable maximum demand

n = fraction of year when outdoor daily mean temperature exceeds 64.9°F.

The stand-by loss is to be determined for a test period of 24 hour duration while maintaining a boiler water temperature of 90°F above ambient.

b) Type L_3 residential buildings.

b) Temperature Controls

1) Service water heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use.

2) Shut down: A separate switch shall be provided to permit turning off the energy supplied to electric service water heating systems. A separate valve shall be provided to permit turning off the fuel supplied to the main burner(s) of all other types of service water heating systems.

3) Swimming Pools

a) Heated swimming pools shall be equipped with controls to limit heating water temperatures to no more than 80°F.

EXCEPTION: Pools used for therapeutic purposes are exempt from this requirement when approved by the building official.

b) Uncovered (unenclosed) heating pools shall be controlled so that the electric or fossil-fueled pool water heating systems are inoperative whenever the outdoor air temperature is below 60°F.

2204.43 PUMP OPERATION

Circulating hot water systems shall be arranged so that the circulating pump(s) can be conveniently turned off, automatically or manually, when the hot water system is not in operation.

2204.44 INSULATION

Service hot water supply and recirculation piping (except runouts to fixtures not longer than 10 feet in length) shall be insulated in accordance with Table 22.10 for low temperature heating system piping.

2204.45 CONSERVATION OF HOT WATER

a) Showers: Showers used for other than safety reasons shall be equipped with flow control devices to limit total flow to a maximum of 3 gpm per shower head.

b) Lavatories in restrooms of public facilities shall:

1) Be equipped with outlet devices which limit the flow of hot water to a maximum of 0.5 gpm.

2) Be equipped with devices which limit the outlet temperature to a maximum of 110°F.

3) Be equipped with self-closing valves that limit delivery to a maximum of 0.25 gal. of hot water.

2204.5 ELECTRICAL POWER DISTRIBUTION

2204.51 SCOPE: Electrical distribution systems shall be designed for efficient distribution of electrical energy from the service entrance to the points of use.

2204.52 POWER FACTOR: Utilization equipment rated greater than 100,000 W and lighting equipment greater than 15 W with an inductive reactance load component, shall have a power factor of not less than 85 percent under rated load conditions. Power factor of less than 85 percent shall be corrected to at least 90 percent under rated load conditions. Power factor corrective devices, installed to comply with the Basic Code, shall be switched with the utilization equipment, except where this results in an unsafe condition or interferes with the intended operation of the equipment.

2204.53 SERVICE VOLTAGE: Where a choice of service voltages is available, a computation shall be made to determine which service voltage would produce the least energy loss, and that voltage shall be selected.

2204.54 LIGHTING SWITCHING

a) Each area enclosed by ceiling height partitions shall have independent control of the lighting within that area.

b) All switching devices used to control lighting within an area shall be readily accessible to personnel occupying that area.

c) For all areas larger than 500 square feet, the connected lighting load shall be so controlled that the illumination may be reduced by at least one half. The maximum area that may be controlled by any two switching devices shall be limited to that area which can be served by two (2) 20 ampere single pole circuits, loaded to no more than 80 percent.

d) In all interior areas where effective use may be made of natural light, lighting circuiting shall be arranged so that units, in portions of the area where natural light is available, are switched independently of the remainder of the area.

e) In all exterior areas, lighting fixtures shall be switched automatically for non-operation when natural light is available

2204.55 ELECTRIC ENERGY DETERMINATION: In all multi-family dwellings, each dwelling unit shall be separately metered.

EXCEPTION: Central, electrically fired heating and/or cooling systems serving multiple dwelling units.

SECTION 2205.0 BUILDING DESIGN BY SYSTEMS ANALYSIS

2205.1 GENERAL: This section establishes design criteria in terms of total energy use by a building including all of its systems.

2205.11 Compliance with this section is optional and will require an analysis of the annual energy consumption. Section 2204.0 establishes criteria for different energy consuming and enclosure elements of the building which, if followed, will eliminate the requirement for an annual energy analysis while meeting the intent of this article.

A building designed in accordance with this section will be deemed as complying with this article if the annual energy consumption is not greater than a similar building (defined as a "standard design") whose enclosure elements and energy consuming systems are designed in accordance with section 2204.0.

"Building of similar design" shall mean a building of the same size and shape, utilizing the same energy source(s) for the same functions, and having equal floor area, environmental requirements, occupancy, climate data and usage operational schedule.

2205.12 The standard design, conforming to the criteria of section 2204.0, and the proposed alternative design, shall be designed on a common basis as specified herein.

The comparison shall be expressed as Btu input per square foot of gross floor area per year.

Identical energy sources must serve the same purpose in both the standard and the proposed alternative design. If the proposed alternative design results in an increase in consumption of one energy source and a decrease in another energy source, each energy source shall be converted to equivalent Btu units for purposes of comparing the total energy used.

2205.2 ANALYSIS PROCEDURE: The analysis of the annual energy usage of the standard and the proposed alternative building and system design shall meet the following criteria:

a) The building heating/cooling load calculation procedure used for annual energy consumption analysis shall be of sufficient detail to permit the evaluation of the effect of the factors specified in section 2205.21.

b) The calculation procedure used to simulate the operation of the building and its service systems through a full year operating period shall be of sufficient detail to permit the evaluation of the effect of system design, climatic factors, operational characteristics, and mechanical equipment on annual energy usage. Manufacturer's data or comparable field test

data shall be used when available in the simulation of all systems and equipment. The calculation procedure shall be based upon 8760 hrs. of operation of the building and its service systems and shall utilize techniques recommended in the appropriate ASHRAE publications.

2205.21 The calculation procedure shall cover the following items:

a) Environmental requirements as indicated in section 2203.0.

b) Climatic Data: Coincident hourly data for temperatures, solar radiation, wind and humidity of typical days in the year representing seasonal variation.

c) Building data: Orientation, size, shape, transfer characteristics of mass, air, moisture and heat.

d) Operational characteristics: Temperature, humidity, ventilation, illumination, control sequence for occupied and non-occupied hours.

e) Mechanical equipment: Design capacity, part load profile.

f) Internal heat generation from lighting, equipment, number of people during occupied and non-occupied periods.

g) Electrical equipment: Lighting, power consumption.

2205.22 DOCUMENTATION: Proposed alternative designs, submitted as requests for exception to the standard design criteria, shall be accompanied by an energy analysis comparison report prepared by a Massachusetts registered engineer or registered architect. The report shall provide sufficient technical detail on the two building and systems designs, and on the data used in and resulting from the comparative analysis, to verify that both the analysis and the designs meet the criteria of this article.

The documentation shall demonstrate that the analysis used is consistent with ASHRAE techniques and accepted engineering practice.

EXCEPTION: Proposed alternative designs for buildings having an area of 5,000 square feet or less and having the indoor temperature controlled from a single point are exempted from the full-year energy analysis as described above. A comparison of energy consumption between the alternative design and the standard design shall be provided in a report prepared by a Massachusetts registered professional engineer or architect. Such analysis shall follow the bin or degree day methods or other simplified analysis procedures consistent with accepted engineering practice.

2206.0 BUILDING UTILIZING SOLAR, GEOTHERMAL, WIND, OR OTHER NON-DEPLETABLE ENERGY SOURCES AS ALTERNATIVE DESIGNS

When a proposed alternative building, submitted in accordance with section 2205.1, utilizes solar, geothermal, wind or other non-depletable energy, that portion supplied to the building shall be excluded from the total energy chargeable to the proposed alternative design.

To qualify for this exclusion, such energy must be derived from a specific collection, storage and distribution system. The solar energy passing through windows shall also be considered as qualifying if: windows are provided with (1) such operable insulating shutters or other devices which, when drawn or closed, shall cause the window area to reduce maximum outward heat flows to those in accordance with section 2204.0 and, (2) the window areas are shaded or otherwise protected from the direct rays of the sun during periods when cooling is required.

This provision shall also apply to nocturnal cooling processes in lieu of energy consuming processes.

All other criteria covered in section 2205.1 and 2205.2 shall apply to the proposed alternative designs utilizing non-depletable sources of energy.

2206.1 DOCUMENTATION: Proposed alternative designs, submitted as requests for exception to the standard design criterial shall be accompanied by an energy analysis, as specified in section 2205.2. The report shall provide sufficient technical detail on the alternative building and system designs and on the data employed in and resulting from the comparative analyses to verify that both the analyses and the designs meet the criteria of this article.

The energy derived from non-depletable sources and the reduction in conventional energy requirements derived from nocturnal cooling, shall be separately identified from the overall building energy use. Supporting documentation, on the basis of the performance estimates for the aforementioned non-depletable energy sources or nocturnal cooling means, must be submitted.

The documentation shall demonstrate that the analysis used is consistent with ASHRAE techniques.

EXCEPTION: Proposed alternative designs that derive over 50 percent of their annual thermal requirements (heating, cooling, service water heating) or over 30 percent of their annual total energy requirements from non-depletable sources shall be exempted from the necessity of comparing the proposed design to a standard design which follows the provisions of section 2205.1. Documentation, verifying the percentage of annual energy use derived from such non-depletable sources shall be required as provided in section 2206.1 and shall be prepared by a Massachusetts registered engineer or architect.

REFERENCE STANDARDS - ARTICLE 22

STANDARD	STANDARD TO BE BASED ON THE PROVISIONS NECESSARY FOR ENFORCEMENT OF THE FOLLOWING
RS-1	(omitted)
RS-2	ASTM E 283-73 Standard Method of Test for Rate of Air Leakage through exterior windows, curtain walls, and doors; plus ANSI A134.1, 134.2; NWMA
RS-3	ASHRAE Standard 62-73 "Natural and Mechanical Ventilation"
RS-4	ASHRAE Standard 55-74 "Thermal Environmental Conditions for Human Occupancy"
RS-5	Sheetmetal and Air Conditioning Contractors National Association: Low Velocity and Duct Construction Standards, 4th ed., 1969 High Velocity Duct Construction Standards, 2nd ed., 1969 Fibrous Glass Duct Construction Standards 3rd ed., 1972
RS-6	Standards for Evaluation of Various Heating A/C Equipment and Devices (34 Standards) included in ASHRAE 90-75
RS-7	Hot Water Heater Standards ANSI C72.1-72 "Household Automatic Electric Storage Type Water Heaters" ANSI 221.10.3-74 "Gas Water Heaters Vol. III, Circulating Tank"

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH

UNIFORM FILING FORM

This form has been prepared to simplify & make uniform the procedure for submitting materials with the Rules & Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation & to M. G. L. Chapter 30A, as amended by Chapter 459 of the Acts of 1976, which set forth the basic filing requirements.

1 - Date August 1, 1977

2 - Cabinet C & D Department DCA Division State Building Code Comm.
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 1305
727-6916

3 - Descriptive title of document: Amendments to the State Building Code

4 - Estimate the number of copies that will be purchased in the next six months: By your agency 1,000 By the public 2,000

(Note: If you need bulk quantities for your agency, please submit a purchase order form or call 727-2834 to place your order for printing.)

5 - The document attached is best classified as a:

[X] Ch. 30A Regulation

[ ] Ch. 30A Emergency Regulation - If this box is checked, state nature of emergency.

[ ] Other - If this box is checked, do not complete the rest of the form.

6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): May 3, 1977 ; or

Date of "action" (Ch. 30A/3) _____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given: _____

8 - Regulation will be effective: January 1, 1978

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of Jan. 1, 1978 pursuant to M. G. L. Ch. 30A

Section(s) 6

9 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s) _____ filed _____
_____ filed _____
_____ filed _____
_____ filed _____
_____ filed _____

Amends regulation(s) State Bldg. Code filed 7/1/74
_____ filed _____
_____ filed _____
_____ filed _____

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

ROOM HEATERS & FUEL-BURNING APPLIANCE LABELING, ETC.

Date Filed December 21, 1977

Date Published December 30, 1977

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT
(16-6Z) $.15

MICHAEL S. DUKAKIS
GOVERNOR
RAYMOND D. CARAVATY
CHAIRMAN
CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

December 20, 1977

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 4, 1977 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on January 1, 1978.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on January 1, 1978.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on December 20, 1977.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

SECTION 1100.1

Add at the end of Section 1100.1 the following words "except as noted otherwise herein"; so that Section reads:

1100.1 ACCEPTED ENGINEERING PRACTICE: All such systems and equipment constructed, installed and maintained in accordance with the applicable standards listed in the reference standards of this article shall be deemed to conform to the provisions of this code, except as noted otherwise herein.

SECTION 1121.5

Add at the end of Section 1121.5 the following words "however, until July 1, 1978, the building official may approve solid fuel burning appliances that are unlisted"; so that Section reads:

1121.5 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; however, until July 1, 1978, the building official may approve solid fuel burning appliances that are unlisted.

SECTION 2109.15

Add at the end of Item f) in Section 2109.15 the following words "however, the building official may until July 1, 1978 approve a solid fuel burning appliance which does not contain a seal indicating approval by an approved testing agency"; so that Section reads:

2109.15 FUEL-BURNING APPLIANCE LABELING: Every fuel-burning comfort heating appliance shall bear a permanent and legible factory applied nameplate on which shall appear:

a) The manufacturer's name or trademark.

b) The B.t.u. rating.

c) The model and serial number.

d) Instructions for the lighting, operation and shut-down of the appliance.

e) The type of fuel approved for use with the appliance.

f) A seal indicating approval of the appliance by an approved testing agency, if acceptance is based on such approval; however, the building official may until July 1, 1978 approve a solid fuel burning appliance which does not contain a seal indicating approval by an approved testing agency.

FOOTNOTES TO SECTIONS 1100.1, 1121.5, AND 2109.15

Under the authority delegated by Chapter 802 of the Acts of 1972, and as directed in Article 1, Sections 102 and 103 of the State Building Code, heating equipment and appliances must be approved and labeled as directed by Articles 11 and 21. The State Building Code Commission has placed a moratorium until July 1, 1978 on the requirement for labeling these appliances by an approved, accredited testing agency.

All comfort heating/solid fuel burning appliances approved by the building official shall be installed in strict accordance with the applicable provisions of Article 10, Sections 1100.0, 1100.1, 1100.3, 1102.0, 1102.2, 1112.0, 1121.5, 2107.0, 2107.7, 2107.8, 2107.9, 2109.4, 2109.8, 2109.9, 2109.15, 2109.17, 2110, 2110.4, Tables 2109-1 and 2109-2, 2111, 2112, 2113.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH

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1 - Date December 20, 1977

2 - Cabinet C & D Department DCA Division State Building Code Comm.
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 1305
727-6916

3 - Descriptive title of document: Amendments to the State Building Code

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6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): October 4, 1977 ; or

Date of "action" (Ch. 30A/3)_____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given:_____

8 - Regulation will be effective:

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of January 1, 1978 pursuant to M. G. L. Ch. 30A

Section(s) 6

9 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)_____ filed_____
_____ filed_____
_____ filed_____
_____ filed_____
_____ filed_____

Amends regulation(s) State Bldg. Code filed 7/1/74
Article 21 filed 12/6/74
_____ filed_____
_____ filed_____

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

HISTORIC BUILDINGS - FIRE PROTECTION EQUIPMENT, ETC.

Date Filed December 21, 1977

Date Published December 30, 1977

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT
(16-6AA) $.30

MICHAEL S. DUKAKIS
GOVERNOR

RAYMOND D. CARAVATY
CHAIRMAN

CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

31

December 20, 1977

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on October 4, 1977 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on July 1, 1978.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on July 1, 1978.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on December 20, 1977.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

SECTION 417.4

Repeal Section 417.4 of the State Building Code in its entirety.

SECTION 429.0

Add the following new Section and Sub-Sections after Section 428.5:

SECTION 429.0 HISTORIC BUILDINGS

429.1 SCOPE: The provisions of Section 429.0 shall govern all buildings and structures in the Commonwealth which are legally designated as historic buildings. This section shall pre-empt all other regulations of the Basic Code governing the reconstruction, alterations, change of use and occupancy, repairs, maintenance and additions for the conformity of historic buildings and structures to the Basic Code, with the exception of Section 126.0 for appeals, or unless otherwise specified.

429.2 DEFINITIONS

HISTORIC BUILDINGS: Any individual building or structure, but excluding districts, so designated by the National Register of Historic Places or certified by the Massachusetts Historic Commission and ratified by the Massachusetts Building Code Commission as listed in Reference Standards RS 429.1 and RS 429.2. Historic buildings shall be further defined as totally or partially preserved buildings.

PARTIALLY PRESERVED BUILDINGS: Any building or structure designated as an historic building by the State Building Code Commission or listed in Reference Standard RS 429.2 and not designated as totally preserved buildings.

RESTORATION: Restoration is the process of accurately reconstructing the form and details of a building or structure or portion thereof as it appeared at a particular period or periods of time by means of removal of later work and/or the replacement of missing original work.

TOTALLY PRESERVED BUILDINGS: A totally preserved building is an historic building or structure. The principal use of such a building or structure must be as an exhibit of the building or structure itself which is open to the public not less than twelve (12) days per year, although additional uses, original or ancillary to the principal use, shall be permitted within the same building up to a maximum of twenty-five (25%) percent of the gross floor area. Totally preserved buildings shall be those listed in Reference Standard RS 429.3.

429.3 TOTALLY PRESERVED BUILDINGS

429.31 STATE BUILDING CODE EXCEPTIONS: A totally preserved building shall be subject to the following exceptions:

a) Repairs, maintenance and restoration shall be allowed without conformity to the Basic Code if the provisions of Section 429.32 have been fully complied with.

b) In case of fire or other casualty to a totally preserved building, it may be rebuilt, in total or in part, using such techniques and materials as are necessary to restore it to its original condition and use group.

c) If an historic building or structure, as a result of proposed work, would become eligible for certification as a totally preserved building and the Massachusetts Historical Commission so certifies by affidavit and it is submitted to the building official with the permit application, then the building official shall allow the work to proceed under the provisions of this section.

429.32 MANDATORY SAFETY REQUIREMENTS: All totally preserved buildings shall comply to the following requirements:

429.321 FIRE PROTECTION EQUIPMENT:

a) MANUAL FIRE EXTINGUISHING EQUIPMENT: All use groups, other than residential L-3, shall have approved manual fire extinguishing equipment, as determined by the fire official.

b) AUTOMATIC FIRE WARNING SYSTEM: All residential buildings in Use Groups L-1, L-2, and L-3 shall conform to the requirements of Section 1218.211 of the Basic Code. All other use groups shall comply with Items 1 and 2 below:

1) Locations: Provide one (1) smoke detector, but not less than one, for every 1200 s.f. of floor area per level. In addition, all lobbies, common corridors, hallways and exitway access and discharge routes shall be provided with approved smoke detectors with no more than a thirty (30) foot spacing between detectors. All required smoke detectors shall have an alarm audible throughout the structure or building.

2) Single Station and Multiple Station Smoke Detection Devices: Smoke detectors of single station and mutliple station types shall meet the requirements of U.L. 217 and be listed or approved by a nationally-recognized fire-testing laboratory.

c) MANUAL PULL STATIONS: A manual fire alarm pull station shall be provided in the natural path of egress in all use groups except L-3. Manual pull stations shall be connected to the building fire warning system in conformance with NFPA 72A (1974).

429.322 EXIT SIGNS AND EMERGENCY LIGHTS: Approved exit signs and emergency lighting, where designated by the local building official, shall be provided in compliance with Section 623.0 and 624.0 of this Code.

EXCEPTION: All totally preserved buildings need not comply with Sections 623.0 and 624.0 if not occupied after daylight hours, except that paths of egress shall have exit signs.

429.323 MAXIMUM OCCUPANCY: Occupancy shall be limited by the actual structural floor load capacity as certified by a qualified Massachusetts registered professional engineer or registered architect or as per Section 606.0, whichever is less. Said floor load shall be posted as per the procedures set forth in Sections 120.0, 121.0, and 707.2. The owner shall submit evidence of this certification and related computations to the building official upon request.

429.324 LIMITED EGRESS: Where one or more floors of a totally preserved building are limited to one means of egress, the occupancy load shall be as follows:

Floors below the first story: Not more than one occupant per 100 square feet of gross floor area with a maximum occupancy of 49.

First story: Not more than one occupant per 50 square feet of gross floor area.

Second story and above: Not more than one occupant per 100 square feet of gross floor area, or 30 occupants per unit of egress width, whichever condition results in the lesser occupancy load.

429.33 INSPECTIONS: The building official and fire official shall inspect all totally preserved buildings not less frequently than once every year in order to determine that the building or structure continues to conform to Section 429.32. A qualfied Massachusetts registered professional engineer or architect shall certify every five (5) years thereafter as to the exact floor load capacity of the building or structure. The building official shall certify all totally preserved buildings not less frequently than once every year. Fees shall be established at $25 per building per inspection.

429.4 PARTIALLY PRESERVED BUILDINGS

429.41 APPLICABILITY: This Section shall apply to all HISTORIC BUILDINGS which are NOT defined as TOTALLY PRESERVED BUILDINGS.

429.42 CONTINUATION OF USE AND OCCUPANCY: The legal use and occupancy of any partially preserved building may be continued without change or further compliance to the Basic Code. The provisions of Section 429.32 shall be required for historic buildings accessible to the public on more than fifty (50) days per years.

429.43 REPAIRS AND MAINTENANCE: The owner of a partially preserved building may perform any repairs and maintenance without increased conformity to the Basic Code, as defined in Section 102, and provided that a building permit has been issued and that no change of Use and Occupancy occurs.

429.31 NEW SYSTEMS: When an entirely new electrical or mechanical system and/or equipment is installed in a partially preserved building, they shall be subject to the provisions of Section 103.0 and Sections 1102.0, 2201.1a, 2201.2, and 2201.4.

429.432 FIRE DAMAGE: If a building or structure is damaged from fire or other casualty, it may be restored to its original condition using techniques and methods consistent with its original construction OR it shall meet the Basic Code provided the Basic Code requirements DO NOT compromise the features for which the building was considered historic when listed in the Reference Standards of this article.

429.44 CHANGE IN OCCUPANCY: Before any change in the use or occupancy of any partially preserved building or parts thereof, the building official shall inspect the building and shall determine whether the proposed new use and occupancy constitutes lesser, equal, or greater hazard in accordance with Table 2-6. Any increase in the proposed denaity or occupancy not in conformance with Sections 605 and 706 and not having a change in use shall also constitute a greater hazard.

Any change in use or occupancy shall be evaluated relative to the last known legal occupancy of the building. After the building official determines that the building conforms to Section 429.4, he shall issue a Certificate of Use and Occupancy.

429.441 LESSER AND EQUAL HAZARD: If a partially preserved building, after a change in use or occupancy, will be in a lower or equal Hazard Group (Table 2-6), no increase in compliance to the Basic Code will be required provided that it conforms to Sections 404, 501, 506, 605, 623, 624, 706 & 1006. The removal of non-original safety features introduced into partially preserved buildings in order to meet more stringent code requirements for prior occupancies may be permitted if lesser hazard exists and if such features are not required for the proposed use or occupancy.

429.442 GREATER HAZARD: If a partially preserved building, after a change in use or occupancy, will be in a higher hazard group (Table 2-6), total compliance to the Basic Code shall be required, for that use group.

429.45 INSPECTION, A CERTIFICATION AND FEES: The building inspector shall inspect all partially preserved buildings not less frequently than once a year in order to determine that the building or structure continues to conform to Section 429.4 and/or 429.32. If in conformance, then he shall issue a certification. Fees shall be in conformance with Table 1-1.

RS 429.1 Criteria and procedures for nominating historic buildings.

RS 429.2 Massachusetts historic buildings as recognized by the National Register of Historic Places.

RS 429.3 Massachusetts totally preserved buildings as ratified by the State Building Code Commission.

SECTION 917.22

Under "Class C Doors" delete the sentence "Kitchen and service pantries in places of assembly in accordance with Section 417"; so that Class C Doors reads:

- CLASS C DOORS: projection and trial exhibition rooms in accordance with Section 407.
  Paint spray rooms in accordance with Section 410.
  Service stations and repair shops in accordance with Sections 414 and 415.
  Corridor rooms and all fireresistive partitions in accordance with Section 910.

SECTION 1008.35

On the second line after the word "clay" add the words "expanded shale or pumice flue liners; so that the entire section reads:

1008.35 FLUE LINING MATERIALS: Flue linings shall be made of fire clay, expanded shale or pumice flue liners or other approved refractory materials 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-eighth (5/8) inches.

SECTION 2107.6

Repeal Section 2107.6 in its entirety and substitute the following:

2107.6 FLUE LINING MATERIAL: Masonry chimneys shall be lined with fire clay, expanded shale or pumice flue liners or other approved refractory materials, not less than five-eighths (5/8) of an inch in thickness, that will resist, without cracking or softening, a temperature of one thousand eight hundred (1800) degrees F.

SECTION 2201.2

Delete the entire first sentence, lines one and two, and substitute the following: "The following buildings are exempt from the provisions of this article, with the exception of Sections 2204.6 and 2207.0 dealing with the lighting requirements."; so that the entire section reads:

2201.2 EXEMPT BUILDINGS: The following buildings are exempt from the provisions of this article, with the exception of sections 2204.6 and 2207.0 dealing with the lighting requirements.

a) Buildings and structures or portions thereof whose peak design rate of energy usage is less than one (1) watt per square foot or three and four tenths (3.4) Btu/h per square foot of floor area for all purposes.

b) Buildings which are neither heated nor cooled.

SECTION 2204.54c

Repeal entire Item c) and substitute the following:

c) The maximum area to be switch controlled shall be 1,000 sq. ft. For all areas larger than 500 sq. ft. the connected lighting load shall be so controlled that the overall illumination may be reduced by at least one-half.

SECTION 2204.6

Add the following new Section and Sub-Sections after Section 2204.55:

2204.6 LIGHTING POWER LIMITS FOR NEW BUILDINGS

2204.61 GENERAL: This section establishes the maximum power limits for interior and exterior illumination systems.

2204.62 EXEMPT BUILDINGS: The following buildings are exempt from the provisions of this section:

a) Buildings in use group L-3 (one - and two-family); and,

b) The dwelling unit portions of use group L-2 (multi-family); and,

c) The manufacturing portion of industrial plants.

2204.63 DEFINITIONS

CONNECTED LIGHTING LOAD: Total possible simultaneous demand for lighting, including power used in the lamp itself and any losses in the fixture and ballast.

LIMITED ACCESS: Available only to authorized personnel.

TASK LIGHTING: Illumination applied to an individual location, with local control of switching. Examples include desk lights, examining lights, and machine lights.

2204.64 LIGHTING POWER LIMIT: A lighting power limit is the upper limit of the power to be available to provide the lighting needs of a building.

2204.641 Separate lighting power limits shall be calculated for the building interior and for the building exterior.

2204.65 CALCULATION PROCEDURE: To establish a lighting power limit, the following procedure shall be used:

a) Interiors

1) Determine the use categories for the various parts of the building from Table 22-11.

2) Multiply the maximum power limit for each category by the gross floor area included in that category.

3) Add the total number of watts for each area to arrive at the total lighting power limit for the building.

4) In open-concept office spaces in excess of 2,000 sq. ft., with no defined egress or circulation pattern, 25 percent of the area shall be designated as category B.

5) In rooms with ceiling height in excess of twenty (20) feet, a power allowance, in watts per square foot, of an additional two percent per foot of height is permitted, up to a maximum of twice the limit in Table 22-11.

b) Exteriors

1) Facade lighting: Multiply the limit given in Table 22-11 by the number of linear feet in the building perimeter.

2) Parking and other exterior lighting: Multiply the value in category F in Table 22-11 by the area to be illuminated.

c) Exceptions:

1) Task lighting shall not be included in the lighting power limit calculation.

2) Lighting for, but not limited to, cleanrooms, and theatrical, television, spectator sports and like performances shall not be included in the total building limit. There shall be limited access to the controls for such lighting.

2204.66 ALTERNATIVES: The installed lighting power for any interior area may be increased or decreased from the values of Table 22-11 provided that the total interior lighting power limit calculated in 2204.65 is not exceeded.

2204.67 SPECIAL REQUIREMENTS: Bathrooms in hotels and motels shall have a switchable, permanently-installed night light with a maximum wattage of five (5) watts.

2204.68 DOCUMENTATION: Lighting power loads shall be included with the plans and specifications submitted to the building official. These data shall provide, for each category of Table 22-11, the total area, the total connected lighting power load in watts, and the average watts per square foot.

TABLE 22-11

LIGHTING LIMIT (CONNECTED LOAD)
FOR LISTED OCCUPANCIES: NEW BUILDINGS

TYPE OF USE	MAX. WATTS/SQ.FT.
INTERIOR	
Category A: Classrooms, office areas, automotive mechanical areas, museums, conference rooms, drafting rooms, clerical areas, laboratories, merchandising areas, kitchens, examining rooms, book stacks, athletic facilities	3.00
Category B: Auditoriums, waiting areas, spectator areas, restrooms, dining areas, transporation terminals, working corridors in prisons and hospitals, book storage areas, active inventory storage, hospital bedrooms, hotel and motel bedrooms, enclosed shopping mall concourse areas, stairways.	1.00
Category C: Corridors, lobbies, elevators, inactive storage areas	0.50
Category D: Indoor parking	0.25
EXTERIOR	
Category E: Building perimeter: wall-wash, facade, canopy	5.00 (per linear foot)
Category F: Outdoor parking	0.10

SECTION 2207.0

Add the following new Section and Sub-Sections after Section 2206.1:

2207.0 LIGHTING POWER LIMITS FOR EXISTING BUILDINGS

2207.1 GENERAL: This section establishes the maximum power limits for interior and exterior illumination systems for existing buildings.

2207.2 REGULATED BUILDINGS: The provisions of section 2207 shall apply to all existing buildings and structures with a gross floor area in excess of 10,000 sq. ft.

2207.21 EXISTING BUILDINGS: For the purpose of section 2207, existing buildings shall be defined as all buildings and structures in existence on July 1, 1978, and buildings and structures for which a building permit has been issued prior to July 1, 1978.

2207.3 EXEMPT BUILDINGS: The following buildings are exempt from the provisions of this section:

a) Building in use group L-3 (one- and two-family); and,

b) The dwelling unit portion of use group L-2 (multi-family); and

c) The manufacturing portion of industrial plants.

2207.4 DEFINITIONS:

CONNECTED LIGHTING LOAD: Total possible simultaneous demand for lighting, including power used in the lamp itself and any losses in the fixture and ballast.

LIMITED ACCESS: Available only to authorized personnel.

TASK LIGHTING: Illumination applied to an individual location, with local control of switching. Examples include desk lights, examining lights, and machine lights.

2207.5 LIGHTING POWER LIMIT: The lighting power limit is the upper limit of the power to be available to provide the lighting needs of a building.

2207.51 Separate lighting power limits shall be calculated for the building interior and for the building exterior.

2207.6 LIGHTING SWITCHING: In all areas exterior to the building lighting fixtures shall be capable of being switched automatically for non-operation when natural light is available.

2207.7 CALCULATION PROCEDURE: To establish the lighting power limit, the following procedure shall be used:

a) Interiors

1) Determine the use categories for the various parts of the building from Table 22-12.

2) Multiply the maximum power limit for each cagegory by the area included in that category.

3) Add the total number of watts for each area to arrive at the total lighting power limit for the building.

4) In open-concept office spaces in excess of 2,000 sq. ft., with no defined egress or circulation pattern, 25 percent of the area shall be designated as category B.

5) In rooms with ceiling height in excess of twenty (20) feet, a power allowance, in watts per square foot, of an additional two percent per foot of height is permitted, up to a maximum of twice the limit in Table 22-12.

b) Exteriors

1) Facade lighting: Multiply the limit given in Table 22-12 by the number of linear feet in the building perimeter.

2) Parking and other exterior lighting: Multiply the value in category F in Table 22-12 by the area to be illuminated.

c) Exceptions:

1) Task lighting shall not be included in the lighting power limit calculation.

2) Lighting for, but not limited to, cleanrooms, and theatrical, television, spectator sports and like performances shall not be included in the total building limit. There shall be limited access to the controls for such lighting.

2207.8 ALTERNATES: The lighting power for any interior area may be increased or decreased from the values of Table 22-12 provided that the total interior lighting power limit calculated in 2207.7 is not exceeded.

2207.9 DOCUMENTATION

2207.91 Prior to August 1, 1978, a report of the lighting power load for every building subject to the provisions of section 2207.0 shall be submitted to the local building official and to the State Building Code Commission by the building owner. The report shall indicate for each building area corresponding to one of the categories of Table 22-12, the existing connected lighting power load in watts, the total area, and the average watts per square foot. The report shall be made on Lighting Power Audit forms available at local building departments or at the Office of the State Building Code Commission.

2207.92 When lighting power loads exceed the limits of section 2207.0, the building owner shall include with his Lighting Power Audit an implementation plan indicating how and when the building will be brought into compliance with section 2207.0. Implementation shall be complete by October 1, 1978.

2207.93 Certification of the building lighting power load by a registered engineer or architect may be required by the building official.

TABLE 22-12

LIGHTING LIMIT (CONNECTED LOAD) FOR LISTED OCCUPANCIES: EXISTING BUILDING

TYPE OF USE	MAX. WATTS/SQ.FT.
INTERIOR	
Category A: Classrooms, office areas, automotive mechanical areas, museums, conference rooms, drafting rooms, clerical areas, laboratories, merchandising areas, kitchens, examining rooms, book stacks, athletic facilities.	3.00
Category B: Auditoriums, waiting areas, spectator areas, restrooms, dining areas, transportation terminals, working corridors in prisons and hospitals, book storage areas, active inventory storage, hospital bedrooms, hotel and motel bedrooms, enclosed shopping mall concourse areas, stairways	1.00
Category C: Corridors, lobbies, elevators, inactive storage areas	0.50
Category D: Indoor parking	0.25
EXTERIOR	
Category E: Building perimeter: wall-wash, facade, canopy	5.00 (per linear foot)
Category F: Outdoor parking	0.10

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH

UNIFORM FILING FORM

This form has been prepared to simplify & make uniform the procedure for submitting materials with the Rules & Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation & to M. G. L. Chapter 30A, as amended by Chapter 459 of the Acts of 1976, which set forth the basic filing requirements.

1 - Date December 20, 1977

2 - Cabinet C & D Department DCA Division State Building Code Comm.
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 1305
727-6916

3 - Descriptive title of document: Amendments to the State Building Code

4 - Estimate the number of copies that will be purchased in the next six months: By your agency 1,000 By the public 2,000

(Note: If you need bulk quantities for your agency, please submit a purchase order form or call 727-2834 to place your order for printing.)

5 - The document attached is best classified as a:

[X] Ch. 30A Regulation

[ ] Ch. 30A Emergency Regulation - If this box is checked, state nature of emergency.

[ ] Other - If this box is checked, do not complete the rest of the form.

6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): October 4, 1977 ; or

Date of "action" (Ch. 30A/3)_____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given:_____

8 - Regulation will be effective:

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of July 1, 1978 pursuant to M. G. L. Ch. 30A

Section(s) 6

9 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)		filed
		filed
		filed
		filed
		filed
Amends regulation(s)	State Bldg. Code	filed 7/1/74
	Article 21	filed 12/6/74
	Article 22	filed 8/1/77
		filed

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION
CONCRETE TESTING LABORATORIES & PERSONNEL; NURSING HOMES; BUILDING INSULATION ARTICLE 22 & RESIDENTIAL BUILDINGS

Date Filed June 12, 1978

Date Published June 22, 1978

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.

(16-6AB) $.55

MICHAEL S. DUKAKIS
GOVERNOR

FRANCIS W. GENS
CHAIRMAN

CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-691

June 12, 1978

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on May 2, 1978 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on July 1, 1978.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on July 1, 1978.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on June 12, 1978.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: _____
Assistant Attorney General

SECTION 109.11

On the first and second lines of Section 109.11, delete the date "July 1, 1978" and substitute the date "July 1, 1979".

On the last line of Section 109.11, delete the date "June 30, 1978" and substitute the date "June 30, 1979".

SECTION 127.31

On the first line of Section 127.31 delete the words "On and after the first day of January, 1975".

On the second and third lines of Section 127.31 after the words "field testing", delete the words "plant testing or field inspection"; so that the entire section reads:

127.31 CONCRETE TESTING: No person shall engage in the activities of field testing of concrete unless such person is licensed to do so by the Commission. Any person who violates the provisions of this section, any person who falsifies or counterfeits a license issued by the board, or any person who fraudulently issues or accepts such a license shall be punished as provided in section 122.0 of this Code. The Commission shall require strict adherence to the standards of the American Society for Testing and Materials, Designation E-329, entitled, "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

SECTION 127.32

On the first and second line of Section 127.32, delete the words "On and after the first day of September, 1976"; so that the entire section reads:

127.32 CONCRETE TESTING LABORATORIES: No person shall engage in the activities of a Testing Laboratory, Branch Laboratory, and/or Project Laboratory for purposes of testing concrete and concrete materials for use in buildings and structures subject to the Basic Code and unless licensed by the Commission in accordance with the Basic Code and the rules and regulations promulgated pursuant thereto.

RULES AND REGULATIONS FOR LICENSING OF CONCRETE TESTING LABORATORIES

Delete the Rules and Regulations for Licensing of Concrete Testing Laboratories, which were filed with the Secretary of State on June 30, 1976 and substitute the following new Rules and Regulations for Licensing of Concrete Testing Laboratories".

EFFECTIVE DATE: July 1, 1978

STATE BUILDING CODE COMMISSION

RULES AND REGULATIONS FOR LICENSING OF CONCRETE TESTING LABORATORIES

PART 1 GENERAL

SECTION 1 ADMINISTRATION

1.1 TITLE: As authorized by Chapter 802 of the Acts of 1972, and in accordance with Section 127 of the State Building Code, establishing the Construction Materials Safety Board, the following Rules and Regulations are adopted for Licensing of Concrete Testing Laboratories.

1.2 DEFINITIONS: Unless otherwise expressly stated in the State Building Code, the following terms shall, for the purpose of these Rules and Regulations, have the meaning indicated in this section:

ACCREDITED LABORATORY: A laboratory which has been licensed in accordance with these regulations by the State Building Code Commission.

BOARD: Construction Materials Safety Board (CMSB).

BRANCH LABORATORIES: A branch of a Testing Laboratory physically removed from the location of the headquarters or main testing facility of the Testing Laboratory.

CODE: Commonwealth of Massachusetts State Building Code (SBC).

COMMISSION: Commonwealth of Massachusetts State Building Code Commission (SBCC).

LABORATORIES: Testing Laboratory, branch laboratory, and project laboratory.

PERSON: Individual, partnership, corporation, trust, joint venture, etc.

PRE-QUALIFYING AGENCY: Construction Materials Safety Board (CMSB).

PROJECT LABORATORY: A temporary on-site facility providing concrete testing services for a specific project in accordance with these licensing regulations.

TESTING AGENCY: National Bureau of Standards Cement and Concrete Reference Laboratory (CCRL) or other agency designated by the SBCC.

TESTING LABORATORY: A proprietorship, corporation, partnership or agency which conforms to the requirements of ASTM E 329-72 as modified in these regulations.

1.3 LICENSING: All laboratories defined by these regulations as Testing Laboratories, Branch Laboratories and Project Laboratories which are engaged in the testing of concrete and concrete materials for use in buildings and structures subject to control according to the provisions of Section 128.0 of the Massachusetts State Building Code shall be licensed by the State Building Code Commission in accordance with these regulations.

1.4 APPLICATION FOR LICENSING: Each laboratory desiring to obtain such license shall make application to the Commission upon such form and in such manner as the Commission shall prescribe and shall furnish evidence satisfactory to the Commission that the laboratory equipment meets the requirements of Section 2 and its management personnel are qualified in accordance with Sections 4 and 5 of these rules and regulations.

1.5 PRE-QUALIFYING AGENCY: The Commission hereby designates the Construction Materials Safety Board as its pre-qualifying agency, provided however, that the Commission may revoke such designation at any time, and may designate any other agency or agencies which it deems qualified, from time to time, to act as its pre-qualifying agency. The pre-qualifying agency shall examine, or cause to be examined, the evaluation performed by the Testing Agency and the personnel on each Concrete Testing Laboratory application and make its recommendation to the Commission regarding such license.

1.6 TESTING AGENCY: The Commission hereby designates the Cement and Concrete Reference Laboratory of the National Bureau of Standards as the agency to examine and evaluate all laboratories desiring to be licensed in the practice of concrete testing provided, however, that the Commission may revoke such designation at any time, and may designate any other agency or agencies which it deems qualified, from time to time, to act as its Testing Agency.

1.7 NOTIFICATION OF TESTING AND TESTING RESULTS: The Testing Agency shall notify the applicant of the date for evaluation. The Commission shall be informed by the Testing Agency/Pre-Qualifying Agency of the evaluation results and recommendations. If the applicant is notified by the Commission that the laboratory has met all the requirements herein established, he shall submit to the said Commission, the license fee in accordance with Section 1.8 of these rules and regulations.

1.8 LICENSING FEE: The fee for licensing shall be one hundred ($100) dollars per annum or in accordance with the fee schedule established by the Commission from time to time.

1.9 NUMBER AND CLASSIFICATION: Each laboratory so licensed by the Commission shall be issued a number and classification.

1.10 RENEWALS: Commencing January 1, 1978, all licenses issued shall expire on December 31 of the year issued. Within ninety (90) days before the expiration date of any such license, the Executive Director of the Commission shall forward to each laboratory so licensed an application form for renewal. The said Executive Director, upon receipt of the completed form and fee, shall renew the license for a period of one (1) year or notify such applicant of the Commission's refusal with reasons thereof.

1.11 PENALTIES: Any such person and/or laboratory who fails to comply with the requirements of these rules and regulations or who files a false report shall be subject to the penalties and actions as prescribed in Section 122 of the Code.

SECTION 2 LABORATORY LICENSING REQUIREMENTS

2.1 ASTM TESTING REQUIREMENTS: Except as modified in these regulations, all testing laboratories including branch laboratories shall conform to Section 5 and 6 of the ASTM E 329-72 standard requirements for testing of concrete and its constituent materials.

Exception: The following sections of ASTM E 329-72 shall not apply:

Sections 2.2; 2.3; 2.7; 3.2.7; 3.3; 3.4; C 360 of 6.2; 7; 8; 9 and 10.

2.2 ASTM EQUIPMENT AND PERSONNEL REQUIREMENTS: All laboratories subject to these regulations shall be approved and licensed in accordance with the ASTM E 329-72 standard for the performance of those functions recommended in standard ASTM E 329-72 for equipment and personnel, as modified in these regulations.

SECTION 3 PRE-QUALIFICATION REQUIREMENTS FOR LABORATORIES

3.1 EVALUATION:

a) Testing and Branch laboratories subject to these regulations shall be examined and evaluated, upon notification from the State Building Code Commission, by a testing agency designated by the SBCC. The interval between such examination and evaluation shall not exceed three years.

b) Project laboratory equipment which is used in the testing of concrete materials for use in buildings and structures subject to the provisions of the Massachusetts State Building Code Commission shall conform to the requirements of ASTM E 329-72 as modified by section 2.

c) Reports of Evaluations by the testing agency shall be filed with the State Building Code Commission within ten (10) days of receipt of the report by the laboratory, unless a waiver is granted by the laboratory to have the report sent directly to the State Building Code Commission by the testing agency.

d) Laboratory deficiencies cited in the report of the testing agency shall be corrected within two (2) months of the date of issue of the report and shall be so certified by an affidavit submitted by the laboratory on a form supplied by the State Building Code Commission.

3.2 REVIEW OF DEFICIENCIES: Laboratories which fail to meet the requirements of items (c) and (d) shall be subject to review and revocation of their license by the State Building Code Commission.

3.3 TESTING MACHINES: Compression testing machines used for testing materials subject to these regulations shall be calibrated and verified, with equipment traceable to the National Bureau of Standards, at least annually or as required by the State Building Code Commission, and the results submitted to the Commission.

SECTION 4 PERSONNEL: The management and supervision of each laboratory subject to these regulations shall be in accordance with the following requirements:

4.1 REQUIRED: Each accredited licensed Concrete Testing Laboratory must have an individual approved by the Commission in each of three (3) distinctly different categories: Director of Testing Services, Supervisory Laboratory Technician and Supervisory Field Technician. An individual may fill more than one position at the particular laboratory if he meets all the qualifications for each position, but he may not fill positions concurrently at a separate (branch or project) laboratory.

4.2 FILING OF QUALIFICATIONS: Each individual being certified for a position must submit their credentials and qualifications under penalty of perjury with their signature notarized. Individuals applying for certification in more than one (1) category must file separate applications for each position as described in Section 5. Application for certification shall be filed within thirty (30) days of employment for such duties. It is the responsibility of the Director of Testing Services to notify the Commission within seven (7) days of any vacancy of any position.

SECTION 5 QUALIFICATIONS

5.1 QUALIFICATIONS FOR DIRECTOR OF TESTING SERVICES: The testing services of each laboratory (main,branch or project) shall be under the direction of a Director of Testing Services who shall be a full-time resident employee of that laboratory and shall be qualified in accordance with any one (1) of the following three (3) sets of requirements:

a) He shall be a Professional Engineer, registered in the Commonwealth of Massachusetts with at least five (5) years of experience in responsible charge of work related to Structural Engineering, Construction Engineering or Construction Materials Testing. He shall be subject to demonstrate his ability to interpret the results of tests of concrete and concrete aggregates as stated in ASTM E 329-72; or,

b) He shall have a bachelors degree in Engineering from an accredited institution and an additional total of three (3) years experience performing tests on concrete and concrete materials which shall include two (2) years as a laboratory technician or supervisor. He shall be subject to demonstrate his ability to interpret the results of tests of concrete and concrete aggregates as stated in ASTM 3 329-72; or,

c) He shall have at least eight (8) years experience including five (5) years experience as a laboratory technician or supervisor and shall be subject to demonstrate his ability to interpret the results of tests of concrete and concrete aggregates as stated in ASTM E 329-72.

5.2 QUALIFICATIONS FOR SUPERVISORY LABORATORY TECHNICIAN: A Supervisory Laboratory Technician shall have at least five (5) years experience performing tests on construction materials including concrete and concrete aggregates. He shall be subject to demonstrate either by oral or written examination or both, his ability to perform correctly tests of concrete and concrete aggregates as stated in ASTM E 329-72. "Class A" accreditation by the pre-qualifying agency shall be required as qualification for concrete only. (See rules and regulations for concrete testing personnel.)

5.3 QUALIFICATIONS FOR SUPERVISORY FIELD TECHNICIAN: A Supervisory Field Technician shall have at least five (5) years experience performing tests on construction materials including concrete. He shall be subject to demonstrate either by oral or written examination, or both, his ability to perform correctly the tests of concrete as stated in ASTM E 329-72. "Class A" accreditation by the pre-qualifying agency shall be required as qualification for concrete only. (See rules and regulations for concrete testing personnel.)

SECTION 7 PROJECT AFFIDAVIT: In accordance with Section 113.51 of the basic code, those structures subject to control as required in Section 128.0, affidavits must be submitted with the building permit application, that the individuals and testing laboratories responsible for carrying out the duties of Section 128.0 have been licensed and registered by the Commission through the provisions of Sections 800.4, 800.41 and 800.42 of the Basic Code.

7.1 AFFIDAVIT: Form number SBCC-L-303-76, as furnished by the licensed laboratory (sample submitted to each laboratory) shall be used by the licensed laboratory for each building project.

7.2 NOTICE OF TERMINATION: The building official shall receive written notification of the termination of laboratory functions certifying that the owner has also been so notified. Such termination shall be effective no earlier than three (3) working days from the notification received by the building official.

7.3 SUCCESSOR LABORATORY: If concrete testing is to be continued for the said project by a successor laboratory, such notice shall be given to the building official and a new project affidavit shall be filed with the building official.

SECTION 8 REVOCATION AND SUSPENSION PROCEDURES

8.1 REVOCATION AND SUSPENSION: The State Building Code Commission on its own initiative or upon the recommendation of the Construction Materials Satety Board, may suspend or revoke the license of any Testing Laboratory, or Project Laboratory found to be in non-compliance with these rules and regulations, the State Building Code, or the standards of good practice. Notice of suspension or revocation of such license shall be in writing with the reasons for suspension or revocation clearly set forth therein, and served in accordance with Section 122.12 of the Basic Code.

8.2 NOTICE AND CONFERENCE: Prior to suspension, revocation, or refusal to renew the license of an accredited laboratory, written notice of such intent shall be served by the Construction Materials Safety Board of SBCC in accordance with Section 122.12 of the Basic Code. Within ten calendar days of receipt of such notice, the affected accredited laboratory may request a conference before a three member panel designated by the chairman of the Construction Materials Safety Board, who will hear facts and make their recommendations to the Construction Materials Safety Board.

8.3 EFFECT OF: Upon suspension or revocation of the license, the accredited laboratory shall immediately cease engaging in the testing of concrete and concrete materials for use in buildings and structures which are subject to the provisions of the Massachusetts State Building Code and no action brought before the

Board of Appeals as specified in Section 3.1 of these regulations or in any court of competent jurisdiction shall stay the said suspension or revocation unless said Board of Appeals or court shall issue an order for a stay of the Commission's suspension or revocation.

SECTION 9 APPEALS

9.1 BUILDING CODE APPEALS BOARD: Any laboratory or individual aggrieved by the suspension or revocation of their license or by an interpretation, order, requirement, direction or failure to act under these Rules and Regulations may appeal to the State Building Code Appeals Board as provided in Section 126 of the Basic Code; however, entry of an appeal from the Commission's order of revocation or suspension shall not stay such revocation or suspension unless so ordered by the State Building Code Appeals Board in a preliminary hearing conducted expressly for the purpose of a stay in accordance with that part of Section 126-32 of the Basic Code dealing with the procedure required for a hearing on such stay.

STATE BUILDING CODE COMMISSION

RULES AND REGULATIONS FOR CONCRETE TESTING PERSONNEL

PART 1 GENERAL

SECTION 1 ADMINISTRATION

1.1 TITLE: As authorized by Chapter 802 of the Acts of 1972, and in accordance with Section 127 of the State Building Code establishing the Construction Materials Safety Board, the following Rules and Regulations are adopted for Concrete Testing Personnel.

1.2 DEFINITIONS: Unless otherwise expressly stated in the State Building Code, the following terms shall, for the purpose of these Rules and Regulations, have the meaning indicated in this section:

BOARD: The Construction Materials Safety Board (CMSB).

CODE: The Commonwealth of Massachusetts State Building Code (SBC).

COMMISSION: The Commonwealth of Massachusetts State Building Code Commission (SBCC).

CONCRETE TESTING PERSONNEL: A person issued a Class "A", "B" or "C" license by the Commission authorizing such person to test/inspect concrete.

FIELD CONCRETE TECHNICIAN: A person issued a Class "A" license by the Commission to test concrete in the field.

PRE-QUALIFYING AGENCY: Construction Materials Safety Board (CMSB).

TESTING AGENCY: Massachusetts Construction Industry Board (MCIB).

1.3 LICENSING: All Concrete Personnel engaged in the testing/inspection of concrete for use in buildings and structures subject to control according to the provisions of Section 128.0 of the Code shall be licensed by the Commission in accordance with these regulations.

1.4 APPLICATION FOR LICENSING: Each person desiring to obtain such license shall make application to the Commission upon such form and in such manner as the Commission shall prescribe and shall furnish evidence satisfactory to the Commission that he is qualified to be licensed in accordance with these Rules and Regulations.

1.5 PRE-QUALIFYING AGENCY: The Commission hereby designates the Construction Materials Safety Board as its Pre-qualifying agency, provided however, that the Commission may revoke such designation at any time and may designate any other agency or agencies which it deems qualified, from time to time, to act as its Pre-qualifying Agency. The Pre-qualification Agency shall examine, or cause to be examined, the examination results and evaluation performed by the Testing Agency on each Concrete Testing Personnel application and make its recommendation to the Commission regarding such license.

1.6 TESTING AGENCY: The Commission hereby designates the Massachusetts Construction Industry Board (MCIB) as the agency to examine and evaluate all persons desiring to be licensed in the practice of concrete testing, provided, however, that the Commission may revoke such designation at any time, and may designate any other agency or agencies which it deems qualified, from time to time, to act as its Testing Agency. The Testing Agency shall submit all examination results and evaluation on each Concrete Testing application and make its recommendations to the Pre-qualification Agency regarding such license.

1.7 EXAMINATION: Accompanied by the application, there shall be paid to the Testing Agency an initial examination fee to cover the cost of such testing. The Testing Agency may also assess fees for partial or complete retesting. The Testing Agency is authorized to require the applicant to provide all required test equipment.

1.8 NOTIFICATION OF EXAMINATION AND EXAMINATION RESULTS: The Testing Agency shall notify the applicant of the time and place for the examination. The Commission shall be informed by the Testing Agency/Pre-qualifying Agency of the examination results, evaluation and recommendations. Within fourteen (14) days therefrom, the Commission shall notify the applicant of its decision. If the applicant fails fully or partially, he may request of the Testing Agency a retesting. If the applicant is notified by the Commission that he has met all the requirements herein established, he shall submit to the said Commission, the license fee in accordance with section 1.9 of these Rules and Regulations, and his 1/4" x 1/4", full face, black and white or color photograph.

1.9 LICENSING FEE: The fee for licensing is twenty ($20) dollars in accordance with the fee schedule established by the Commission. Concrete Testing Personnel employed for that purpose by a municipality or county, or the federal government, or the Commonwealth or any department, commission, agency or authority of, or created by, the Commonwealth, shall be exempt from this fee.

1.10 NUMBER AND CLASSIFICATION: Each person so licensed by the Commission shall be issued a number and classification.

1.11 RENEWALS: Licenses shall be valid for two (2) years. Within ninety (90) days before the expiration date of any such license, the Executive Director of the Commission shall forward to each person so licensed an application form for renewal. The said Executive Director, upon receipt of the completed form and fee, shall renew the license for a period of two (2) years or notify such applicant of the Commissions' refusal with the reasons thereof. Any application for renewal of a license which has expired shall require the payment of a new license fee and be treated as an application for a new license requiring re-testing and re-evaluation; the Commission, however, may waive the requirement of such retesting and re-evaluation.

SECTION 2 PRE-QUALIFICATION REQUIREMENTS FOR PERSONS DESIROUS OF BEING LICENSED FOR CONCRETE TESTING

2.1 EVALUATION: Field Concrete Technicians, subject to these Regulations, shall be examined and evaluated by the Massachusetts Construction Industry Board to determine the applicants knowledge and ability to perform the following ASTM Standard Test Procedures.

a. ASTM C172: Sampling Fresh Concrete
b. ASTM C143: Test for Slump
c. ASTM C31: Making and Curing Test Specimens in the Field
d. ASTM C231: Test for Air Content - Pressure Metnod
e. ASTM C173: Test for Air Content - Volumetric Method
f. ASTM C138: Test for Weight per Cubic Foot (Density)
g. ASTM C192: Storage and Transportation of Test Cylinders

The applicant's performance of these tests is to be observed and evaluated by three qualified jurors designated by the Testing Agency (MCIB), using detailed data sheets. The said jurors evaluations are appraised by the certification committeeof the Testing Agency and reappraised by the Board of Trustees of the said Testing Agency. Three (3) categories of performance are to be used in the final evaluation process as follows:

1. PASS: The applicant has satisfactorily completed the examination.
2. PARTIAL: The applicant has failed one of the five performance tests and must take a partial re-test.
3. FAIL: The applicant has failed two or more of the five performance tests and must take a complete re-test.

SECTION 3 REVOCATION AND SUSPENSION PROCEDURES

3.1 REVOCATION AND SUSPENSION: The Commission on its own initiative or upon the recommendation of the Construction Materials Safety Board or the Massachusetts Construction Industry Board, may suspend or revoke the license of any one so engaged in the practice of Concrete Testing found to be in non-compliance with these Rules and Regulations, the Code or the standards of good practice. Notice of suspension or revocation of such license shall be in writing with the reasons for suspension or revocation clearly set forth therein, and served in accordance with Section 122.12 of the Code.

3.2 NOTICE AND CONFERENCE: Prior to suspension, revocation or refusal to renew such license, written notice of such intent shall be served by the Pre-qualifying Agency or Commission in accordance with Section 122.12 of the Code. Within ten (10) calendar days of receipt of such notice, the affected licensee may request a conference before a three (3) member panel designated by the chairman of the said agency, who will hear facts and make their recommendations to the Pre-qualifying Agency.

3.3 EFFECT OF: Upon suspension or revocation of the license, the licensee shall immediately cease engaging in the testing of concrete and concrete materials for use in buildings and structures which are subject to the provisions of the Code and no action brought before State Building Code Appeals Board as specified in Section 4.1 of these Regulations or in any court of competent jurisdiction shall stay the said suspension or revocation unless said Appeals Board or court shall issue an order for a stay of the Commissions' suspension or revocation.

SECTION 4 APPEALS

4.1 MASSACHUSETTS STATE BUILDING CODE APPEALS BOARD: Any one engaged in the practice of Concrete Testing aggrieved by the suspension or revocation of their license or by an interpretation, order, requirement, direction or failure to act under these Rules and Regulations may appeal to the State Building Code Appeals Board as provided in Section 126 of the Code; however, entry of an appeal from the Commission's order of revocation or suspension shall not stay such revocation or suspension unless so ordered by the said Appeals Board in a preliminary hearing conducted expressly for the purpose of a Stay in accordance with that part of Section 126.32 of the Code dealing with the procedure required for a hearing on such Stay.

SECTION 426.0

Repeal Section 426.0 in its entirety and substitute the following new section:

SECTION 426.0 NURSING HOMES, REST HOMES, CHARITABLE HOMES FOR THE AGED, CONVALESCENT HOMES AND HOSPITALS

Buildings in use group H-2 shall conform to the applicable provisions of the Basic Code, this section, and the following reference standard: Buildings used as nursing homes, rest homes, charitable homes for the aged, convalescent homes, and hospitals shall meet the provisions of NFPA 101 Life Safety Code, 1973.

SECTION 501.0 DEFINITIONS

Under the definition for "Habitable Room, Minimum Height", on the second line after the words "finished ceiling of not less than" delete the words "seven and one-half (7 1/2) feet" and substitute the words "seven and one-quarter (7 1/4) feet"; so that the entire definition reads:

HABITABLE ROOM, MINIMUM HEIGHT: a clear height from finished floor to finished ceiling of not less than seven and one-quarter (7 1/4) feet, except that in attics and top half-stories the height shall be not less than seven and one-third (7 1/3) feet over not less than one-third (1/3) the area of the floor when used for sleeping, study or similar activity.

SECTION 1121.5

Repeal Section 1121.5 in its entirety and substitute the following new section:

1121.5 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; however, until July 1, 1979, the building official shall accept solid fuel burning appliances that are unlisted.

SECTION 2100.6

Repeal Section 2100.6 in its entirety and substitute the following new section:

2100.6 CEILING HEIGHT: Habitable rooms shall have an average height of not less than seven (7) feet three (3) inches in at least fifty (50) percent of their required area with no portion less than five (5) feet in height.

EXCEPTION: Beams and girders spaced not less than six (6) feet on center may project not more than seven (7) inches below the required average ceiling height.

All other rooms, including hallways and corridors, shall have a ceiling height of not less than seven (7) feet measured to the lowest projection from the ceiling.

SECTION 2109.15

Repeal Section 2109.15 in its entirety and substitute the following new section:

2109.15 FUEL-BURNING APPLIANCE LABELING: Every fuel-burning comfort heating appliance shall bear a permanent and legible factory applied nameplate on which shall appear:

a) The manufacturer's name or trademark.

b) The B.t.u. rating.

c) The model and serial number.

d) Instructions for the lighting, operation and shut-down of the appliance.

e) The type of fuel approved for use with the appliance.

f) A seal indicating approval of the appliance by an approved testing agency, if acceptance is based on such approval.

EXCEPTION: Solid fuel burning appliances shall be exempt from Section 2109.15 until July 1, 1979.

FOOTNOTES TO SECTIONS 1100.1, 1121.5, and 2109.15

Under the authority delegated by Chapter 802 of the Acts of 1972, and as directed in Article 1, Sections 102 and 103 of the State Building Code, heating equipment and appliances must be approved and labeled as directed by Articles 11 and 21. The State Building Code Commission has placed a moratorium until July 1, 1979 on the requirement for labels and nameplates.

All comfort heating/solid fuel burning appliances approved by the building official shall be installed in strict accordance with the applicable provisions of Article 10, Sections 1100.0, 1100.1, 1100.3, 1102.0, 1102.2, 1112.0, 1121.5, 2107.0, 2107.7, 2107.8, 2107.9, 2109.4, 2109.8, 2109.9, 2109.15, 2109.17, 2110, 2110.4, Tables 2109-1 and 2109-2, 2111, 2112, 2113.

APPENDIX A

In Appendix A, Page A-10, under Fire Testing Laboratories (Floor, Walls, Roof and Similar Tests), add Commercial Testing Company, Inc., as an accredited Authoritative Agency for testing surface burning characteristics for carpets using the ASTM E-84 Standard and the National Bureau of Standards smoke chamber test only; so that it reads:

Commercial Testing Company, Inc.
P. O. Box 94 - 407 Central Avenue
Dalton, Georgia 30720.....CTC
(For testing carpeting for E-84 and the National Bureau of Standards Smoke Chamber Test only.)

SECTION 2204.21

Repeal Section 2204.21 in its entirety and substitute the following new section:

2204.21 GROSS WALL AREA: For the purposes of this article, the gross area of exterior walls consists of all opaque wall areas, including foundation walls, walls between floor spandrels, peripheral edges of floors, window areas including sash, and door areas, where such surfaces enclose a heated or mechanically cooled space including interstitial areas between two such spaces.

SECTION 2204.23

Repeal Section 2204.23 in its entirety and substitute the following new section:

2204.23 BUILDING INSULATION

a) Foam plastic insulation shall have a flame spread rating of 0-75 tested in accordance with ASTM E 84. In habitable and nonhabitable areas, foam plastic insulation shall be covered and protected by an interior finish material having a 15 minute membrane protective rating.

b) When eave vents are installed in conjunction with attic insulation, baffling shall be provided so as to deflect the incoming air above the surface of the insulation. Baffles shall be installed prior to insulation and shall be installed over the exterior wall at an angle to provide a 2" minimum clearance under the roof deck for upward flow of ventilation air to the fixed vents in the upper portion of the attic.

c) In the case of slab on grade floors, perimeter insulation for slab on grade construction shall be installed so that the concrete to concrete contact between the foundation wall and the floor slab is broken and extends downward the thickness of the slab and then extends an additional 24" below exterior grade vertically, or 24" horizontally beneath the floor slab.

SECTION 2204.24

Repeal Section 2204.24 in its entirety and substitute the following new section:

2204.24 CRITERIA FOR RESIDENTIAL BUILDINGS: The following requirements shall apply to all buildings and structures or portions thereof in use groups L-1, L-2 and L-3 (hotels, multi-family, and one-and two-family) that are heated or mechanically cooled when not more than three (3) stories or forty (40) feet in height.

a) All buildings in these use groups shall conform to the thermal transmittance values in Table 22-2.

b) An overall U_o value of 0.20 for the combination of walls, doors and windows containing heated space may be used in lieu of the separate U values listed for "walls", "foundation walls", and "doors and windows". The overall U_o of 0.20 shall be used when the doors or windows exceed 20 percent of the gross exterior wall area. See Equation 1 for the calculations of the overall U_o. The U_o of 0.20 applies only to gross walls enclosing a space provided with a positive heat supply, and not the entire envelope.

c) Framing members shall not be included in the calculations of R and U values.

TABLE 22-2

Repeal Table 22-2 in its entirety and substitute the following new Table:

TABLE 22-2

MAXIMUM U VALUES OF WALLS, ROOF/CEILINGS, AND FLOORS
FOR RESIDENTIAL BUILDINGS OF SECTION 2204.24

ELEMENT	DESCRIPTION	U VALUE	TOTAL R VALUE	NOTES
Walls	All wall construction containing heated or mechanically cooled space	0.08	12.5	1
Foundation Walls Including Band Joist	Containing heated or mechanically cooled space	0.08	12.5	
	Containing unheated space	0.17	5.9	5
Roof Assembly	Plank and beam construction containing heated or mechanically cooled space	0.08	12.5	2
Roof Assembly	Construction other than plank and beam containing heated or mechanically cooled space	0.05	20.0	
Doors and Windows	All construction enclosing heated or mechanically cooled space	0.65	1.54	3
Floors	Floor sections over areas exposed to outside air or unheated areas	0.08	12.5	4
	Unheated slab on grade	-	5.50	
	Heated slab on grade	-	7.75	

Note 1: This value may be used when the doors and windows do not exceed 20 percent of the gross exterior wall area. When doors and windows exceed 20 percent of the gross wall area, see Section 2204.24(c).

Note 2: Plank and beam assemblies are construction in which the finished interior surface is the underside of the roof deck.

Note 3: Double glazing or storm windows will satisfy the required U value of 0.65.

Note 4: Insulation may be omitted from floors over unheated areas when foundation walls are provided with a U value of 0.17.

Note 5: The U value requirement of 0.17 for foundation walls may be omitted when floors over unheated spaces are provided with a U value of 0.08.

TABLE 22-5

Delete the "EXCEPTION" under Table 22-5 and add the following new "EXCEPTION":

"EXCEPTION: Until July 1, 1979, storm windows and doors installed over exterior windows and doors shall be accepted when windows and doors have not been tested for infiltration according to Table 22-5";

so that the entire Table reads:

TABLE 22-5 ALLOWABLE AIR INFILTRATION RATES

WINDOWS	RESIDENTIAL DOORS		COMMERCIAL DOORS
(cfm per linear foot of operable sash crack)	(cfm per square foot of door area)		(cfm per linear foot of crack)
	Sliding Glass	Entrance	Swinging, Sliding, Revolving
0.5	0.5	1.25	11.0

1) When tested at a pressure differential of 1.567 lb./sq. ft. which is equivalent to the impact pressure of a 25 mph wind.

2) Compliance with the criteria for air leakage of all types of doors shall be determined by Std. RS-2.

EXCEPTION: Until July 1, 1979, storm windows and doors installed over exterior windows and doors shall be accepted when windows and doors have not been tested for infiltration according to Table 22-5.

UNIFORM FILING FORM

This form has been prepared to simplify & make uniform the procedure for submitting materials with the Rules & Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation & to M. G. L. Chapter 30A, as amended by Chapter 459 of the Acts of 1976, which set forth the basic filing requirements.

1 - Date June 9, 1978

2 - Cabinet C & D Department DCA Division State Building Code Comm
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 13C
727-6916

3 - Descriptive title of document: Amendments to the State Building Code

4 - Estimate the number of copies that will be purchased in the next six months: By your agency 1,000 By the public 2,000

(Note: If you need bulk quantities for your agency, please submit a purchase order form or call 727-2834 to place your order for printing.)

5 - The document attached is best classified as a:

[X] Ch. 30A Regulation

[ ] Ch. 30A Emergency Regulation - If this box is checked, state nature of emergency.

[ ] Other - If this box is checked, do not complete the rest of the form.

6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): May 2, 1978 ; or

Date of "action" (Ch. 30A/3)_____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given:_____

8 - Regulation will be effective:

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of July 1, 1978 pursuant to M. G. L. Ch. 30A

Section(s) 6

9 - The enclosed regulation relates to other regulations already filed as follows:

Supersedes regulation(s)		filed	
		filed	
		filed	
		filed	
		filed	
Amends regulation(s)	State Bldg. Code	filed	7/1/74
	109.11	filed	6/3/77
	127.32	filed	6/30/76
	Rules & Regs.Concrete Lab	filed	6/30/76
	426.0		6/30/76
	1121.5, 2109.15 & Footnotes to 1100.1, 1121.5, 2109.15		12/21/77
	Appendix A		8/1/77
	Article 22		12/21/77

The Commonwealth of Massachusetts

OFFICE OF THE SECRETARY
STATE HOUSE, BOSTON, MASS.

Rules and Regulations filed in this Office under the provisions of CHAPTER 30A as amended.

Filed by STATE BUILDING CODE COMMISSION

LIGHTING POWER LOAD

Date Filed July 20, 1978

Date Published July 27, 1978

Chapter 233, sec. 75

Printed copies of rules and regulations purporting to be issued by authority of any department, commission, board or Officer of the Commonwealth or any city or town having authority to adopt them, or printed copies of any ordinances or town by-laws, shall be admitted without certification or attestations, but if this genuineness is questioned, the court may require such certifications or attestations thereof as it deems necessary.

Attested as a true copy
PAUL GUZZI

Paul Guzzi

SECRETARY OF THE COMMONWEALTH

PUBLICATION OF THIS DOCUMENT APPROVED BY ALFRED C. HOLLAND, STATE PURCHASING AGENT.
(16-6AC) $.15

MICHAEL S. DUKAKIS
GOVERNOR

FRANCIS W. GENS
CHAIRMAN

CHARLES J. DINEZIO
EXECUTIVE DIRECTOR

The Commonwealth of Massachusetts
State Building Code Commission
John W. McCormack State Office Building
13th Floor
One Ashburton Place, Boston, 02108

(617) 727-6916

July 20, 1978

The Honorable Paul Guzzi
Secretary of the Commonwealth
State House
Boston, Massachusetts 02133

RE: AMENDMENTS TO THE STATE BUILDING CODE

Dear Sir:

In accordance with Section 20 of MGLA Chapter 23B, as amended, the State Building Code Commission after proper notice and publication, and having conducted its public hearing on June 29, 1978 at 1 Ashburton Place, Boston, on proposed amendments to the State Building Code, has adopted the attached amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on August 1, 1978.

This attested document is hereby filed in accordance with the provisions of Massachusetts General Laws, Chapter 30A, Section 5; Chapter 30, Section 37; and Section 20 of MGLA Chapter 23B.

Very truly yours,

STATE BUILDING CODE COMMISSION

Charles J. Dinezio
Executive Director

CJD:ls

Enclosures

In accordance with the laws of the Commonwealth of Massachusetts, the Massachusetts State Building Code Commission approved and adopted these amendments to the Commonwealth of Massachusetts State Building Code, which are to be effective on August 1, 1978.

A true copy attest:

Charles J. Dinezio
Executive Director
State Building Code Commission

Filed with the Secretary of the Commonwealth on July 20, 1978.

Approved as to matter of form:

FRANCIS X. BELLOTTI
Attorney General

By: Terence P. O'Malley
Assistant Attorney General

SECTION 2207.91

On the first line delete "August 1, 1978" and substitute "November 1, 1978"; so that entire section reads:

2207.91 Prior to November 1, 1978, a report of the lighting power load for every building subject to the provisions of section 2207.0 shall be submitted to the local building official and to the State Building Code Commission by the building owner. The report shall indicate for each building area corresponding to one of the categories of Table 22-12, the existing connected lighting power load in watts, the total area, and the average watts per square foot. The report shall be made on Lighting Power Audit Forms available at local building departments or at the Office of the State Building Code Commission.

SECTION 2207.92

On last line delete "October 1, 1978" and substitute "February 1, 1979"; so that the entire section reads:

2207.92 When lighting power loads exceed the limits of section 2207.0, the building owner shall include with his Lighting Power Audit an implementation plan indicating how and when the building will be brought into compliance with section 2207.0. Implementation shall be complete by February 1, 1979.

PAUL GUZZI, SECRETARY OF THE COMMONWEALTH

UNIFORM FILING FORM

This form has been prepared to simplify & make uniform the procedure for submitting materials with the Rules & Regulations Division. You may find it helpful in completing this form to refer to your enabling legislation & to M. G. L. Chapter 30A, as amended by Chapter 459 of the Acts of 1976, which set forth the basic filing requirements.

1 - Date July 20, 1978

2 - Cabinet C & D Department DCA Division State Building Code Comm
Contact Charles J. Dinezio, Executive Director
Address John W. McCormack Building, 1 Ashburton Place, Boston Room 13(727-6916

3 - Descriptive title of document: Amendments to the State Building Code

4 - Estimate the number of copies that will be purchased in the next six months: By your agency 1,000 By the public 2,000

(Note: If you need bulk quantities for your agency, please submit a purchase order form or call 727-2834 to place your order for printing.)

5 - The document attached is best classified as a:

[X] Ch. 30A Regulation

[ ] Ch. 30A Emergency Regulation - If this box is checked, state nature of emergency.

[ ] Other - If this box is checked, do not complete the rest of the form.

6 - List statutory and/or regulatory authority for this promulgating action: MGLA: c 30A,s.5; c. 23B,s. 20; c30, s. 37.

Was a public hearing required? Yes [X] No [ ]

If approval of other agencies was required, list approvals & date obtained: Not applicable

(OVER)

7 - Date of public hearing (Ch. 30A/2): June 29, 1978 ; or

Date of "action" (Ch. 30A/3) _____

Was notice of the regulatory proceeding filed in the office of the Secretary of the Commonwealth & published in appropriate newspaper (s) 21 days prior to the public hearing or regulatory action?

Yes [X] No [ ]

If "no", list the chapter & section of the General Laws under which notice was given: _____

8 - Regulation will be effective:

[ ] as of date of publication pursuant to M. G. L. Ch. 30A

[ ] as an emergency regulation as of filing date pursuant to M. G. L. Ch. 30A

[x] as of August 1, 1978 pursuant to M. G. L. Ch. 30A

Section(s) 6

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Supersedes regulation(s)		filed	
		filed	
		filed	
		filed	
		filed	
Amends regulation(s)	State Bldg. Code	filed	7/1/74
	Article 22	filed	8/1/77
	Sections 2207.91 &	filed	
	2207.92	filed	12/21/77