UNIVERSITY OF KENTUCKY
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The Kentucky Building Code

Fourth Edition
1988

Judith G. Walden
Editor, Kentucky Edition

KENTUCKY DEPARTMENT OF HOUSING, BUILDINGS AND CONSTRUCTION

The 127 Building — U.S. 127 South
Frankfort, Kentucky 40601
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EFFECTIVE DATES

On February 15, 1980 the *Kentucky Building Code* became mandatorily effective for the construction of all buildings in Kentucky in excess of three stories; or in excess of 20,000 square feet; or intended for assembly, educational, institutional, or high hazard occupancy; or business or industrial occupancy in excess of 100 persons; or for use as a frozen food locker plant.

The *Kentucky Building Code* became mandatorily effective for other buildings on a county wide basis on the following schedule:

February 15, 1980

Boyd, Campbell, Daviess, Fayette, Franklin, Jefferson, Kenton, McCracken and Warren.

August 15, 1981

Allen, Anderson, Barren, Bath, Bell, Boone, Bourbon, Boyle, Bracken, Breathitt, Bullitt, Caldwell, Calloway, Carroll, Carter, Christian, Clark, Clay, Crittenden, Estill, Fleming, Floyd, Fulton, Gallatin, Graves, Grayson, Greenup, Hardin, Harlan, Harrison, Henderson, Henry, Hopkins, Jessamine, Johnson, Knox, Larue, Laurel, Letcher, Lewis, Logan, Madison, Magoffin, Marshall, Marion, Mason, Mercer, Montgomery, Muhlenberg, Nelson, Nicholas, Oldham, Pendleton, Perry, Pike, Powell, Pulaski, Robertson, Rowan, Scott, Shelby, Simpson, Taylor, Todd, Union, Washington, Wayne, Webster, Whitley, Woodford.

August 15, 1982

Adair, Ballard, Breckinridge, Butler, Carlisle, Casey, Clinton, Cumberland, Edmonson, Elliott, Garrard, Grant, Green, Hancock, Hart, Hickman, Jackson, Knott, Lawrence, Lee, Leslie, Lincoln, Livingston, Lyon, McCreary, McLean, Martin, Menifee, Meade, Metcalfe, Monroe, Morgan, Ohio, Owen, Owsley, Rockcastle, Russell, Spencer, Trigg, Trimble and Wolfe.

New Editions

The second edition of the *Kentucky Building Code* became effective February 3, 1982. The effective date of the third edition was July 9, 1985, although it did not become mandatory until December 1, 1985. The effective date of this fourth edition is September 10, 1987, although it did not become mandatory until January 1, 1988.

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PREFACE

The *Kentucky Building Code* is essentially the *BOCA National Building Code* published by the Building Officials and Code Administrators, International, Inc., with a new administrative section written to conform with Kentucky law and other selective additions, deletions or changes.

The *Kentucky Building Code* includes the State Plumbing Code which is referenced in Article 28. It includes the *National Electrical Code,* 1987 Edition, NFiPA #70, published by the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269. This publication is not included herein because of its bulk and specialized use. However, it is readily available from the publisher.

The *Kentucky Building Code* states regulations in terms of measured performance rather than in rigid specification of materials and, in this way, makes possible the acceptance of new materials and methods of construction which can be evaluated by accepted standards, without the necessity of adopting cumbersome amendments for each variable condition.

By presenting the purposes to be accomplished rather than the method to be followed, the code allows the designer the widest possible freedom and does not hamper development. It accepts nationally recognized standards as the criteria for evaluation of minimum safe practice, or for determining the performance of materials or systems of construction. The application of these standards is stated in the text of the code requirements, and the standards are listed and identified in the appendices of the code, making it practical and convenient to update any standard as it is revised or reissued by the sponsoring agency.

This edition presents the code as amended through September 10, 1987.

This code may be amended by proposals to the Kentucky Board of Housing, Buildings and Construction by code enforcement officials, industry and design professionals, and other interested persons and organizations. Changes are discussed in an open meeting of the board. Changes approved are printed in the Kentucky Administrative Register and forwarded to the BOCA organization for inclusion in their mailings to BOCA's Kentucky members. A new edition, such as this, is prepared every three years and contains all approved changes since the previous edition.

Changes as described above do not just happen. The *BOCA National Building Code* is dedicated to the hundreds of code enforcement officials from throughout the United States and Canada; to the engineers, architects, technicians, builders, contractors, material producers, trade associations and others who voluntarily collaborated in its preparation; and to the members of the code changes committees and their constituent committees, who participated in the important work of keeping the code abreast of new developments in construction technology. These individuals have given unstintingly of their time and their talents to produce and maintain this performance type code, which has been widely recognized, highly respected, and adopted by countless communities.

Note to Kentucky Building Code Users

Double vertical lines have been added in the margins adjacent to all passages of the code text which are Kentucky changes to the original text of the *BOCA National Building Code/1987.*

Until December 31, 1987, the building official shall accept plans in conformity with the requirements of either this edition or the 1985 Edition of the *Kentucky Building Code.* After December 31, 1987, all plans shall be designed to conform with this edition.

Single vertical lines in the margin indicate content requirement changes to the text of BOCA code requirements since BOCA's 1984 Edition. Editorial changes are not so marked. The use of asterisks in the margins indicates provisions which BOCA has either deleted or relocated elsewhere in the code.

The values stated in U.S. customary units are to be regarded as code requirements. The metric equivalents of U.S. customary units may be approximate.

ADOPTION INFORMATION

The *1988 Kentucky Building Code* applies to all buildings to be constructed, altered or remodeled with the exception of farms and single family dwellings which are not trade or brand names homes.

The Kentucky Building Code may be extended by local government ordinance to apply to single family dwellings. Jurisdictions wishing to adopt enforceable minimum construction safety requirements for single family dwellings should insure that certain factual information is included in the adopting ordinance at the time adoption is being considered by the appropriate governmental body. The following sample adoption ordinance addresses several key elements of a code adoption ordinance, including the information required for insertion into the code text.

SAMPLE ORDINANCE FOR ADOPTION OF THE 1988 KENTUCKY BUILDING CODE (CITY/COUNTY) ORDINANCE

ORDINANCE NO. _____

AN ORDINANCE RELATING TO THE ADOPTION OF THE KENTUCKY BUILDING CODE AS PROMULGATED IN 815 KAR 7:010 AND 7:020 BY THE BOARD OF HOUSING, BUILDINGS AND CONSTRUCTION OF THE COMMONWEALTH OF KENTUCKY

WHEREAS, KRS 198B.060(1), requires that all buildings constructed in _____ (*CITY/COUNTY*) _____ shall be built in conformance with the uniform state building code as adopted by the Board of Housing, Buildings and Construction:

WHEREAS, KRS 198B.010(5) authorizes any city, county or urban county government to extend, by ordinance, the application of the Kentucky Building Code to single family dwellings; and,

WHEREAS, KRS 198B.060(14) authorizes each local government to establish a schedule of fees which are designed to cover the cost of the service performed but not to exceed it;

NOW, THEREFORE, BE IT ORDAINED BY THE FISCAL COUNTY AND/OR LEGISLATIVE BODY OF _____ (*CITY/COUNTY*) _____ , COMMONWEALTH OF KENTUCKY;

SECTION ONE

THAT, the Kentucky Building Code as promulgated in 815 KAR 7:010 and 7:020 by the Board of Housing, Buildings and Construction, Commonwealth of Kentucky, is hereby adopted in full as an Ordinance of _____ (*CITY/COUNTY*) _____ of the Commonwealth of Kentucky as if set out at length herein;

THAT, a copy of said Kentucky Building Code together with a copy of all other regulations or NFiPA Pamphlets adopted or referred to thereunder, is on file in the Office of the _____ County Clerk, and the Clerk shall at all times keep a copy of said building code for reference;

THAT, an attested copy of this Ordinance shall be transmitted to the Department of Housing, Buildings and Construction of the Commonwealth of Kentucky.

SECTION TWO

THAT, _____ (*OFFICER*) _____ , shall be designated as the local enforcement agent/agency for said Kentucky Building Code.

SECTION THREE

THAT, the application of the Kentucky Building Code is hereby extended to all single family dwellings to be constructed in _____ (*CITY/COUNTY*) _____ .

SECTION FOUR

THAT, the fees for the permits and inspections shall be as provided in the attached schedule.

SECTION FIVE

THAT, all ordinances or parts of ordinances in conflict herewith are, to the extent of such conflict, hereby repealed.

SECTION SIX

THAT, this resolution shall take effect and be in full force when passed, published and recorded according to law.

_____

COUNTY JUDGE/EXECUTIVE OR MAYOR

ATTEST:

_____

CITY/COUNTY CLERK

_____

DATE PASSED

A GUIDE TO USE OF THE KENTUCKY BUILDING CODE

The format and provisions of *The Kentucky Building Code* are designed to provide units of government with effective minimum requirements for safe construction.

The following step-by-step approach is recommended for use in determining the code's application to particular buildings and building uses within a government jurisdiction.

1. **Plans and specifications:** Determine compliance with the requirements for the plans and specifications in Sections 113.0, 125.0, 701.0, 801.0, 901.0, 1001.0, 1101.0, 1201.0, 2401.0, 2501.0, 2601.0, 2701.0, 2800.1, 3001.0 and 3101.0.
2. **Use group:** Determine the appropriate use group classification of the building. See Section 301.0 for a listing of all use groups and Sections 302.0 through 311.0 for a description of each use group.
3. **Type of construction:** Determine the type of construction of the building by the building materials used and the fireresistance rating of the building elements. See Section 401.0 and Table 401 for a listing of all the types of construction and Sections 402.0 through 406.0 for a description of each type of construction.
4. **Siting:** Determine the location of the building on the site, including separation distances from lot lines and other buildings. See Section 906.0 for exterior wall and wall opening requirements based on proximity to lot lines and adjacent buildings.
5. **Height and area:** Determine compliance with the allowable floor area and building height based on building use and type of construction. See Sections 501.0 through 504.0, as well as Table 501, for general limitations and exceptions.
6. **Interior environment and design:** Determine compliance with special use requirements (Article 6), interior environment requirements (Article 7) and means of egress requirements (Article 8).

*7. **Fire performance:** Determine compliance with detailed requirements for fireresistance (Article 9) and fire protection systems (Article 10).

8. **Structural performance:** Determine compliance with structural requirements (Articles 11 and 12) and building material requirements (Articles 13 through 20).
9. **Exterior envelope:** Determine compliance with exterior envelope requirements (Article 21, 22 and 23) as well as energy conservation (Article 31).
10. **Building service system:** Determine compliance with various building service system requirements (Articles 24 through 28).

* **Note:** Fire Protection Sprinkler Contractors are required to be licensed pursuant to KRS 198B550-630, and all drawings must be sealed or approved by a licensed professional engineer.

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ARTICLE 1

ADMINISTRATION AND ENFORCEMENT OF THE KENTUCKY BUILDING CODE

Department of Housing, Buildings and Construction

SECTION 101.0 DEFINITIONS

101.1 Board of Housing or "Board" means the Kentucky Board of Housing, Buildings and Construction.

101.2 BOCA means Building Officials and Code Administrators International, Inc.

101.3 Building means any combination of materials, whether portable or fixed, which comprises a structure or nonmine underground area affording facilities or shelter for any human occupancy, whether infrequent or regular. The word "building" shall be construed wherever used herein as if followed by the words "or part or parts thereof and all equipment therein" unless the context clearly requires a different meaning. "Building" shall also mean swimming pools constructed below grade on-site, but not swimming pools assembled above grade on-site. "Building" shall not mean a mobile home, or a farm dwelling or other farm buildings and structures incident to the operation and maintenance of the farm if such farm structures are located outside the boundary of a municipality and are not used in the business of retail trade or used as a place of regular employment for ten or more people or structures used in the storage or processing of timber products.

101.4 Commissioner means the Commissioner of the Department of Housing, Buildings and Construction.

101.5 Department means the Department of Housing, Buildings and Construction.

101.6 Fire official means the Chief of the Fire Department or the Fire Prevention Bureau, or if there is not a jurisdictional fire department or fire prevention bureau, such officer as shall be designated by the appointing authority of the jurisdiction or his duly appointed representative, to enforce the provisions of KRS 227.300 and 815 KAR 10:020.

101.7 Industrialized building system or "building system" means a structure or component thereof which is wholly or in substantial part fabricated in an off-site manufacturing facility for installation or assembly on a permanent foundation at a building site in Kentucky. "Industrialized building system" includes a building of any size or for any use, all or any component part of which is of closed construction made from precast concrete panels, or precut wood sections fabricated to individual specifications in an off-site manufacturing facility, and assembled in accordance with the manufacturer's instructions.

101.8 KAR means Kentucky Administrative Regulations.

101.9 KBC means Kentucky Building Code.

101.10 KRS means Kentucky Revised Statutes.

101.11 Major structural change means alterations or repairs made within any period of 12 months, costing in excess of 50 percent of the physical value of the structure, as determined by a comparison of the extent/value of the alterations involved and the replacement value of the structure at the time the plans for the alterations are approved, using the BOCA chart for construction costs.

101.12 Person means a person, partnership, corporation or other legal entity.

101.13 Single family dwelling means one unit providing complete independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking and sanitation, and which is not connected to any other unit or buildings.

101.14 Trade or brand name house means any single structure made of precut or prefabricated panels, sections or individual pieces that are sold or prefabricated under a name that identifies both the manufacturer and a particular type of structure he makes, and that are assembled on a permanent foundation by conventional homebuilding and electrical and plumbing installation techniques.

SECTION 102.0 SCOPE

This regulation shall supersede any and all other conflicting administration and enforcement provisions which may be incorporated by reference within the KBC.

102.1 The KBC shall control all matters concerning the construction, alteration, addition, remodeling, use and occupancy classifications of all buildings in the state.

102.2 Trade or brand name houses shall be constructed in accordance with the applicable provisions of the KBC.

102.3 The provisions of the KBC relating to single family dwellings, that are not trade or brand name houses or industrialized building systems, shall be mandatory only after a local government, by ordinance, extends the application of the KBC to those units. However, the State Plumbing Code and the National Electrical Code shall be applicable to these units, whether or not the local government passes an ordinance. A local government may not enforce any building code other than the KBC on such units.

102.4 Unless otherwise specifically provided within the KBC, 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 KBC.

102.5 The provisions of this code relating to the construction, repair, alteration, enlargement, restoration and moving of buildings or structures shall not be mandatory for existing buildings or structures identified and classified by the state or local government authority as historic buildings, subject to the approval of the board of appeals when such buildings are judged by the building official to be safe and in the interest of public health, safety and welfare regarding any proposed construction, alteration, repair, enlargement, restoration and relocation. The building official may require submission of architectural and engineering plans and specifications bearing the professional seal of the designer prior to a determination.

102.6 The KBC shall be construed to secure its expressed intent which is to secure public safety, health and welfare insofar as they are affected by building construction quality, electrical systems, plumbing, energy, boiler, safety, handicapped accessibility, life safety from hazards of fire and explosion and other disasters. It is the further expressed intent of this code to avoid duplicative plan review and inspection of new construction and to gather together in one set of regulations all the requirements relating to the construction of buildings in the state to enable builders, owners and building officials to be adequately informed.

SECTION 103.0 APPLICABILITY

103.1 The provisions of the KBC shall cover all matters affecting or relating to buildings, and structures, as set forth in Section 102.0 above.

103.2 No person shall construct a building or structure, extend, repair, remove or alter in violation of these provisions, except for ordinary repairs as identified in Section 104.0 and except further that the raising, lowering, or moving of a building or structure as a unit necessitated by a change in legal grade or widening of a street shall be permitted provided the building or structure is not otherwise altered or its use or occupancy changed.

103.3 Any requirement for structural, fire or sanitary safety of a building essential for the safety of the occupants thereof, and which is not specifically

covered by this code, shall be determined by other regulations of the department or other applicable law.

103.4 Any person who violates any provision of the article or any other provision of the Kentucky Building Code shall be subject to the penalties provided in Section 119.0.

SECTION 104.0 ORDINARY REPAIRS

104.1 Ordinary repairs to structures may be made without application or notice to the building official. Ordinary repair means any nonstructural reconstruction or renewal of any part of an existing building for the purpose of its maintenance, or decoration, and shall include, but not be limited to, the replacement or installation of nonstructural components of the building such as roofing, siding, windows, storm windows, insulation, drywall or lath and plaster, or any other replacement, in kind, that does not alter the structural integrity, alter the occupancy or use of the building, or affect, by rearrangement, exitways and means of egress; but shall not include additions to, or alteration of, or relocation of any standpipe, water supply, sewer, drainage, gas, soil, waste, vent or similar piping, electric wiring or mechanical equipment including furnaces and hot water heaters or other work affecting public health or safety.

SECTION 105.0 INSTALLATION OF SERVICE EQUIPMENT

105.1 When the installation, extension, alteration or repair of an elevator, moving stairway, mechanical equipment, refrigeration, air conditioning or ventilating apparatus, plumbing, gas piping, electrical wiring, heating system or other equipment is specifically controlled by the provisions of this code, it shall be unlawful to use such equipment until a certificate of approval has been issued therefor by the building official or other agency having jurisdiction.

SECTION 106.0 EXISTING STRUCTURES

106.1 Continuation of existing use: The legal use and occupancy of any structure existing on the date of adoption of this code or for which it has been heretofore approved may be continued without change except as may be specifically covered in this code for existing structures or fire prevention codes set forth in 815 KAR 10:020 or as may be deemed necessary by the building official for the general safety and welfare of the occupants and the public.

106.2 Change in use: It shall be unlawful to make any change in the use or occupancy of any structure or portion thereof which would subject it to any special provisions of this code without approval of the building official; such approval shall be granted if the building official finds that such structure meets the intent of the provisions of law governing building construction for the proposed new use and occupancy, and that such change does not result in any greater hazard to public safety or welfare. In making his decision, the building official may require a written opinion from a design professional.

106.3 Additions, alterations or repairs: Additions, alterations or repairs may be made to any structure without requiring the existing structure to comply with all the requirements of this code, provided such work conforms to that required of a new structure. Additions, alterations or repairs shall not cause an existing structure to become unsafe or adversely affect the performance of the building. Any building plus new additions shall not exceed the height, number of stories and area specified for new buildings.

106.4 Alterations or repairs to an existing structure which are nonstructural and do not adversely affect any structural member of any part of the structure having a required fireresistance rating may be made with the same materials of which the structure is constructed.

SECTION 107.0 DEPARTMENTS OF BUILDING INSPECTION

107.1 Each local government singularly or by association with other local governments shall employ a building official or inspector and other code enforcement personnel as necessary to enforce this code within its jurisdiction. The department shall be responsible for the enforcement of this code as it pertains to the buildings assigned by law to it.

107.2 All building officials shall be appointed by the chief appointing authority for the respective jurisdiction, and shall meet the qualifications for the position which may be established by the appointing authority, in addition to the requirements for certification of Kentucky building code inspectors as detailed in 815 KAR 7:070.

107.3 Official records shall be kept of all business and activities of the various local building departments or state building departments specified in provisions of the KBC, and all such records shall be open to the public inspection at all appropriate times under the terms and conditions of KRS Chapter 61.

SECTION 108.0 DUTIES AND POWERS OF THE LOCAL BUILDING OFFICIAL

108.1 The local government shall designate the persons to be charged with the responsibility of enforcing the KBC within its community and it shall neither adopt nor enforce any ordinance regulating buildings which conflicts with the KBC. The local building official shall be responsible for the examination and approval of plans and specifications and the inspections necessary to determine compliance for the following buildings:

108.1.1 All buildings classified as storage, residential, miscellaneous and/or utility occupancies so long as they do not exceed three stories in height or 20,000 square feet of floor area.

108.1.2 All buildings classified as assembly, business or mercantile occupancies having a capacity which does not exceed 100 persons.

108.1.3 All churches having a capacity of 400 or less persons and 6,000 or less square feet of total floor area.

108.1.4 All buildings classified as factory or industrial occupancies having a capacity which does not exceed 100 persons.

108.1.5 Buildings owned by the commonwealth are not subject to local plan review, inspection or approval, regardless of size, occupant load or occupancy classification.

SECTION 109.0 DUTIES AND POWERS OF THE DEPARTMENT

109.1 It shall be the responsibility of the department to review plans and specifications, issue permits, make inspections and to determine compliance with the KBC for the following buildings:

(a) All buildings classified as assembly occupancies having a capacity in excess of 100 persons, except churches having a capacity of 400 or less persons and 6,000 or less square feet of total floor area;

(b) All buildings classified as educational occupancies;

(c) All buildings classified as institutional occupancies;

(d) All buildings classified as business and mercantile occupancies having a capacity in excess of 100 persons;

(e) All buildings classified as industrial and factory occupancies having a capacity in excess of 100 persons;

(f) All frozen food locker plants;

(g) All buildings classified as high hazard occupancies;

(h) All other buildings containing in excess of three stories or 20,000 square feet of floor area;

(i) All industrialized building systems regardless of occupancy classification;

(j) All buildings owned by the commonwealth regardless, of occupancy classification or size.

109.2 Any local government may petition to the department for additional plan review responsibility. Such petition shall include the evidence of the local government's capability to perform those functions, as required by regulations of the board. Denials of such petitions are appealable to the board.

109.3 The appropriate official shall make all the required inspections, or he may accept reports of inspection by authoritative and recognized services or individuals; and all reports of such inspection shall be in writing and certified by a responsible officer of such authoritative service or by the responsible individual.

109.4 The building official or his authorized representative should carry proper credentials of his respective office for the purpose of inspecting buildings and premises and the performance of his duty under this code.

109.5 The board shall have the powers as may be necessary in the interest of public safety, health and general welfare, to adopt and promulgate amendments to the code and other rules and regulations which are necessary to implement this code and by means of the appeals board procedures, to issue

interpretations which shall be binding upon the appellant and the building official. The building official shall implement the provisions of this code to secure the intent thereof.

109.6 In the absence of provisions not specifically contained in this code or approved rules and orders, the regulations, specifications and standards listed in Appendix A, Referenced Standards shall be deemed to represent accepted engineering practice with respect to the materials, equipment, systems or methods of construction therein specified, and shall therefore be acceptable.

SECTION 110.0 NEW MATERIALS AND MODIFICATIONS

110.1 It is the purpose of the KBC to set forth performance objectives so as to facilitate new technologies, techniques and materials; therefore, alternate materials and equipment may be used, provided such an alternative has been tested and listed by nationally recognized testing and research laboratories approved by the board.

110.2 The building official may accept as supporting data to assist him in his determinations duly authenticated research reports from BOCA or from other approved authenticated sources, for all materials or assemblies proposed for use which are not specifically provided for in the KBC.

110.3 Used materials, equipment and devices may be used provided they have been retested and placed in good and proper working condition and approved by the building official.

110.4 When there are practical difficulties involved in carrying out structural or mechanical provisions of this code or of an approved rule, the building official having plan review responsibility may vary or modify such provision upon application of the owner or his representative only if the spirit and intent of the law shall be observed and equivalent safeguards provided. The application for modification and the final decision of the building official shall be in writing. When a modification is granted by a local building official, a copy of the application and the decision shall be forwarded to the department and the local fire official.

110.5 The board may withdraw authority for plan review from a local building department where it finds, upon petition of the department, that the local inspection agency is not adequately performing any portion of its program and thereafter, allow the department to preempt that portion of a local program.

SECTION 111.0 INSPECTIONS

111.1 Before issuing a permit, the appropriate building officials may examine or cause to be examined all buildings, structures and sites for which an application has been filed for a permit required by this code. No construction shall begin on buildings covered by this regulation until a local building official has issued a permit for such construction or if there is no local official,

n official representing the department has issued a letter releasing the plans r construction, if the department has plan review responsibility.

1.2 After issuing a building permit or letter for a building over which he has an review responsibility, the building official shall conduct inspections from me to time during and upon completion of work and he shall maintain a cord of all such examinations and inspections and of all violations of the BC.

1.3 The building official may accept reports of approved inspection services hich satisfy the requirements of the appropriate governmental entity.

1.4 Inspections for KBC compliance of trade or brand name homes shall be he responsibility of the local building official.

1.5 In-plant inspections in production and manufacturing facilities for ndustrialized building systems as well as on-site inspection shall be conducted y the department or its authorized agent pursuant to 815 KAR 7:020. The ocal building official shall be responsible to inspect such systems only for ocation under applicable local ordinances.

1.6 Upon completion of the building, the owner or agent of the facility shall equest a final inspection. The building official shall set a time for said nspection and notify the owner or agent and the fire official. If compliance vith the approved plans and permit has been achieved, a certificate of occupancy shall be issued, as described in Section 117.0. If compliance has not been achieved, any violations shall be noted and immediately communicated to the owner or agent.

1.7 The building official shall cooperate with the fire official by allowing the ire official to inspect all buildings during construction. Any recommendations made by the fire official relating to fire safety in construction of a building shall be considered by the building official and if a certificate of occupancy is issued contrary to said written recommendations the building official shall give written notification of his decision to the fire official and the department at once.

SECTION 112.0 RIGHT OF ENTRY

112.1 Applicants for building permits shall be deemed to consent to inspection during construction and upon completion of construction for the purpose of determining that such building is constructed in compliance with the *Kentucky Building Code,* and the inspector may enter upon the premises during any reasonable hour.

SECTION 113.0 APPLICATION FOR PERMIT REQUIRED

113.1 It shall be unlawful to construct, enlarge, or alter a structure; or change the type of occupancy of a building requiring greater strength, exiting or sanitary provisions; or to change to another use; or to install or alter any

equipment for which provision is made or the installation of which is required by KBC, without first filing an application with the appropriate building official in writing and obtaining the required permit or letter therefore; except that ordinary repairs, as defined in Section 104.0 which do not involve any violation of KBC, shall be exempt from this provision.

113.2 The application for a permit shall be submitted in writing and in such form as the department may prescribe and shall be accompanied by the required fee.

113.3 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 or structure, and such additional information as may be required by the building official.

113.4 Application for permit shall be made by the owner or lessee of the building or structure, or agent of either, or by the licensed engineer or architect employed in connection with the proposed work. If the application is made by a person other than the owner in fee, it shall be accompanied by a duly verified affidavit of the owner, or the qualified person making the application, that the proposed work is authorized by the owner in fee and that the applicant is authorized to make such application. The full names and addresses of the owner, lessee, applicant and of the responsible officers, if the owner or lessee is a corporate body, shall be stated in the application.

113.5 The application for the permit shall be accompanied by specifications and plans drawn to scale, with sufficient clarity and detail dimensions to show the nature and character of the work to be performed. The building official shall cooperate with the fire official by allowing the fire official to review all plans. Any recommendations made by the fire official relating to fire safety in construction of a building shall be considered by the building official and he shall report his decision to the fire official at once. When quality of materials is essential for conformity to the KBC, specific information shall be given to establish such quality; and the KBC shall not 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.

113.6 Site plan: There shall also be a site plan showing to scale the size and location of all new construction and all existing structures on the site, distances from lot grades; and it shall be drawn in accordance with an accurate boundary line survey.

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 engineering plans and computations shall bear the signature of the responsible design professional. Plans for buildings more than two stories in height shall indicate how required structural and fireresistance rating integrity will be maintained, and

where a penetration will be made for electrical, mechanical, plumbing and communication conduits, pipes and systems.

113.8 An application for permit for any proposed work should be deemed to have been abandoned six 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 90 days each.

113.9 Subject to the limitations of Section 113.0, amendments to a plan, application or other records accompanying the same, may be filed at any time before completion of the work for which the permit is sought or issued and such amendments shall be deemed a part of the original application and shall be filed therewith.

113.10 The building official may revoke a permit or approval issued under the KBC in case of any false statements or misrepresentation in the application or on the plans.

SECTION 114.0 PERMIT REQUIRED

114.1 The building official shall examine or cause to be examined all applications for permits and amendments thereto within a reasonable time after filing. If the application or the plans do not conform to the requirements of all pertinent laws, he shall reject such application in writing, stating the reasons therefor. If he finds that the proposed work conforms to the requirements of this code and all laws and ordinances applicable thereto, he shall issue a permit therefor as soon as practicable.

114.2 Any permit issued shall become invalid if the authorized work is not commenced within one year after issuance of the permit, or if the authorized work is suspended or abandoned for a period of six months after the time of commencing the work.

114.3 The KBC shall not require changes in the plans, construction or designated use of a building for which a lawful permit has been heretofore issued or otherwise lawfully authorized by approved plans, so long as the substantial construction on the project has commenced within one year from the date the permit was issued.

114.4 The building official shall attach his signature to every permit, or he may authorize a subordinate to affix such signature thereto.

114.5 The building official shall record and communicate to the owner or agent the terms and conditions related to his approval to commence construction.

114.6 The building official may issue a permit for the construction of foundations or any other part of a building or structure before the entire plans and specifications for the whole building or structure have been submitted, provided adequate information and detailed statements have been filed complying with all the pertinent requirements of this code. The holder of such permit

for the foundations or other part of a building or structure shall proceed at his own risk with the building operation and without assurance that a permit for the entire structure will be granted.

114.7 Approved plans: The building official shall stamp or endorse in writing the corrected plans approved, and that set shall be available at the building site, open to inspection of the building official or his authorized representative at all reasonable times.

114.8 A true copy of the building permit shall be available on the site of operation open to public inspection during the entire time of prosecution of the work and until the completion of the same.

SECTION 115.0 CONDITIONS OF PERMIT

115.1 A permit shall not be issued until the fees prescribed by the department or the local government have been paid. 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 KBC, except as specifically stipulated by modification or legally granted variation as described in the permit.

115.2 All work shall conform to the appropriate application and plans for which the permit has been issued and any approved amendments thereto and shall be located strictly in accordance with the approved plot plan and any local ordinances governing the location of the building.

115.3 A lot shall not be changed, increased or diminished in area from that shown on the official plot site plan, 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 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 FEES

116.1 A permit to begin work for new construction, alteration or other building operations shall not be issued until the fees prescribed by law shall have been paid to the department or local building department, nor shall an amendment to a permit necessitating an additional fee because of an increase in the estimated cost of the work involved be approved until the additional fee shall have been paid.

116.2 The payment of the fee for the construction, alteration 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 permits, erection of signs and display structures, marquees or other appurtenant structures, or fees of inspections, certificates of use and occupancy or other privileges or requirements, both within and without the jurisdiction of building inspection.

116.3 The fee for building permits and other functions performed pursuant to KRS Chapter 198B may be designed to fully cover the cost of the service performed; and the department and each local government is authorized to establish by approved rules or ordinances a schedule of unit rates for buildings and structures of all use groups and types of construction as classified and defined in the KBC.

SECTION 117.0 CERTIFICATE OF USE AND OCCUPANCY

117.1 No building on which site preparation and assembly were begun, after the Kentucky Building Code becomes effective as to that building, shall be occupied until the appropriate building official has issued a certificate of occupancy certifying that the building was constructed in conformance with the standards of the Kentucky Building Code, or assembled or installed in conformance with application instructions; except that:

117.1.1 A building for which a permit was legally granted prior to the effective date of the KBC may be constructed and occupied under the provisions of relevant regulations in force at the time the permit was issued, provided that substantial construction has commenced within one year from the date the permit was issued.

117.2 A building or structure hereafter enlarged, extended or altered to change from one use group to another or to a different use within the same use group, in whole or part, and a building or structure hereafter altered for which a certificate of use and occupancy has not been heretofore issued, shall not be occupied or used until the certificate shall have been issued by the building official, certifying that the work has been completed in accordance with the provisions of the approved permit; except that any use or occupancy, which was not discontinued during the work or alteration, shall be discontinued within 30 days after the completion of the alteration unless the required certificate is secured from the building official.

117.3 After a change of use has been made in a building or structure, the reestablishment of a prior use that would not have been legal in a new building of the same type of construction is prohibited unless the building complies with all applicable provisions of this code. A change from one prohibited use, for which a permit has been granted, to another prohibited use shall be deemed a violation of this code.

117.4 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 or structure without endangering life or public welfare.

117.5 When a building or structure is entitled thereto, the building official shall issue a certificate of use and occupancy within ten days after written application. The certificate shall certify compliance with the provisions of this

code and the purpose for which the building may be used in its several parts. The certificate of use and occupancy may specify the following information from the KBC, the use group, in accordance with the provisions of Article 3; the fire grading as defined in Article 2 and Table 902, the maximum live load on all floors as prescribed in Article 11; the occupancy load in the building and all parts thereof as defined in Article 3 and Article 8; and any special stipulations and conditions of the building permit.

SECTION 118.0 POSTING STRUCTURES

118.1 Every building and structure and part thereof designed for business, factory and industrial, high hazard, mercantile, or storage use (Use Groups, B, F, H, M and S) as defined by the KBC shall be posted on all floors by the owner with a suitably designed placard in a form designated by the department, which shall be securely fastened to the structure in a readily visible place, stating the use group, and the occupancy loads.

118.2 Every room constituting a place of assembly shall have the occupancy load of the room posted in a conspicuous place, near the main exit from the room. Approved signs shall be maintained in a legible manner by the owner or his authorized agent. Signs shall be durable and shall indicate the number of occupants permitted for each room use.

118.3 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.

SECTION 119.0 VIOLATIONS AND REMEDIES

119.1 It shall be unlawful for any person, firm or corporation to erect, construct, alter, extend, repair, remove, use or occupy any building or structure or equipment regulated by the KBC, or cause same to be done, contrary to or in conflict with or in violation of any of the provisions of this code.

119.2 The building official shall serve a notice of violation or order on the person responsible for erection, construction, alteration, extension, repair, removal, demolition, use or occupancy of a building or structure in violation of this code or in violation of a permit or certificate issued under the provisions of this code; and such order shall direct the discontinuance of the illegal action or condition and the abatement of the violation.

119.3 If the notice of violation is not complied with promptly, the building official shall request the legal counsel of the jurisdiction to institute the appropriate proceeding at law or in equity to restrain, correct or abate such violation or to require the removal or termination of the unlawful use of the building or of the order or direction made pursuant thereto.

119.4 Penalties: Any person who shall violate a provision of the KBC or shall fail to comply with any of the requirements thereof or who shall erect, construct, alter or repair a building or structure in violation of an approved

lan or proper direction of the building official, or of a permit or certificate ssued under the provisions of the KBC, shall be subject to such penalties as ay be provided by KRS 198B.990 and other applicable law.

19.5 **Injunctive relief:** The department or any local agency enforcing the niform state building code may obtain injunctive relief from any court of ompetent jurisdiction to enjoin the offering for sale, delivery, use, occupancy r construction of any building on which construction was begun after the ffective date of said code, upon an affidavit of the department or the local overnment agency specifying the manner in which the construction, or if a uilding existing prior to the effective date of said code, the reconstruction, lteration, repair or conversion does not conform to the requirements of BC.

19.6 No person shall hinder an inspector enforcing any of the provisions of his code in the performance of his lawful duties under this chapter.

SECTION 120.0 NOTICE TO OWNER

120.1 Upon notice from the building official that work on any building or tructure is being prosecuted contrary to the provisions of this code or in an nsafe and dangerous manner, such work shall be immediately stopped. The top work order shall be in writing and shall be given to the owner of the roperty involved, or to the owner's agent, or to the person doing the work; nd shall state the conditions under which work may be resumed.

120.2 Unlawful continuance: Any person who shall continue any work in or bout the structure after having been served with a stop work order, except uch work as he is directed to perform to remove a violation or unsafe onditions, shall be liable to the restraints provided in Section 119.0.

SECTION 121.0 AUTHORITY FOR EXISTING BUILDINGS

121.1 Upon the issuance of a final approval of a facility and the issuance of a awful certificate of occupancy with respect to a particular facility, the building official's authority and responsibility as to that facility is ended so far as he KBC is concerned, unless the facility later becomes subjected to the KBC y virtue of Section 106.0.

121.2 Other local or state law must be consulted to determine the existence of ther powers given to the building official, such as those related to demolition r authority over unsafe structures, which are not specifically awarded him or ier in the KBC.

121.3 State Fire Marshal's Office and the local fire official designated by the ocal government shall continue to be the persons responsible for enforcement f the fire safety standards for existing buildings and shall also inspect for fire afety maintenance after a building has been given a final certificate by the uilding official, under KRS Chapter 227, and 815 KAR 10:020.

SECTION 122.0 LOCAL BOARD OF APPEALS

122.1 The mayor, chairman of the board of trustees or county judge executive of a local government which is enforcing the Kentucky Building Code may, upon approval of the local legislative body, appoint a local appeals board, consisting of at least five technically qualified persons with professional experience related to the building industry, three of which must not be employees of the local government, to hear appeals of the decisions of the local building official.

122.2 Local governments which are enforcing the Kentucky Building Code may cooperate with each other and provide a local appeals board and shall adhere to the provisions of KRS Chapter 65 when entering into such cooperative agreements.

122.3 No local building official or employee of a local inspection department may sit on a local appeals board if such board is hearing an appeal to a decision rendered by his department. No member of a local appeals board shall hear an appeal in a case in which he has financial interest.

122.4 Any party to a decision by the local building official may appeal that decision to the local appeals board. Upon receipt of an appeal from a qualified party, the local appeals board shall convene a hearing to consider the appeal within 15 days of receipt.

122.5 All parties to the appeal shall be notified of the time and place of the hearing by letter mailed by certified mail no later than ten days prior to the date of hearing.

122.6 The local appeals board shall render a decision within five working days after the hearing. The board may uphold, amend or reverse the decision of a local building official, and there shall be no appeal from the decision of the local appeals board other than by appeal to the board.

SECTION 123.0 APPEALS PROCEDURES

123.1 Where a local appeals board exists, a party must first appeal to the local board when aggrieved by a decision of the local building official.

123.2 A party, including the fire official, aggrieved by a decision of a local building official where no local appeals board exists may appeal directly to the board. The board shall further hear appeals directly from a party aggrieved by the decision of an agent of the department.

123.3 Application for appeal may be made when it is claimed in writing that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or an equally good or better form of construction can be used, or that the building official has refused to grant a modification to the provisions of this code covering the manner of construction or material to be used in the erection, alteration or repair of a building or structure.

123.4 The board may appoint five or more of its members, excluding the chairman of the board, to consider the recommendations of the commissioner or to conduct hearings, and those appointed shall act in all matters concerning the appeal for the entire board.

123.5 The board may adopt such rules, regulations and by-laws as are necessary to conduct said appeals; and no member of the board or committee may vote on any matter which will result in his direct or indirect financial gain.

123.6 Appeals to the board shall be in writing and shall be addressed to the Commissioner of Housing, Buildings and Construction, The 127 Building, U.S. 127 South, Frankfort, Kentucky 40601; Attention: Appeals Board. Such appeals shall include citations of those provisions of the Kentucky Building Code which are at issue, an explanation as stated in subsection (3) of why the decision of the state building official or local building official relative to those provisions is being contested and a copy of the decision rendered by the local appeals board, if any.

123.7 The commissioner shall immediately notify the board when an appeal is received. The commissioner or a designated employee of the department shall then investigate the evidence pertaining to such an appeal, based upon the results of such investigation, and make recommendations to the board or committee on the disposition of the case in question.

123.8 No employee of the department shall investigate or make recommendation on an appeal to his own decision, but shall defer in such cases to employees who are not party to the decision which lead to the appeal.

123.9 In conducting such investigation, the commissioner or the designated representatives, acting for the department, shall have the authority to administer oaths and affirmations, issue subpoenas authorized by law, rule upon offers of proof and receive relevant evidence, take or cause depositions to be taken, regulate the course of any hearings they may schedule, and hold conferences for the settlement or simplification of the issue by consent of the parties.

123.10 The commissioner shall cause such investigation to be completed, and forwarded with written recommendation to the board within 30 days after receiving such an appeal.

SECTION 124.0 ACTION OF THE BOARD

124.1 Upon receiving the written recommendations of the commissioner, the board may decide to accept such recommendations, or it may decide to convene a hearing to consider the question further. Upon receipt of the recommendations of the commissioner, the board shall render a decision on each appeal at its regularly scheduled meeting but no later than 30 days after receipt of such recommendations.

124.2 If the board has authorized an appeals committee to hear an appeal, the committee shall act for the board in all matters related to the appeal.

124.3 Should the board's decision be to schedule a hearing on the appeal, such hearing shall occur within 30 days of such decision, and all parties to such hearing shall be immediately notified in writing of the time and place of such hearing by the commissioner. The board may further exercise the same powers of investigation as granted to the commissioner in Section 123.0. The board shall render a decision within ten days of any appeals hearing it may conduct.

124.4 The board may uphold, amend or reverse the decision of a local appeals board, a local building official or the state building official; and the decision of the board shall be final.

124.5 The chairman of the board shall notify the appropriate building official and he or she shall take immediate action in accordance with the decision of the board.

124.6 There shall be no appeal from the board's decision except to the circuit court within whose jurisdiction the property in question is located. Application for review shall be made to the proper court within 30 days following that decision.

SECTION 125.0 CONSTRUCTION CONTROL AND RESPONSIBILITIES

125.1 The provisions of this section shall define the responsibility of the building official in relation to design professionals and the circumstances under which the department or the local building official shall be authorized to accept design professional's affirmation in their plans and specifications as to compliance with various provisions of this code.

125.2 All new, alteration, repair, expansion, addition or modification work involving the practice of professional architecture and engineering as defined by KRS Chapters 322 and 323 shall be prepared by registered professional architects or engineers as certified by the state; and all plans, computations and specifications required for a building permit application for such work must be prepared by or under the direct supervision of the registered architect or engineer and bear his seal and signature in accordance with those statutes.*

SECTION 126.0 VALIDITY

126.1 In the event any part or provisions of this code is held to be illegal or void, this shall not have the effect of making void or illegal any of the other parts of provisions thereof, which may or shall be determined to be legal; and it shall be presumed that this code would have been passed without such illegal or invalid parts or provisions.

126.2 Any invalid part of this code shall be segregated from the remainder of this code by the court holding such part invalid, and the remainder shall remain effective.

126.3 The invalidity of any provision in any section of the KBC as applied to existing buildings and structures shall not be held to affect the validity of such section in its application to buildings and structures hereafter erected.

*See Appendix E, pages 556(a)-(c)

SECTION 127.0 EFFECTIVE DATES FOR KBC APPLICATION

127.1 Any building required by Section 109.0(1) to be submitted to the Department of Housing, Buildings and Construction and which was not submitted and accepted for construction prior to February 15, 1980, must be constructed in compliance with the applicable provisions of the KBC:

127.2 Any building required by Section 108.0 to be submitted to a local government for plan review and which was not lawfully approved for construction prior to the following timetables shall be constructed in compliance with the applicable provisions of the KBC:

127.2.1 In all local governments in a county containing a first or second class city or urban county government, no later than February 15, 1980.

127.2.2 In all local governments in a county where the largest city is of the third or fourth class, no later than August 15, 1981.

127.2.3 In all local governments in a county containing no city larger than fifth or sixth class, no later than August 15, 1982.

SECTION 128.0 ALTERNATIVE CODES

128.1* Whenever the department has entered into a contractual obligation requiring enforcement of applicable federally approved codes, the department shall approve plans and make inspections using those federal codes as an alternative to other applicable provisions of the KBC so long as equivalent safety is maintained. Any facility of an occupancy type subject to review by the federal codes may use this section.

SECTION 129.0 DAY CARE CENTERS

129.1 Family child day care homes, group day care homes, child day care centers and day nurseries which comply with the provisions of the Life Safety Code, NFiPA Pamphlet #101, shall be deemed to have satisfied all the life safety requirements of the Kentucky Building Code.

SECTION 130.0 FEE SCHEDULES

****130.1 Submission of Plans and Fees to the Department.**

130.1.1 All plans and specifications required to be submitted to the department under the *Kentucky Building Code* shall be accompanied by the applicable fee as set forth in this section, rounded to the nearest dollar.

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*Facilities licensed by the state as Ambulatory Surgical Centers which do not receive any reimbursement from the Federal government may be constructed under the provisions of the KBC for Business Occupancy. However, if these same facilities at a later date desire to participate in a Federal reimbursement program, they must comply with the provisions of Section 12-6 (new health care centers) of the 1981 Life Safety Code.

**Fees for local permits and fees for plans approval for inspection of buildings under the jurisdiction of the local government shall be set by the local governmental body.

130.1.2 All fees required herein shall be in check form payable to the Kentucky State Treasurer.

130.1.3 No approval for construction shall be issued by the department until all required fees have been paid.

130.1.4 The plan review fees required by this regulation are intended to cover the cost of corresponding inspections for compliance with such plans.

130.2 New construction: Departmental plan review fees for new buildings shall be calculated by multiplying the total square footage times the cost per square foot of each occupancy type as listed in the following table. Total square footage will be determined by the outside dimensions of the building. Minimum fee for review of plans under this section will be fifty dollars ($50).

OCCUPANCY TYPE	COST PER SQUARE FOOT
Residential (excluding single family dwellings and duplexes)	2 cents
Assembly occupancies	
Nightclub/restaurants	3.5 cents
All other assembly	3 cents
Educational	2 cents
Day care centers	2 cents
Business	2 cents
Mercantile	2 cents
Industrial factories	2 cents
Warehouses	1.5 cents
Institutional	2.5 cents
Frozen food plants	2 cents
High hazard	3 cents
All other nonresidential	2 cents

130.2.2 Plan review fees for additions to existing buildings, which do not require the entire building to conform to the *Kentucky Building Code,* shall be calculated in accordance with Section 130.1 by the measurement of the square footage of the addition, only, as determined by the outside dimensions of the addition. Minimum fee for review of plans under this section will be fifty dollars ($50).

130.2.3 Plan review fees for existing buildings in which the use group or occupancy type is changed shall be calculated in accordance with Section 130.1 by using the total square footage of the entire building or structure under the new occupancy type as determined by the outside dimensions. Minimum fee for review of plans under this section will be fifty dollars ($50).

130.2.4 Plan review fees for alterations and repairs not otherwise covered by this section shall be calculated by multiplying the cost for the repairs by .001. Minimum fee for review of plans under this section will be fifty dollars ($50).

130.3 Specialized fees: In addition to the fees required by Section 130.2, the following fees must be paid for the specialized plan reviews listed:

130.3.1 Sprinkler fees:

AUTOMATIC SPRINKLER REVIEW FEE TABLE

Sprinkler Heads	Plan Review Fee
4-200	$ 50
201-300	60
301-400	80
401-750	100
over 750	$100 plus 10 cents per sprinkler over 750

130.3.2 Fire detection system review fee: $10 per 5,000 square feet up to 70,000 square feet; over 70,000 square feet — $140 plus $15 per each additional 10,000 square feet.

130.3.3 Standpipe plan review fee: $30 (Combination standpipe and riser plans will be reviewed under automatic sprinkler review fee schedule).

130.3.4 Carbon dioxide suppression system review fee: 1 to 200 pounds of agent — $50; over 200 pounds of agent — $50 plus 2 cents per pound in excess of 200 pounds.

130.3.5 Halon suppression system review fee: Up to 35 pounds of agent —$50; over 35 pounds — $50 plus 5 cents per pound in excess of 35 pounds.

130.3.6 Foam suppression system review fee: $1 per gallon of foam concentrate. The fee for review of plans under this section shall not be less than $50 or more than $1,000.

130.3.7 Commercial range hood review fee: $20.00 per hood.

130.3.8 Dry chemical systems review fee (except range hoods): 1 to 30 pounds of agent — $30; over 30 pounds of agent — $30 plus 20 cents per pound in excess of 30 pounds.

130.3.9 Flammable liquid or pressure tank fee: $25 for the first tank and $5 for each additional tank. (6 Ky. R. 486; eff. 4-1-80; Am. 9 Ky. R. 497; eff. 12-1-82.)

ARTICLE 2

DEFINITIONS

SECTION 200.0 GENERAL

200.1 Scope: Unless otherwise expressly stated, the following terms shall, for the purpose of this code, have the meanings indicated in this article.

200.2 Interchangeability: 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.

200.3 Terms defined in other codes: Where terms are not defined in this article and are defined in the plumbing, fire prevention or mechanical codes listed in Appendix A, they shall have the meanings ascribed to them as in those codes.

200.4 Terms not defined: Where terms are not defined through methods authorized by this section, they shall have their ordinarily accepted meanings such as the context implies.

SECTION 201.0 GENERAL DEFINITIONS

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.

Addition: An extension or increase in floor area or height of a building or structure.

Airplane hangar, private: A hangar for the storage of four or less single motor planes in which volatile or flammable oil is not handled, stored or kept other than that contained in the fuel storage tank of the plane.

Airplane hangar, public: A building for the storage, care or repair of private or commercial airplanes not included in the term "private airplane hangar." *

Alteration: As applied to a building or structure, means a change or rearrangement in the structural parts or in the means of egress; or an enlargement, whether by extending on a side or by increasing in height; or the moving from one location or position to another.

Alternating tread stairway: A stair that has a series of steps between 50 and 70 degrees (0.87 and 1.22 rad) from horizontal, usually attached to a center support rail in an alternating manner so that the user of the stairs never has both feet at the same level at the same time (see Section 816.11).

* **Approved:** Approved by the code official or other authority having jurisdiction.

Approved agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

Approved material, equipment and methods: Material, equipment and methods evaluated and approved (see Section 107.0).

Approved rules: The legally adopted rules of the code official (see Section 110.0).

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: Plain or ornamental hard burned plastic clay units, larger in size than brick, with glazed or unglazed ceramic finish (see Section 1406.0).

Area, building: The area included within surrounding exterior walls (or exterior walls and fire walls) exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if included within the horizontal projection of the roof or floor above (see Section 501.0).

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

Attic: The space between the ceiling beams of the top story and the roof rafters.

Attic, habitable: 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 7 1/3 feet (2235 mm) above the attic floor is not more than one-third the area of the next floor below.

Automatic: As applied to fire protection devices, automatic refers to a device or system providing an emergency function without the necessity of human intervention and activated as a result of a predetermined temperature rise, rate of rise of temperature, or increase in the level of combustion products; such as incorporated in an automatic sprinkler system, automatic fire door, etc.

Automatic fire suppression system: An engineered system using carbon dioxide (CO_2), dry chemical, a halogenated extinguishing agent, or an auto-

matic sprinkler system to automatically detect and suppress a fire through fixed piping and nozzles.

Basement: That portion of a building the average height of which is at least half below grade, which is ordinarily used for purposes such as storage, laundry facilities, household tool shops, and installation and operation of heating, cooling, ventilating facilities, but which is not ordinarily used for purposes of general household habitation (see "Story" and "Above grade").

Bay (part of a structure): The space between two adjacent piers or mullions or between two adjacent lines of columns.

Brick (See Article 14):

Calcium silicate brick (sand lime brick): A building unit made of sand and lime.

Clay or shale: A solid masonry unit of clay or shale, usually formed into a rectangular prism while in the plastic state and burned or fired in a kiln.

Concrete brick: A solid masonry unit having the approximate shape of a rectangular prism and composed of inert aggregate particles embedded in a hardened cementitious matrix.

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 60 percent or more than 75 percent of its gross cross-sectional area measured in the same plane.

Building: Any structure used or intended for supporting or sheltering any use or occupancy. For application of this code, each portion of a building completely separated from other portions by fire walls complying with Section 908.0 shall be considered as a separate building.

Building, existing: Any structure erected prior to the adoption of the appropriate code, or one for which a legal building permit has been issued.

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 provides 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.

Buttress: A projecting part of a masonry wall built integrally therewith to furnish lateral stability which is supported on proper foundations.

Central station system: A system, or group of systems, the operations of which are signaled to, recorded in, maintained and supervised from an approved

matic sprinkler system to automatically detect and suppress a fire through fixed piping and nozzles.

Basement: That portion of a building the average height of which is at least half below grade, which is ordinarily used for purposes such as storage, laundry facilities, household tool shops, and installation and operation of heating, cooling, ventilating facilities, but which is not ordinarily used for purposes of general household habitation (see "Story above grade").

Bay (part of a structure): The space between two adjacent piers or mullions or between two adjacent lines of columns.

Brick (See Article 14):

Calcium silicate brick (sand lime brick): A building unit made of sand and lime.

Clay or shale: A solid masonry unit of clay or shale, usually formed into a rectangular prism while in the plastic state and burned or fired in a kiln.

Concrete brick: A solid masonry unit having the approximate shape of a rectangular prism and composed of inert aggregate particles embedded in a hardened cementitious matrix.

Hollow brick: A masonry unit of clay or shale whose net cross-sectional area in any plane parellel to the bearing surface is not less than 60 percent or more than 75 percent of its gross cross-sectional area measured in the same plane.

Building: Any structure used or intended for supporting or sheltering any use or occupancy as described in Section 101.3. For application of this code, each portion of a building completely separated from other portions by fire walls complying with Section 908.0 shall be considered as a separate building for the determination of height and area limitations of buildings contained in Table 501.

Building, existing: Any structure erected prior to the adoption of the appropriate code, or one for which a legal building permit has been issued.

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 provides 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.

Buttress: A projecting part of a masonry wall built integrally therewith to furnish lateral stability which is supported on proper foundations.

Central station system: A system, or group of systems, the operations of which are signaled to, recorded in, maintained and supervised from an approved

central station, in which there are competent and experienced observers and operators in attendance at all times whose duty it shall be, upon receipt of a signal, to take such action as shall be required under the rules established for their guidance. Such systems shall be controlled and operated by a person, firm or corporation whose principal business is the furnishing and maintaining of supervised protective signaling service and who does not have interest in protected properties (see Section 1020.0).

Certificate of use and occupancy: The certificate issued by the code 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 (see Section 119.0).

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 (see Section 103.2).

* **Chimney:** A primarily vertical enclosure containing one or more passageways.
Factory-built chimney: A chimney that is factory-made and listed by an approved testing or inspection agency for the venting of gas appliances, gas incinerators and solid or liquid fuel burning appliances.
Masonry chimney: A field-constructed chimney of solid masonry units, bricks, stones, listed hollow masonry units or reinforced concrete.
Metal chimney (smokestack): A field-constructed chimney made of metal.

Code official: The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

Combustible material: A combustible material is a material which cannot be classified as noncombustible in accordance with that definition (see Section 903.4).

Concrete: A mixture of cement, aggregates and water, of such proportions and manipulation as to meet specific requirements (see Article 15).

Concrete, reinforced: Concrete in which reinforcement, other than that provided for shrinkage or temperature changes, is combined in such a manner that the two materials act together in resisting forces.

Conflagration hazard: The fire risk involved in the spread of fire by exterior exposure to and from adjoining buildings and structures.

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, type of: See Section 401.0.
Type 1: See Section 402.0.
Type 2: See Section 403.0.
Type 3: See Section 404.0.
Type 4: See Section 405.0.
Type 5: See Section 406.0

Corridor: An enclosed passageway which limits means of egress to a single path of travel.

Court: An open, uncovered and unoccupied space on the same lot with a building and enclosed wholly or partly by buildings, walls or other enclosing devices.
Inner: Any court enclosed wholly by buildings, walls or other enclosing devices.
Outer: A court extending to and opening upon a street, public alley, or other approved open space, not less than 15 feet (4572 mm) wide, or upon a required yard.

Court width: As applied to an inner court, means its least horizontal dimension. 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.

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.

Damper, fire: 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 shall not be used as a smoke damper unless the location lends itself to the dual purpose (see Section 918.0).

Degree day, heating: A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying the nominal heating load of a building in winter. For any one day, when the mean temperature is less than 65 degrees F. (18 degrees C.), there exist as many degree days as there are Fahrenheit (Celsius) degrees difference in temperature between the mean temperature for the day and 65 degrees F. (18 degrees C.) (see Article 31).

Deluge system: An automatic sprinkler system consisting of open sprinklers with water supply valves activated by a separate automatic detection system.

Detecting device, automatic: A device which automatically detects heat, smoke or other products of combustion (see Section 1018.0).

Detection system, automatic fire: A fire protective siangling system contain-

ing automatic detecting device(s) which actuate a fire alarm signal (see Section 1018.0).

Detector, smoke: An approved, listed detector for sensing visible or invisible particles of combustion (see Section 1018.0).

Dispensing: The pouring or transferring of any material from a container, tank or similar vessel, whereby vapors, dust, fumes, mists or gases are liberated to the atmosphere.

Door assembly, fire: A combination of a fire door, frame, hardware, and other accessories which together provide a specific degree of fire protection to the opening (see Section 916.0).

Door, fire: A door and its assembly, so constructed and assembled in place as to give protection against the passage of fire (see Section 916.0).

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

Draftstopping: Building materials installed to prevent the movement of air, smoke, gases and flame to other areas of the building through large concealed passages such as attic spaces and floor assemblies with suspended ceilings or open web trusses (see Section 921.0).

Dumbwaiter: A hoisting and lowering mechanism with a car of limited capacity and size which moves in guides in a substantially vertical direction and is used exclusively for carrying material (see Article 26).

Dwellings

Boarding house: A building arranged or used for lodging, with or without meals, for compensation and not occupied as a single family unit.

Dormitory: A space in a building where group sleeping accommodations are provided for persons not members of the same family group, in one room, or in a series of closely associated rooms.

Hotel: Any building containing six 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.

Multi-family apartment house: A building or portion thereof containing more than two dwelling units and not classified as a one- or two-family dwelling.

One-family dwelling: A building containing one dwelling unit with not more than five lodgers or boarders.

Two-family dwelling: A building containing two dwelling units with not more than five lodgers or boarders per family.

Dwelling unit: A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.

Elevator: A hoisting and lowering mechanism equipped with a car or platform which moves in guides for the transportation of individuals or freight in a

substantially vertical direction through successive floors or levels of a building or structure (see Section 2607.0).

Freight elevator: An elevator primarily used for carrying freight and on which only the operator and the persons necessary for loading or unloading and employees having special permission of the code official are permitted to ride.

Hand elevator: A freight elevator that is driven by manual power.

Hydraulic elevator: A power elevator in which the motion of the car is obtained through the application of force from liquid under pressure.

Passenger elevator: An elevator for the transportation of individuals.

Power elevator: An elevator in which the motion of the car is obtained through the application of force other than by hand or gravity.

Sidewalk elevator: A freight elevator which operates between a sidewalk or other area exterior to the building and floor levels inside the building below such area, which does not have a landing opening into the building at its upper limit of travel and which is not used to carry automobiles.

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

Emergency control station: An approved location on the premises where signals from emergency equipment are received.

Equipment: Facilities or installations including but not limited to, heating, electrical, ventilating, air conditioning, and refrigerating facilities or installations.

Equipment, existing: Any equipment covered by this code which was installed prior to the effective date of this code, or for which an application for permit to install was filed with the code official prior thereto.

Escalator: A power-driven, inclined, continuous stairway used for raising and lowering passengers (see Section 2617.0).

Exit: 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 way of travel to the exit discharge (see Section 809.0).

Exit access: Exit access is that portion of a means of egress which leads to an entrance to an exit (see Section 810.0).

Exit discharge: That portion of a means of egress between the termination of an exit and a public way (see Section 807.3).

Exit, horizontal: A way of passage from one building to an area of refuge in another building on approximately the same level, or a way of passage through or around a wall or partition to an area of refuge on approximately the same level in the same building, which affords safety from fire or smoke

from the area of incidence and areas communicating therewith (see Section 814.0).

Exterior envelope: The elements of a building which enclose conditioned spaces through which thermal energy transfers to or from the exterior (see Section 3102.0).

Extinguishing system, carbon dioxide (CO_2): A system to supply CO_2 from a pressurized vessel through fixed pipes and nozzles. The system includes an automatic detection and actuating mechanism (see Section 1008.0).

Extinguishing system, dry chemical: A system consisting of dry chemical and expellant gas storage tanks, fixed piping, and nozzles used to assure proper distribution of an approved extinguishing agent on a specific fire hazard or into a potential fire area. The system includes an automatic detection and actuating mechanism (see Section 1010.0).

Extinguishing system, foam: A special system to discharge, either mechanically or chemically, a foam made from concentrates, over the area to be protected (see Section 1007.0).

Extinguishing system, halogenated: A system of pipes, nozzles, an actuating mechanism and a container of halogenated agent under pressure (see Section 1009.0).

Fire area: The floor area enclosed and bounded by fire walls, fire separation assemblies or exterior walls of a building to restrict the spread of fire.

Fire department connection: A connection for fire department use in supplementing or supplying water for standpipes or sprinkler systems (see Section 1014.0).

Fire grading: The fire hazard classification of a building or structure in hours or fractions thereof established for its use group and occupancy in Table 902.

Fire hazard: The potential degree of fire severity existing in the use and occupancy of a building, 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 explosions or large volumes of smoke, poisonous fumes or gases 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 protection: The provision of construction safeguards and exit facilities; and the installation of fire alarm, fire detecting and fire extinguishing service equipment, to reduce the fire risk and the conflagration hazard.

Fire protection system: A system including systems, devices and equipment to detect a fire, actuate an alarm or suppress or control a fire or any combination thereof (see Article 10).

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 the fire test specified in this code (see Section 903.1.1).

Fire separation distance: The distance in feet measured from the building face to the closest interior lot line, to the center line of a street or public way or to an imaginary line between two buildings on the same property.

Firestopping: Building materials installed to prevent the movement of flame and gases to other areas of a building through small concealed passages in building components such as floors, walls and stairs (see Section 921.0).

Flameresistance: That property of materials or combinations of component materials which restricts the spread of flame as determined by the flame-resistance tests specified in this code (see Section 904.0).

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 the tests specified in this code (see Section 904.0).

Flammable: Subject to easy ignition and rapid flaming combustion.

Floor area, gross: Gross floor area shall be the floor area within the perimeter of the outside walls of the building under consideration, without deduction for hallways, stairs, closets, thickness of walls, columns, or other features (see Section 806.0).

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 (see Section 806.0).

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 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.

Garage, private: A garage for four or less passenger motor vehicles without provision for repairing or servicing such vehicles for profit (see Section 608.0).

Garage, public: A building or structure for the storage or parking of more

than four passenger motor vehicles or motor powered boats, or more than one commercial motor vehicle; with or without provision 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 of the following groups (see Section 609.0).

Group 1: A public garage in which provision is made for the care, storage, repair or painting of or fuel-dispensing to motor vehicles.

Group 2: A public garage used exclusively for passenger vehicles that will accommodate not more than nine passengers.

Grade: A reference plane representing the average of finished ground level adjoining the building at all exterior walls. When the finished ground level slopes away from the exterior walls, the reference plane shall be established by the lowest points within the area between the building and the lot line or, when the lot line is more than 6 feet (1829 mm) from the building, between the building and a point 6 feet (1829 mm) from the building.

Grade hallway, grade lobby, grade passageway: An enclosed hallway or corridor that is an element of an exit; and terminating at a street or an open space or court communicating with a street.

Grandstand: Any structure, except movable seating and sectional benches, intended primarily to support individuals for the purposes of assembly, but this definition shall not apply to the permanent seating in theatres, churches, auditoriums and similar buildings (see Section 612.0).

Habitable space: Space in a structure for living, sleeping, eating, or cooking. Bathrooms, toilet compartments, closets, halls, storage or utility spaces and similar areas are not considered habitable space.

Hazardous production material (HPM): A solid, liquid or gas that has a degree of hazard rating in health, flammability or reactivity of 3 or 4 as ranked by NFiPA 704 listed in Appendix A, and which is used directly in research, laboratory or production processes which have, as their end product, materials which are not hazardous (see Section 603.0).

Heated space: A space within a building which is provided with a positive heat supply. Finished living space within a basement, or registers or heating devices designed to supply heat to a basement space shall define that space as heated space.

Height

Building: The vertical distance from grade to the top of the highest roof beams of a flat roof, or the mean level of the highest gable or slope of a hip roof.

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 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, when there is not a ceiling, to the top of the roof rafters.

Walls: 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 this code becomes effective.

Heretofore: Before the time that this code became effective.

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

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

Automotive lift: A fixed mechanical device for raising an entire motor vehicle above the floor level, but not through successive floors of the building or structure (see Section 2615.0).

Conveyors: A system of machinery and manual or mechanized devices other than elevator and dumbwaiter equipment, consisting of belts, chains, rollers, buckets, aprons, slides and chutes and other miscellaneous equipment for hoisting, lowering and transporting materials and merchandise in packages or in bulk in any direction in a building or structure (see Section 2616.0).

Freight lift: A power operated raising and lowering device for transporting freight vertically, operating entirely within one story of the building or structure.

Manlifts: A power operated belt device with steps and handholds for transporting persons in a vertical position through successive floors or levels of the building or structure (see Section 2613.0).

Hoisting and elevating equipment, miscellaneous: All power operated hoisting and elevating equipment for raising, lowering and moving persons or merchandise from one level to another such as inclined elevators, slings and hooks, tiering and piling machines not permanently located in a fixed position, mine elevators, skip hoists for blast furnaces, stage and orchestra lifts, lift bridges and temporary builders' hoists and similar equipment.

Inspection, special: Professional supervision as herein required of the installation, fabrication, erection or placement of components and/or connections requiring special expertise to ensure adequacy (see Section 108.0).

Jurisdiction: The governmental unit which has adopted this code under due legislative authority.

Label: A plate, tag or other device permanently and prominently affixed to a product or material indicating that it has been tested and evaluated by an approved agency (see Section 1306.3).

Lintel: A beam placed over an opening or recess in a wall which supports the wall construction above.

Load: Forces or other actions that arise on structural systems from the weight of all permanent construction, occupants and their possessions, environmental effects, differential settlement and restrained dimensional changes (see Article 11).

Dead load: The weight of all permanent structural and nonstructural components of a building, such as walls, floors, roofs, ceilings, stairways and fixed service equipment.

Duration of load: The period of continuous application of a given load, or the aggregate of periods of intermittent applications 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.

Internal load: The forces resulting from the restraint of movement of construction materials or differential movement of a combination of materials caused by the effects of expansion or contraction due to temperature changes, shrinkage, moisture changes, creep, differential settlement or combinations thereof.

Lateral soil load: The lateral pressure in pounds per square foot (psf) (kilograms per square meter [kg/ m^2]) due to the weight of the adjacent soil, including due allowance for hydrostatic pressure and possible surcharge from fixed or moving loads.

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 (psf) (kilograms per square meter [kg/ m^2]) due to wind blowing in any direction.

Loading ramp: A hinged, nonportable device, either mechanical or hydraulic, hand or power operated, used for spanning gaps or adjusting heights between loading surface and carrier or between loading surface and loading surface.

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

Corner lot: A lot with two adjacent sides abutting upon streets or other public spaces.

Interior lot: A lot which faces on one street or with opposite sides on two streets.

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

Lot line, interior: Any lot line other than one adjoining a street or public space.

Lot line, street: The lot line dividing a lot from a street or other public way.

* **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 (see Article 14).

Ashlar facing masonry: Facing of solid rectangular units larger in size than brick and 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.
Solid masonry: Masonry consisting of solid masonry units laid continuously with the joints between the units filled with mortar, or consisting of plain concrete.

Masonry unit
Clay: A building unit larger in size than a brick, composed of burned clay, shale, fire clay or mixtures thereof.
Concrete: A building unit or block larger in size than 12 by 4 by 4 inches (305 mm by 102 mm by 102 mm) made of cement and suitable aggregates.
Hollow: A masonry unit whose net cross-sectional area in any plane parallel to the bearing surface is less than 75 percent of its gross cross-sectional area measured in the same plane.
Solid: A masonry unit whose net cross-sectional area in every plane parallel to the bearing surface is 75 percent or more of its gross cross-sectional area measured in the same plane.

Means of egress: A continuous and unobstructed path of travel from any point in a building or structure to a public way, and consisting of three separate and distinct parts: (a) the exit access, (b) the exit and (c) the exit 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 (see Article 8).

Member
Primary: 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 8 feet (2438 mm) or more, and any other member required to brace a column or a truss.
Secondary: Any member of the structural framework other than a primary member, including filling-in beams of floor systems.

Membrane: As it pertains to membrane structures, a thin, flexible, impervious material capable of being supported by an air pressure of 1.5 inches of water column (373 P) (see Section 604.0).

Membrane structures (See Section 604.0):
Air-inflated structure: A building where the shape of the structure is maintained by air pressurization of cells or tubes to form a barrel vault over the usable area. Occupants of such a structure do not occupy the pressurized area used to support the structure.
Air-supported structure: A building wherein the shape of the structure is attained by air pressure and occupants of the structure are within the elevated pressure area. Air supported structures are of two basic types:
Single skin: Where there is only the single outer skin and the air pressure

is directly against that skin.

Double skin: Similar to a single skin, but with an attached liner which is separated from the outer skin and provides an air space which serves for insulation, acoustic, aesthetic or similar purposes.

Cable-restrained, air-supported structure: A structure in which the uplift is resisted by cables or webbings which are anchored to either foundations or dead men. Reinforcing cable or webbing is attached by various methods to the membrane or is an integral part of the membrane. This is not a cable-supported structure.

Membrane-covered cable structure: A nonpressurized structure in which a mast and cable system provides support and tension to the membrane weather barrier and the membrane imparts structural stability to the structure.

Membrane-covered frame structure: A nonpressurized building wherein the structure is composed of a rigid framework to support tensioned membrane which provides the weather barrier.

Noncombustible membrane structure: A membrane structure in which the membrane and all component parts of the structure are noncombustible.

Tent: Any structure, enclosure or shelter constructed of canvas or pliable material supported by any manner except by air or the contents it protects.

Mezzanine(s): An intermediate level or levels between the floor and ceiling of any story with an aggregate floor area of not more than 33 percent of the floor area of the story in which the level or levels are located (see Section 605.0).

Mobile unit: A structure of vehicular, portable design, built on a chassis and designed to be moved from one site to another, and to be used with or without a permanent foundation (see Section 621.0).

Mortar: A plastic mixture of approved cementitious materials, fine aggregates and water used to bond masonry or other structural units (see Section 1409.0).

Mortar, surface-bonding: A mixture containing hydraulic cement, glass fiber reinforcement with or without inorganic fillers, or organic modifiers, and water, used to bond concrete masonry units (see Section 1422.0).

Motel: A hotel as defined in this code.

Moving walk: A type of passenger carrying device on which passengers stand or walk, and in which the passenger carrying surface remains parallel to its direction of motion and is uninterrupted (see Section 2600.2).

Noncombustible: This is a general, relative term. Its precise meaning is defined in this code for specific applications.

Noncombustible building material: See Section 903.0.

Nominal dimension

Lumber: A dimension that varies from actual dimensions in accordance with DOC PS 20 listed in Appendix A.

Masonry: A dimension that varies from actual masonry dimensions by the thickness of a mortar joint but not more than one-half inch (13 mm).

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

Occupant load: The total number of persons that are permitted to occupy a building, or portion thereof, at any one time (see Section 806.0).

Occupiable room: A room or enclosed space designed for human occupancy in which 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 this code.

Occupied: As applied to a building, shall be construed as though followed by the words "or intended, arranged or designed to be occupied." *

Owner: Any person, agent, firm, or corporation having a legal or equitable interest in the property.

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

Particle board: Particle board is a mat-formed panel consisting of particles of wood or a combination of wood particles and wood fibers bonded together with synthetic resins or other suitable bonding systems (see Section 1711.0).

Penthouse: An enclosed structure above the roof of a building, other than a roof structure or bulkhead, occupying not more than 33⅓ percent of the roof area.

Permit: An official document or certificate issued by the authority having jurisdiction which authorizes performance of a specified activity.

Person: Includes a corporation or co-partnership as well as an individual.

Plastic

Light diffusing system: A suspended construction consisting in whole or in part of lenses, panels, grids or baffles suspended below independently mounted electrical lighting sources.

Plastic glazing: Plastic materials which are glazed or set in frame or sash and not held by mechanical fasteners which pass through the glazing material.

Plastic roof panels: Plastic materials which are fastened to structural members, or to structural panels or sheathing, and which are used as light transmitting media in roofs.

Plastic wall panels: Plastic materials which are fastened to structural members, or to structural panels or sheathing, and which are used as light transmitting media in exterior walls.

Reinforced plastic, glass fiber: Plastic reinforced with glass fiber having not less than 20 percent of glass fibers by weight.

Thermosetting material: A plastic material which is capable of being changed into a substantially nonreformable product when cured.

Thermoplastic material: A plastic material which is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

Plenum: An enclosed portion of the building structure, so designed to allow the movement of air, that forms part of an air distribution system.

Positive heat supply: Heat deliberately supplied to a space by design, such as a supply register, radiator or heating element. Also, heat indirectly supplied to a space through uninsulated surfaces of service water heaters and space heating components, such as furnaces, boilers and heating and cooling distribution systems which continually maintain air temperature within the space of 50 degrees F. (10 degrees C.) or higher during normal operation.

Posted use and occupancy: The posted classification of a building in respect to use, fire grading, floor load and occupant load (see Section 122.0).

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.

Preservative treatment (treated material): Unless otherwise noted, is impregnation under pressure with a wood preservative. Wood preservative is any suitable substance that is toxic to fungi, insects, borers, and other living wood-destroying organisms.

Professional engineer or architect: An individual technically and legally qualified to practice the profession of engineering or architecture.

Proprietary (local) system: An electrical alarm system capable of automatically notifying building supervisory personnel of a water flow or an impairment of a sprinkler system (see Section 1020.0).

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 firere-sistance rating specified for its particular use or application in Table 401; and includes protected combustible and protected noncombustible construction.

Public way: Any street, alley or other parcel of land open to the outside air leading to a public street; deeded, dedicated, or otherwise permanently appropriated to the public for public use and having a clear width of not less than 10 feet (3048 mm).

Reconstruction: The process of reproducing by new construction the exact form and detail of a vanished building, structure or object or a part thereof as it appeared at a specific period of time.

Rehabilitation: The process of returning a property to a state of utility through repair or alteration which makes possible an efficient contempor-

ary use of while preserving those portions or features of the property which are significant to historical, architectural and cultural values.

Remote station system: An electric alarm system capable of automatically notifying the public or private fire department, or other approved constantly attended location, when the system is activated (see Section 1020.0).

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 this code.

Riser: The vertical supply pipes in a sprinkler system or standpipe system (see Article 10).

Roof: The roof slab or deck with its supporting members, not including vertical supports (see Article 23).

Roof covering: The covering applied to the roof for weather resistance, fireresistance or appearance (see Section 2301.0).

Roof structure: An enclosed structure on or above the roof of any part of a building (see Section 927.0).

Rubble

Coursed rubble: Masonry composed of roughly shaped stones fitting approximately on level beds and well bonded.

Random rubble: Masonry composed of roughly shaped stones laid without regularity of coursing but well bonded and fitted together to form well defined joints.

Rough or ordinary rubble: Masonry composed of unsquared field stones laid without regularity of coursing but well bonded.

Rubble masonry: Masonry composed of roughly shaped stones.

Runway: An aisle or walkway constructed or maintained as a temporary passageway for pedestrians or vehicles.

Scaffold: Any elevated platform which is used for supporting workmen, materials or both (see Section 3014.0).

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.

Service passage, HPM: A passage used for the transportation of hazardous production material (HPM) from a separate inside HPM storage room or the exterior of the building to the perimeter wall of the fabrication area, and for purposes other than required egress (see Section 603.0).

Shaft, covered: An interior enclosed space extending through one or more stories of a building, connecting openings in successive floors, or floors and roof; and covered at the top.

Shaft, open: An exterior, enclosed space extending through one or more stories of a building, enclosed with walls of the required weather and

fireresistance rating for exterior walls, and open to the sky at the top.

Shall: The term, when used in this code, shall be construed as mandatory.

* **Sign:** Any fabricated sign or outdoor display structure, 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, constructed, attached, erected, fastened or manufactured in any manner whatsoever so that the same shall be used for the attraction of the public to any place, subject, person, firm, corporation, public performance, article, machine or merchandise whatsoever, and displayed in any manner out of doors for recognized advertising purposes (see Article 29).

Closed sign: A sign in which more than 50 percent of the entire area is solid or tightly enclosed or covered.

Ground sign: A sign supported by uprights or braces in or upon the ground surface.

Marquee sign: A sign attached to or hung from a marquee, canopy or other covered structure, projecting from and supported by the building and extending beyond the building wall, building line or street lot line.

Open sign: A sign in which at least 50 percent of the enclosed area is uncovered, or open to the transmission of wind.

Projecting sign: A display sign which is attached directly to the building wall, and which extends more than 15 inches (381 mm) from the face of the wall.

Portable sign: A sign, usually of a temporary nature, not securely anchored to the ground or to a building or structure and which obtains some or all of its structural stability with respect to wind or other normally applied forces by means of its geometry or character.

Roof sign: A sign which is erected, constructed and maintained above the roof of the building.

Temporary sign: A sign constructed of cloth, fabric or other light temporary material with or without a structural frame intended for a limited period of display; including decoration displays for holidays or public demonstrations.

Wall sign: A sign which is painted on or attached directly to a fence or on the surface of masonry, concrete, frame or other approved building walls, and which extends not more than 15 inches (381 mm) from the face of the fence or wall.

Signaling system, fire protective : An interior alarm system composed of sending stations and signaling devices in a building, operated on an electrical circuit, so arranged that the operation of any one station will ring all signals throughout the building and at one or more approved locations (see Section 1017.0).

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 a street or other public way.

Smoke barrier: A continuous membrane that will resist the movement of smoke.

Smoke compartment: A space within a building enclosed by smoke barriers or fire separation walls on all sides, including top and bottom.

Smokeproof enclosure: An enclosed stairway, with access from the floor area of the building either through outside balconies or ventilated vestibules, opening on a street, yard or open court; and with a separately enclosed direct exit to the street at the grade floor (see Section 818.0).

Sprinkler, automatic: A device, connected to a water supply system, that opens automatically at a predetermined fixed temperature and disburses a spray of water (see Section 1004.0).

Sprinkler system, automatic: A sprinkler system, for fire protection purposes, is an integrated system of underground or overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply. The portion of the system above ground is a network of specially or hydraulically designed piping installed in a building, structure or area, generally overhead, and to which automatic sprinklers are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the fire area (see Section 1004.0).

Sprinkler system, limited area: An automatic sprinkler system consisting of not more than 20 sprinklers for use in a room or space enclosed by construction assemblies as required by this code (see Section 1005.0).

Sprinkler system, occupancy: An automatic sprinkler system servicing a use group in a building enclosed by construction assemblies as required by this code (see Section 1004.2).

Stabilization: The process of applying measures designed to re-establish a weather resistant enclosure and the structural stability of an unsafe or deteriorated property while maintaining the essential form as it exists.

Stage: See Section 615.2.

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 code, shall have at least three risers.

Standpipe: A standpipe system is an arrangement of piping, valves, hose outlets and allied equipment installed in a building or structure. The outlets are located in such a manner that water can be discharged in streams or spray patterns through hoses and nozzles attached to such hose outlets for the purpose of extinguishing a fire and so protecting the occupants. This is accomplished by connections to water supply systems or by pumps, tanks and other equipment necessary to provide an adequate supply of water to the hose outlets (see Section 1012.0).

Steel construction, cold-formed: 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.

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

Steel member, structural: Any steel structural member of a building or structure consisting of a rolled steel structural shape other than cold-formed steel, light gage steel or steel joist members.

Storage room, HPM, separate inside: A room used for the storage of hazardous production material (HPM) in containers, tanks, drums or other means, separated from other occupancies (see Section 603.0). Such rooms include:

HPM inside room: An HPM storage room totally enclosed within a building and not having exterior walls.

HPM cutoff room: An HPM storage room within a building and having at least one exterior wall.

Story: That portion of a building comprised between a floor and the floor or roof next above which is not a basement or attic (also see "Mezzanine").

Story above grade: Any story having its finished floor surface entirely above grade except that a basement shall be considered as a story above grade when the distance from grade to the finished surface of the floor above the basement is more than 6 feet (1829 mm) for more than 50 percent of the total perimeter or more than 12 feet (3658 mm) at any point.

Street: A public thoroughfare (such as street, avenue or boulevard) which has been dedicated for public use.

Structure: That which is built or constructed.

Thermal resistance (*R*): A measure of the ability to retard the flow of heat. The *R* value is the reciprocal of thermal conductance expressed in units of hr · ft² · °F. per Btu (see Article 31).

Thermal transmittance (*U*): The coefficient of heat transmission (air-to-air) expressed in units of Btu per hour per square foot per degrees F. (Watts per square meter per degree K.). It is the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films. The *U* value applies to combinations of different materials used in series along the heat flow path and also to single materials that comprise a building section and includes cavity air spaces and surface air films on both sides of a building element (see Article 31).

Thermal transmittance (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 degrees F. (Watts per square meter per degree K.). 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, floor or roof/ceiling (see Article 31).

TIA or Tentative Interim Amendment: A publication of the National Fire Protection Association Standards Council which is a tentative amendment of the National Electrical Code referenced in Article 27, Section 2700.5.1 of this Code because it has not been processed through the entire standards-making process; and it is interim because it is effective only between editions of the standard. As used in this Code, it is a permanent provision until otherwise amended.

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.

Tile, structural clay: A hollow masonry unit composed of burned clay, shale, fire clay or mixtures thereof, and having parallel cells.

Tires, bulk storage of: Storage of 10,000 or more average size passenger vehicle tires weighing approximately 25 pounds (11 kg) each (see Section 306.0).

Use (used): The purpose for which the building or structure is designed, used or intended to be used.

Use, accessory: A use incidental to the principal use of a building as defined or limited by the provisions of the local zoning laws.

Use group: The classification of a building or structure based on the purpose for which it is used as listed in Article 3.

Use Group A	assembly (see Section 302.0).
Use Group B	business (see Section 303.0).
Use Group E	educational (see Section 304.0).
Use Group F	factory and industrial (see Section 305.0).
Use Group H	high hazard (see Section 306.0).
Use Group I	institutional (see Section 307.0).
Use Group M	mercantile (see Section 308.0).
Use Group R	residential (see Section 309.0).
Use Group S	storage (see Section 310.0).
Use Group U	utility and miscellaneous (see Section 311.0).

Ventilation: The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

Vertical opening: An opening through a floor or roof.

Wall

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.

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 or more masonry

units of different materials bonded together, one forming the backup and the other the facing elements.

Curtain wall: A nonbearing enclosure wall not supported at each story.

Dry-stacked, surface-bonded walls: A wall built of concrete masonry units where the units are stacked dry, without mortar on the bed or head joints, and where both sides of the wall are coated with a surface-bonding mortar (see Section 1422.0).

Faced wall: A wall in which the masonry facing and backing are so bonded as to exert common action under load.

Fire separation wall: A fireresistance rated assembly of materials having protected openings, and designed to restrict the spread of fire (see Section 910.0).

Fire wall: A fireresistance rated wall, having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof (see Section 908.0).

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 (see Section 1222.0).

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.

Nonbearing wall: A wall which does not support vertical loads other than its own weight.

Parapet wall: That part of any wall entirely above the roof line.

Party wall: A fire wall on an interior lot line used or adapted for joint service between two buildings (see Section 908.0).

Retaining wall: A wall designed to resist the lateral displacement of soil or other material.

Skeleton or panel wall: A nonbearing 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.

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.

Water spray fixed system: A system using water in a form having a predetermined pattern, particle size, velocity and density discharged from specially designed nozzles or devices.

Water supply, automatic: Water supplied through a gravity or pressure tank or automatically operated fire pumps, or from a direct connection to an approved municipal water main (see Section 1013.0).

Winder: A step in a winding stairway (see Section 816.4.3).

Window

Bay window: A window projecting beyond the wall line of the building and extending down to the foundation.

Fire window: A window constructed and glazed to give protection against the passage of fire (see Section 917.0).
Oriel window: A window projected beyond and suspended from the wall of the building or cantilevered therefrom.

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

Written notice: A notification in writing delivered in person to the individual or parties intended; or delivered at, or sent by certified or registered mail to the last residential or business address of legal record.

Yard: An unoccupied open space other than a court.

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.

ARTICLE 3

USE GROUP CLASSIFICATION

SECTION 300.0 GENERAL

300.1 Scope: The provisions of this article shall control the classification of all buildings and structures as to use group.

300.2 Application of other laws: The provisions of this article shall not be deemed to nullify any provisions of the zoning law or any other statute of the jurisdiction pertaining to the location or use of buildings, except as is specifically required by the provisions of this code.

SECTION 301.0 CLASSIFICATION

301.1 General: All buildings and structures shall be classified with respect to use in one of the use groups listed below.

1. Use Group A assembly (see Section 302.0).
2. Use Group B business (see Section 303.0).
3. Use Group E educational (see Section 304.0).
4. Use Group F factory and industrial (see Section 305.0).
5. Use Group H high hazard (see Section 306.0).
6. Use Group I institutional (see Section 307.0).
7. Use Group M mercantile (see Section 308.0).
8. Use Group R residential (see Section 309.0).
9. Use Group S storage (see Section 310.0).
10. Use Group U utility and miscellaneous (see Section 311.0).

301.2 Fire grading of buildings: All buildings and structures shall be graded in accordance with the degree of fire hazard of their use in terms of hours and fractions of an hour and as regulated by Section 902.0.

301.3 New uses: The code 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.

SECTION 302.0 USE GROUP A, ASSEMBLY USES

302.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group A which are used or designed for the gathering together of persons for purposes such as civic, social or religious functions, recreation,

food or drink consumption or awaiting transportation. A room or space used for assembly purposes by less than 50 persons and which is accessory to another use group shall be included as a part of that main use group.

* **302.2 Use Group A-1, theaters:** This use group shall include all theaters and all other buildings and structures, or parts thereof, intended for the production and viewing of the performing arts or motion pictures and usually provided with fixed seats, including theaters, motion picture theaters and television and radio studios admitting an audience. Stages and platforms shall comply with Section 615.0.

* **302.3 Use Group A-2 structures:** This use group 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.

302.4 Use Group A-3 structures: This use group shall include all buildings with or without an auditorium in which persons assemble for amusement, entertainment or recreation, and incidental motion picture, dramatic or theatrical 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.

302.5 Use Group A-4 structures: This use group shall include all buildings used as churches and for similar religious purposes.

302.6 Use Group A-5, outdoor assembly: This use group shall include structures used for outdoor assembly intended for participation in or reviewing activities including grandstands, bleachers, coliseums, stadiums, amusement park structures and fair or carnival structures. Such structures shall comply with the provisions of this code for special uses and occupancies (see Article 6).

SECTION 303.0 USE GROUP B, BUSINESS USES

303.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group B which are used for the transaction of business, for the rendering of professional services, or for other services that involve stocks of goods, wares or merchandise in limited quantities for use incidental to office uses or sample purposes.

303.2 List of business uses: The uses listed in Table 303.2 are indicative of and shall be classified as Use Group B.

Table 303.2
USE GROUP B, BUSINESS USES

Airport traffic control towers	Fire stations
Animal hospitals, kennels, pounds	Florists and nurseries
Automobile and other motor vehicle showrooms	Laboratories; testing and research
Banks	Laundries; pickup and delivery stations and self-service
Barber shops	Police stations
Beauty shops	Post offices
Car wash	Print shops
Civic administration	Professional services; attorney, dentist, physician, engineer, etc.
Clinic, outpatient	Radio and television stations
Dry cleaning; pickup and delivery stations and self-service	Telephone exchanges
Electronic data processing	

SECTION 304.0 USE GROUP E, EDUCATIONAL USES

304.1 General: All buildings and structures, or parts thereof, other than those used for business training or vocational training, shall be classified in Use Group E which are used by more than five persons at one time for educational purposes including, among others, schools, academies, colleges and universities. Educational type uses with a total occupant load less than 50 shall be classified as Use Group B. School buildings, or parts thereof, for business training or vocational training shall be classified in the same use group as the business or vocation taught.

304.1.1 Day care facilities: A day care facility which provides care for more than five persons more than 2½ years of age for less than 24 hours per day shall be classified as Use Group E.

SECTION 305.0 USE GROUP F, FACTORY AND INDUSTRIAL USES

305.1 General: All buildings and structures, or parts thereof, in which occupants are engaged in performing work or labor in the fabricating, assembling or processing of products or materials shall be classified in Use Group F; including, among others, factories, assembling plants, industrial laboratories and all other industrial and manufacturing uses, except those of Use Group H involving highly combustible, flammable or explosive products and materials.

305.2 Use Group F-1 structures: Factory and industrial uses which are not otherwise classified as low hazard Use Group F-2, shall be classified as moderate hazard factory and industrial, Use Group F-1. The manufacturing processes listed in Table 305.2 shall be indicative of and included in Use Group F-1.

305.3 Use Group F-2 structures: Factory and industrial uses which involve the fabrication or manufacturing of noncombustible materials which during finishing, packing or processing do not involve a significant fire hazard shall be classified as Use Group F-2. Except as herein provided, buildings of Use

Group F-2 shall comply with the requirements of the code for buildings of Use Group F-1. The manufacturing processes listed in Table 305.3 shall be indicative of and included in Use Group F-2.

Table 305.2
USE GROUP F-1 MODERATE HAZARD FACTORY AND INDUSTRIAL USES

Aircraft	Food processing
Appliances	Furniture
Athletic equipment	Hemp and jute products
Automobiles and other motor vehicles	Laundries
Bakeries	Leather and tanneries, excluding enameling or japanning
Beverages, alcoholic	Machinery
Bicycles	Millwork and woodworking, wood distillation
Boat building	Motion picture and television filming
Boiler works	Musical instruments
Brooms or brushes	Optical goods
Business machines	Paper mills or products
Cameras and photo equipment	Plastic products
Canneries, including food products	Printing or publishing
Clothing	Recreational vehicles
Condensed and powdered milk manufacture	Refuse incinerators
Construction and agricultural machinery	Shoes
Disinfectants	Soaps and detergents
Dry cleaning using other than flammable liquids in cleaning or dyeing operations or other than classified in Table 306.2	Sugar refineries
Electric light plants and power houses	Textile mills, including canvas, cotton cloth, bagging, burlap, carpets and rags
Electrolytic reducing works	Tobacco
Electronics	Trailers
Engines, including rebuilding	Upholstery and manufacturing shops
Film, photographic	

Table 305.3
USE GROUP F-2, LOW HAZARD FACTORY AND INDUSTRIAL USES

Beverages, nonalcoholic	Gypsum
Brick and masonry	Ice
Ceramic products	Metal fabrication and assembly
Foundries	Water pumping plants
Glass products	

SECTION 306.0 USE GROUP H, HIGH HAZARD USES

306.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group H which are used for the manufacturing, processing, generation or storage of corrosive, highly toxic, highly combustible, flammable or explosive materials that constitute a high fire or explosion hazard, including loose combustible fibers, dust and unstable materials.

306.2 List of high hazard uses: The processes, materials and manufactures listed in Table 306.2 are indicative of and shall be classified as Use Group H.

306.2.1 Exceptions: The following shall not be classified as Use Group H:

1. Any building or portion of a building containing less than the exempt amount of those materials shown in Table 306.2.1 when maintained in accordance with the fire prevention code listed in Appendix A.
2. Buildings containing rooms conforming to the requirements of Article 6 and the fire prevention code listed in Appendix A for such hazardous material.
3. Rooms containing flammable liquids in tightly-closed containers of one gallon (0.0038 m^3) capacity or less for retail sale or private use on the premises and in quantities not exceeding 2 gallons per square foot (0.082 m^3/m^2) of room area.
4. Rooms used for preparation or storage of food products for retail sale on the premises.
5. Retail paint salesrooms with quantities of paint not exceeding 2 gallons per square foot (0.082 m^3/m^2) of room area.
6. Liquor stores and distributors without bulk storage.
7. The storage or use of materials for agricultural purposes for use on the premises.
8. Closed systems housing flammable or combustible liquids or gases used for the operation of machinery or equipment.
9. Cleaning establishments which utilize combustible liquid solvents having a flash point of 140 degrees F. (60 degrees C.) or higher in closed systems employing equipment listed by an approved testing laboratory, provided this use is separated from all other areas of the building by 1 hour fireresistance rated construction.
10. Cleaning establishments which utilize a liquid solvent having a flash point at or above 200 degrees F. (93 degrees C.).
11. Refrigeration systems.
12. Tire retail stores without bulk storage.

Table 306.2
USE GROUP H, HIGH HAZARD USES

Bulk storage of tires.
Combustible dust and any similar solid material sufficiently comminuted for suspension in still air which, when so suspended, is capable of self-sustained combustion.
Combustible fibers and any similar readily ignitable and free burning fibers such as cotton, sisal, henequen, jute, hemp, tow, cocoa fiber, oakum, baled waste, baled wastepaper, kapok, hay, straw, excelsior, Spanish moss and other like material.
Combustible liquids having a flash point at or above 100 degrees F. (38 degrees C.). Combustible liquids shall be subdivided as follows:
Class II liquids shall include those having flash points at or above 100 degrees F. (38 degrees C.), and below 140 degrees F. (60 degrees C.).
Class III-A liquids shall include those having flash points at or above 140 degrees F. (60 degrees C.) and below 200 degrees F. (93 degrees C.).
Corrosive liquids which, when in contact with living tissue, will cause severe damage to

Table 306.2 (cont'd.)
USE GROUP H, HIGH HAZARD USES

such tissue by chemical action or are liable to cause fire when in contact with organic matter or with certain chemicals such as acids and alkaline caustic liquids.

Explosive material and any chemical compound, mixture or device, the primary and common purpose of which is to function by explosion with substantially simultaneous release of gas and heat, the resultant pressure being capable of destructive effects.

Flammable liquids having a flash point below 100 degrees F. (38 degrees C.), and having a vapor pressure not exceeding 40 psia (276 kPa) at 100 degrees F. (38 degrees C.). Class I liquids shall include those having flash points below 100 degrees F. (38 degrees C.), and may be subdivided as follows:

Class I-A shall include those having flash points below 73 degrees F. (23 degrees C.) and having a boiling point below 100 degrees F. (38 degrees C.).

Class I-B shall include those having flash points below 73 degrees F. (23 degrees C.) and having a boiling point at or above 100 degrees F. (38 degrees C.).

Class I-C shall include those having flash points at or above 73 degrees F. (23 degrees C.) and below 100 degrees F. (38 degrees C.).

The flash point of liquids having a flash point at or below 175 degrees F. (79 degrees C.), except for fuel oils and certain viscous materials, shall be determined in accordance with ASTM D56 listed in Appendix A.
The flash point of liquids having a flash point above 175 degrees F. (79 degrees C.), except for fuel oils, shall be determined in accordance with ASTM D92 listed in Appendix A.
The flash point of fuel oil and certain viscous materials having a flash point at or below 175 degrees F. (79 degrees C.) shall be determined in accordance with ASTM D93 listed in Appendix A.

Flammable gas having a flammability range with air greater than 1 percent by volume which is a liquid while under pressure and having a vapor pressure in excess of 27 psia (186 kPa) at a temperature of 100 degrees F. (38 degrees C.).

Flammable solids and any similar solid substance other than one classified as explosive, which is liable to cause fires through friction, through absorption of moisture, through spontaneous chemical change or as a result of retained heat from manufacturing or processing.

Liquefied petroleum gas which is composed predominately of the following hydrocarbons or mixtures of them, such as: propane, propylene, butane (normal butane or isobutane) and butylenes.

Nitromethane which is a combustible liquid which at 599 degrees F. (315 degrees C.) and 915 psig (6309 kPa) decomposes explosively and is an unstable material.

Oxidizing materials and any similar substances that readily yield oxygen to stimulate combustion, such as sodium nitrate, potassium chlorate and pyroxylin plastic.

Organic peroxide.

Unstable materials which polymerize, decompose, condense or become self-reactive when exposed to air, water, heat, shock or pressure.

Table 306.2.1
EXEMPT AMOUNTS OF HAZARDOUS MATERIALS, LIQUIDS AND CHEMICALS

Material	Maximum quantities[a]
1. Flammable liquids	
Class I-A	30 gal.[b]
Class I-B	60 gal.[b]
Class I-C	90 gal.[b]
2. Combustible liquids[c]	
Class II	120 gal.[b]
Class III-A	250 gal.[b]
3. Combination flammable liquids[a]	120 gal.[b]
4. Flammable gases	3,000 cu. ft. at one atmosphere of pressure at 70° F.
5. Liquefied flammable gases	60 gal.
6. Combustible fibers — loose	100 cu. ft.
7. Combustible fibers — baled	1,000 cu. ft.
8. Flammable solids	500 lbs.
9. Unstable materials	No exemptions
10. Corrosive liquids	55 gal.
11. Oxidizing material — gases	6,000 cu. ft.
12. Oxidizing material — liquids	50 gal.
13. Oxidizing material — solids	500 lbs.
14. Organic peroxides	10 lbs.
15. Nitromethane (unstable materials)	No exemptions
16. Ammonium nitrate	1,000 lbs.
17. Ammonium nitrate compound mixtures containing more than 60% nitrate by weight	1,000 lbs.
18. Highly toxic material and poisonous gas	No exemptions
19. Smokeless powder	20 lbs.[d]
20. Black sporting powder	5 lbs.[d]

Note a. Containing not more than the exempt amounts of Class 1-A, 1-B or 1-C flammable liquids.
Note b. The maximum quantities shall be increased by 100 percent in areas which are not accessible to the public. In buildings where automatic fire suppression systems are installed, the maximum quantities shall be increased 100 percent in the areas accessible to the public.
Note c. Tank storage up to 660 gallons for fuel burning equipment meeting the requirements of the mechanical code or the fire prevention code listed in Appendix A shall be permitted.
Note d. Maximum quantities in the amount specified by NFiPA 495 shall be permitted when stored in accordance with NFiPA 495 listed in Appendix A.
Note e. 1 gallon = 0.00379 m^3; 1 cubic foot = 0.028 m^3; 1 pound = 0.454 kg.

SECTION 307.0 USE GROUP I, INSTITUTIONAL USES

307.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group I 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 correction purposes, or in which the liberty of the inmates is restricted.

307.2 Use Group I-1: This use group shall include buildings or parts thereof housing six or more individuals who, because of age, mental disability or other reasons, must live in a supervised environment but who are physically capable of responding to an emergency situation without personal assistance.

The following types of facilities when accommodating persons of the above description shall be classified as an I-1 facility: board and care facility, half-way house, group home, social rehabilitation facility, alcohol and drug center and convalescent facility. A facility such as the above with five or less occupants shall be classified as a residential use group.

307.3 Use Group I-2: This use group shall include buildings or parts thereof used for medical, surgical, psychiatric, nursing or custodial care on a 24-hour basis of six or more persons who are not capable of self-preservation. The following types of facilities, when accommodating persons of the above description, shall be classified as I-2 facilities: hospital, nursing home (both intermediate care facility and skilled nursing facility), mental hospital, and detoxification facility. A facility such as the above with five or less occupants shall be classified as a residential use group.

307.3.1 Child care facility: A child care facility which accommodates more than five children 2½ years of age or less shall be classified as Use Group I-2.

307.4 Use Group I-3: This use group shall include buildings or parts thereof inhabited by six or more persons who are under some restraint or security. An I-3 facility is occupied by persons who are generally incapable of self-preservation due to security measures not under the occupants' control. The following types of facilities, when accommodating persons of the above description, shall be classified as I-3 facilities: prisons, jails, reformatories, detention centers, correctional centers and pre-release centers. Buildings of Use Group I-3 shall be classified as one of the subclassifications indicated in Sections 307.4.1 through 307.4.5 (see Section 611.0).

307.4.1 Use Condition I: This use condition shall include all buildings in which free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via means of egress without restraint. A Use Condition I facility shall be classified in Use Group R.

307.4.2 Use Condition II: This use condition shall include all buildings in which free movement is allowed from sleeping areas and any other occupied smoke compartment to one or more other smoke compartments. Egress to the exterior is impeded by locked exits.

307.4.3 Use Condition III: This use condition shall include all buildings in which free movement is allowed within individual smoke compartments, such as within a residential unit comprised of individual sleeping rooms and group activity space, with egress impeded by remote control release of means of egress from such smoke compartment to another smoke compartment.

307.4.4 Use Condition IV: This use condition shall include all buildings in which free movement is restricted from an occupied space. Remote controlled release is provided to permit movement from all sleeping rooms, activity space and other occupied areas within the smoke compartment and to other smoke compartments.

307.4.5 Use Condition V: This use condition shall include all buildings in

which free movement is restricted from an occupied space. Staff controlled release is provided to permit movement from all sleeping rooms, activity spaces and other occupied areas within the smoke compartment and to other smoke compartments.

SECTION 308.0 USE GROUP M, MERCANTILE USES

308.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group M 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, motor fuel service stations, shops and salesrooms and markets. Highly combustible goods shall be limited to small quantities that do not constitute a high hazard; and if not so limited, the construction shall comply with the requirements for Use Group H as set forth in the provisions of Section 306.0 and Tables 401 and 501.

SECTION 309.0 USE GROUP R, RESIDENTIAL USES

309.1 General: All buildings and structures, or parts thereof, shall be classified in Use Group R 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.

309.2 Use Group R-1 structures: This use group shall include all hotels, motels, boarding houses and similar buildings arranged for shelter and sleeping accommodations and in which the occupants are primarily transient in nature, making use of the facilities for a period of less than 30 days.

309.3 Use Group R-2 structures: This use group shall include all multiple-family dwellings having more than two dwelling units, except as provided in Section 910.3 for multiple single-family dwelling units, and shall also include all boarding houses and similar buildings arranged for shelter and sleeping accommodations in which the occupants are primarily not transient in nature.

309.3.1 Dormitories: A dormitory facility which accommodates more than five persons more than 2½ years of age shall be classified as Use Group R-2.

309.4 Use Group R-3 structures: This use group shall include all buildings arranged for the use of one- or two-family dwelling units, including not more than five lodgers or boarders per family, and as provided in Section 910.3 for multiple single-family dwelling units.

309.4.1 Child care facilities: A child care facility which accommodates five or less children of any age shall be classified as Use Group R-3.

309.5 Use Group R-4 structures: This use group shall include all detached one-or two-family dwellings not more than three stories in height, and their accessory structures as indicated in the *One and Two Family Dwelling Code* listed in Appendix A. All such structures shall be designed and built in accordance with the requirements of this code for a Use Group R-3 structure,

r with the requirements of the *One and Two Family Dwelling Code*, except hat the requirements of the State Plumbing Code (Article 28) shall supersede hose conflicting requirements of the *One and Two Family Dwelling Code*. This choice shall be made by the builder at the time of plans submission. Nevertheless, any builder may use Exception #3 of Section 809.4 to determine minimum size of egress windows.

SECTION 310.0 USE GROUP S, STORAGE USES

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

310.2 List of moderate hazard uses: Buildings used for the 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 310.2, shall be classified in Use Group S-1.

Table 310.2
USE GROUP S-1 STORAGE USES, MODERATE HAZARD

Bags, cloth, burlap and paper	Linoleum
Bamboo and rattan	Livestock shelters
Baskets	Lumber yards
Belting, canvas and leather	Motor vehicle repair shops
Books and paper in rolls or packs	Petroleum warehouses for storage of lubricating oils with a flash point of 200 degrees F. (93.33 degrees C.) or higher
Boots and shoes	Photo engraving
Buttons, including cloth covered, pearl or bone	Public garages (Group 1) and stables
Cardboard and cardboard boxes	Silk
Clothing, woolen wearing apparel	Soap
Cordage	Sugar
Furniture	Tobacco, cigars, cigarettes and snuff
Furs	Upholstering and mattress manufacturing
Glue, mucilage, paste and size	Wax candles
Horn and combs, other than celluloid	
Leather, enameling or japanning	

310.3 List of low hazard uses: Low hazard uses shall include buildings used for the storage of noncombustible materials, and of low hazard wares that do not ordinarily burn rapidly such as products on wood pallets or in paper cartons without significant amounts of combustible wrappings, but with a negligible amount of plastic trim such as knobs, handles or film wrapping. Such uses shall be classified as Use Group S-2 including, among others, the materials listed in Table 310.3.

Table 310.3
USE GROUP S-2 STORAGE USES, LOW HAZARD

Asbestos	Gypsum board
Beer or wine up to 12% alcohol in metal, glass or ceramic containers	Inert pigments
Cement in bags	Ivory
Chalk and crayons	Meats
Dairy products in nonwaxed coated paper containers	Metal cabinets
Dry cell batteries	Metal desks with plastic tops and trim
Electrical coils	Metal parts
Electrical motors	Metals
Food products	Mirrors
Foods in noncombustible containers	New empty cans
Fresh fruits and vegetables in nonplastic trays or containers	Oil filled and other types of distribution transformers
Frozen foods	Open parking structures
Glass	Porcelain and pottery
Glass bottles, empty or filled with noncombustible liquids	Public garages (Group 2)
	Stoves
	Talc and soapstones
	Washers and dryers

310.4 Tobacco auction warehouses: Warehouses, for the sale of tobacco only, of Type 1, Type 2, or Type 3 construction, may be constructed without a sprinkler system when all of the following requirements have been met.

1. The initial submission of plans to the Department of Housing, Buildings and Construction shall include a signed certificate by the owner that the warehouse will be used solely for the sale of tobacco on a seasonal basis or for the storage of noncombustibles.
2. A manual fire alarm and automatic fire and smoke detection system with notification to the local fire service shall be provided with installation in accordance with Section 1017.0 of this code.
3. An 18 foot paved and posted fire lane surrounding the entire perimeter of the building shall be provided and be accessible from a public street.
4. A 50 foot fire separation shall be maintained between the warehouse and the lot line and the warehouse and the nearest building.

SECTION 311.0 USE GROUP U, UTILITY AND MISCELLANEOUS USES

311.1 General: Buildings and structures of an accessory character and miscellaneous structures not classified in any specific use group shall be constructed, equipped and maintained to meet the requirements of this code commensurate with the fire and life hazard incidental to their use. Utility and miscellaneous uses shall include fences over 6 feet (1829 mm) high, tanks, cooling towers, retaining walls and buildings such as private garages, carports, sheds and agricultural buildings.

SECTION 312.0 DOUBTFUL USE CLASSIFICATION

312.1 General: When a building or structure is proposed for a use not specifically provided for in this 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 code official.

SECTION 313.0 MIXED USE AND OCCUPANCY

313.1 Two or more uses: When a building is occupied for two or more uses, not included in the same use group, one of the following Sections 313.1.1 through 313.1.4 shall apply.

313.1.1 Nonseparated uses: 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.

313.1.2 Separated uses: 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 902 for the separate uses. Each part of the building shall be separately classified 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.

313.1.3 Separate buildings: The mixed uses shall be completely separated by fire walls having a fireresistance rating corresponding to the highest fire grading prescribed in Table 902 for the separate uses. Each use group shall then comply with the provisions of this code applicable to that group.

313.1.4 Incidental uses: Where the use is supplemental to the main use of the building and the area devoted to such use does not occupy more than 10 percent of the area of any floor nor more than the basic area permitted by Table 501, the building shall be classified according to the main use. Where the incidental use is a higher hazard than the main use, it shall be constructed and segregated by fireresistance-rated construction as required in Section 313.1.2, except that specific use areas within buildings of Use Groups I-2 and I-3 shall conform to Sections 610.2 and 611.7 respectively.

313.2 High hazard uses: A place of public assembly or education shall not be permitted in a building classified in Use Group H.

313.3 Means of egress: The means of egress requirements shall be applied in accordance with Section 802.2.

313.4 Open parking facilities beneath other use groups: Open parking structures constructed under Use Groups A, I, B, M and R shall not exceed the height and area limitations permitted under Section 607.0. The height and area of the structure for the occupancy above the open parking facility shall be in accordance with Section 501.0. The height of the entire building shall be the

distance defined in Section 201.0 and shall not exceed the limitations for the upper occupancy in Section 501.3. Fire separation for wall assemblies and floor/ceiling assemblies between the parking occupancy and the upper occupancy shall correspond to the highest fire grading prescribed in Table 902 for the uses involved. The type of construction shall apply to each occupancy individually, except that all structural members including main bracing within the open parking structure necessary to the support of the upper occupancy shall be protected with more restrictive fireresistive assemblies of the occupancies involved as shown in Table 401. Exit facilities for the upper occupancy shall conform to Article 8 and shall be separated from the parking area by walls having at least a 2-hour fireresistance-rating as required by Table 401 and self-closing doors complying with Section 916.0. Means of egress from the opening parking facility shall comply with Section 809.5.

ARTICLE 4

TYPES OF CONSTRUCTION CLASSIFICATION

SECTION 400.0 GENERAL

400.1 Scope: The provisions of this article shall control the classification of all buildings as to type of construction.

400.2 Application of other laws: The provisions of this article shall not be deemed to nullify any provisions of the zoning law or any other statute of the jurisdiction pertaining to the location, or type of construction of buildings, except as is specifically required by the provisions of this code.

SECTION 401.0 CONSTRUCTION CLASSIFICATION

401.1 General: All buildings and structures erected or to be erected, altered or extended in height or area shall be classified in any one or in a combination of the five construction types defined in Table 401 and Sections 402.0 through 406.0.

401.2 False designation: A building shall not be designated a given type of construction unless it conforms to the minimum requirements for that type. 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.

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

401.4 Noncombustibility requirements: Where a structure or a part of a structure is required to be constructed of noncombustible construction, the use of combustible elements shall be permitted subject to the limitations of this section without altering the construction classification.

401.4.1 Roofs, floors and walls: Combustible elements in roofs, floors and walls are permitted to be used for the following components:

1. Interior finish and trim materials as regulated by Sections 922.0, 923.0 and 924.0.

Table 401
FIRERESISTANCE RATINGS OF STRUCTURE ELEMENTS (IN HOURS)

Structure element		Type of construction Section 401.0									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1 Section 402.0		Type 2 Section 403.0			Type 3 Section 404.0		Type 4 Section 405.0	Type 5 Section 406.0	
		Protected		Protected		Unprotected	Protected	Unprotected	Heavy timber Note c	Protected	Unprotected
Note a		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
1 Exterior walls	Load-bearing	4	3	2	1	0	2	2	2	1	0
	Nonload-bearing	← Not less than the rating based on fire separation distance (see Section 906.2) →									
2 Fire walls and party walls (Section 908.0)		4	3	2	2	2	2	2	2	2	2
3 Fire separation assemblies (Sections 313.0, 910.0 and 913.0)		← Not less than fire grading of use group — (see Table 902) →									
4 Smoke barriers (Section 911.0 and Note g).		← Fireresistance rating corresponding to fire grading of use group — (see Table 902) →									
5 Fire enclosures of exits, exit hallways and stairways (Section 816.9.2, 910.0 and Note b).		1	1	1	1	1	1	1	1	1	1
6 Shafts (other than exits) and elevator hoistways (Sections 910.0, 915.0 and Note b)		2	2	2	2	2	2	2	2	2	2
7 Exit access corridors (Notes f, g)		2	2	2	2	2	2	2	2	1	1
8 Separations	Tenant spaces (Note f)	1	1	1	1	1	1	1	1	1	1
	Dwelling unit (Note f)	← Note d →									
	Other nonbearing partitions	1	1	1	1	0	1	0	1	1	0
		← Note d →									
		0	0	0	0	0	0	0	0	0	0
		← Note d →									

Table 401 (cont'd.)
FIRERESISTANCE RATINGS OF STRUCTURE ELEMENTS (IN HOURS)

Structure element (Note a)		Type of construction Section 401.0									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1 Section 402.0		Type 2 Section 403.0			Type 3 Section 404.0		Type 4 Section 405.0	Type 5 Section 406.0	
		Protected		Protected		Unprotected	Protected	Unprotected	Heavy timber Note c	Protected	Unprotected
		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
9 Interior bearing walls, bearing partitions, columns, girders, trusses (other than roof trusses) and framing (Section 912.0)	Supporting more than one floor	4	3	2	1	0	1	0	see Sec. 405.0	1	0
	Supporting one floor only or a roof only	3	2	1½	1	0	1	0	see Sec. 405.0	1	0
10 Structural members supporting wall (Section 912.0 and Note g)		3	2	1½	1	0	1	0	1	1	0
11 Floor construction including beams (Section 913.0 and Note h)		3	2	1½	1	0	1	0	see Sec. 405.0 Note c	1	0
12 Roof construction, including beams, trusses and framing, arches and roof deck (Section 914.0 and Notes e, i)	15' or less in height to lowest member	2	1½	1	1	0	1	0	see Sec. 405.0 Note c	1	0
	More than 15 but less than 20' in height to lowest lowest member	1	1	1	0	0	0	0	see Sec. 405.0	1	0
	20' or more in height to lowest member	0	0	0	0	0	0	0	see Sec. 405.0	0	0

Not less than fireresistance rating of wall supported

Note d

Note a. For increased fireresistance rating requirements in special high hazard uses involving a higher degree of fire severity and higher concentration of combustible contents, see Section 600.2. For fireresistance rating requirements for structural membranes and assemblies which support other fireresistance rated members or assemblies, see Section 912.1.
Note b. For reductions in the required fireresistance rating of exit and shaft enclosures, see Sections 816.9.2 and 915.3.
Note c. For substitution of other structural materials for timber in Type 4 construction, see Section 1702.2.
Note d. Fire-retardant treated wood permitted, see Sections 903.5 and 905.3.
Note e. For permitted uses of heavy timber in roof construction in buildings of Types 1 and 2 construction, see Section 914.4.
Note f. For reductions in required fireresistance ratings of exit access corridors, tenant separations and dwelling unit separations, see Section 810.4 and 810.4.1.
Note g. For exceptions to the required fireresistance rating of construction supporting exit access corridors and smoke barriers, see Sections 910.6 and 911.2.
Note h. For buildings having habitable or occupiable stories or basements below grade, see Section 807.3.1.
Note i. 1 foot = 304.8 mm.

2. Light-transmitting plastics as permitted by Articles 20, 21, 22 and 23.
3. Fire-retardant treated wood as permitted by Section 903.0.
4. Mastics and caulking materials applied to provide flexible seals between components of exterior wall construction.
5. Roof covering materials as regulated by Section 2301.0.
6. Thermal and sound insulation as permitted by Sections 908.4, 928.0, 1709.4, 2002.0 and 2301.4.
7. Exterior veneer and trim as permitted by Sections 926.2 and 2105.0.
8. Nailing or furring strips as permitted by Sections 900.3.1 and 923.0.
9. Windows and doors as permitted by Section 907.4.
10. Heavy timber as permitted by Sections 807.3.1 and 914.2.
11. Partitions as permitted by Section 905.3.
12. Roof structures as permitted by Section 927.0.

401.4.2 Ducts: Nonmetallic ducts as permitted by the mechanical code listed in Appendix A.

401.4.3 Piping: Combustible piping materials as permitted by the mechanical and plumbing codes listed in Appendix A.

401.4.4 Electrical: Insulated electrical wiring and related components as regulated by NFiPA 70 listed in Appendix A.

SECTION 402.0 TYPE 1 CONSTRUCTION

402.1 General: Buildings and structures of Type 1 construction are those in which the walls, partitions, structural elements, floors, ceilings, roofs, and the exits are constructed and protected with approved noncombustible materials to afford the fireresistance rating specified in Table 401, except as otherwise specificially regulated by the provisions of Article 9. Type 1 buildings shall be further classified as Types 1A and 1B. Fire-retardant treated wood shall only be used as specified in Table 401 and Section 903.5.

SECTION 403.0 TYPE 2 CONSTRUCTION

403.1 General: Buildings and structures of Type 2 construction are those in which the walls, partitions, structural elements, floors, ceilings, roofs, and the exits are constructed of approved noncombustible materials meeting the fireresistance rating requirements specified in Table 401, except as further regulated in Article 9. Type 2 buildings shall be further classified as Types 2A, 2B, and 2C. Fire-retardant treated wood shall only be used as specified in Table 401 and Section 903.5.

SECTION 404.0 TYPE 3 CONSTRUCTION

404.1 General: Buildings and structures of Type 3 construction are those in which the exterior, fire and party walls are constrtructed of masonry or other approved noncombustible materials of the required fireresistance rating 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 rating of the walls supported thereon; and all structural elements shall have the required fireresistance rating specified in Table 401.

404.2 Type 3A: Structures of Type 3A construction shall include all Type 3 buildings in which the interior structural elements are wholly or partly of fire protected wood of not less than 2-inch nominal thickness, or of other approved protected combustible materials, or of metal protected and insulated to afford the fireresistance rating specified in Table 401.

404.3 Type 3B: Structures of Type 3B construction shall include all Type 3 buildings in which the interior structural members are of wood of not less than 2-inch nominal thickness or consist of other combustible or noncombustible materials with protection of less than 1-hour fireresistance rating.

SECTION 405.0 TYPE 4 CONSTRUCTION

405.1 General: Buildings and structures of Type 4 construction are those in which the exterior walls are of noncombustible materials having a fireresistance rating not less than that specified in Table 401 and the interior structural members are of solid or laminated wood without concealed spaces. The elements of Type 4 construction shall comply with the provisions of this section (see Section 1702.0 for construction details).

405.2 Columns: Wood columns shall be sawn or glued laminated and shall be not less than 8 inches, nominal, in any dimension when supporting floor loads and not less than 6 inches, nominal, in width and not less than 8 inches, nominal, in depth when supporting roof and ceiling loads only. Columns shall be continuous or superimposed and connected in an approved manner.

405.3 Floor framing: Beams and girders of wood shall be sawn or glued laminated timber and shall be not less than 6 inches, nominal, in width and not less than 10 inches, nominal, in depth. Framed sawn or glued laminated timber arches which spring from the floor line and support floor loads shall be not less than 8 inches, nominal, in any dimension. Framed timber trusses supporting floor loads shall have members of not less than 8 inches, nominal, in any dimension.

405.4 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 6 inches, nominal, in width and not less than 8 inches, nominal, in depth for the lower half of the height and not less than 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 does not support floor loads shall have members not less than 4 inches, nominal, in width and not less than 6 inches, nominal, in depth. Spaced members shall be composed of two or more pieces not less than 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 2 inches, nominal, in thickness, secured to the underside of the members. Splice plates shall be not less than 3 inches, nominal, in thickness. When protected by approved automatic sprinklers under the roof deck, framing members shall be not less than 3 inches, nominal, in width.

405.5 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 3 inches, nominal, in thickness covered with 1 inch, nominal, dimension tongue and groove flooring, laid crosswise or diagonally, or $^{15}/_{32}$-inch plywood or ½-inch particle board; or of planks not less than 4 inches, nominal, in width, set on edge close together and well spiked, and covered with 1-inch nominal, dimension flooring, or $^{15}/_{32}$-inch plywood, or ½-inch particle board. The lumber shall be laid so that no continuous line of joints will occur except at points of support. Floors shall not extend closer than ½ inch (13 mm) to walls. Such ½-inch (13 mm) spaces shall be covered by a molding fastened to the wall either above or below the floor and so arranged that it will not obstruct the swelling or shrinkage movements of the floor, or corbeling of masonry walls under floor shall be used in place of molding.

405.6 Roofs: Roofs shall be without concealed spaces and roof decks shall be sawn or glued laminated, splined or tongue and groove plank, not less than 2 inches, nominal, in thickness, 1⅛-inch thick interior plywood (exterior glue), or of planks not less than 3 inches, nominal, in width, set on edge close together and laid as required for floors. Other types of decking shall only be used if providing equivalent fireresistance rating and structural properties.

405.7 Walls: Walls shall be of solid wood construction formed by not less than two layers of 1-inch matched boards or laminated construction of a 4-inch thickness, or of 1-hour fireresistance rated construction.

405.8 Exterior structural members: Wood columns and arches conforming to heavy timber sizes shall only be used externally where a fire separation distance of 20 feet (6096 mm) or more is provided.

SECTION 406.0 TYPE 5 CONSTRUCTION

406.1 General: Buildings and structures of Type 5 construction are those in which the exterior walls, bearing walls, partitions, floor and roof construction are constructed of any materials permitted by this code and in which the structural elements have the required fireresistance ratings specified in Table 401. Type 5 buildings shall be further classified as Types 5A and 5B.

ARTICLE 5

GENERAL BUILDING LIMITATIONS

SECTION 500.0 GENERAL

500.1 Scope: The provisions of this article control the height and area of all buildings hereafter erected, and extensions to existing buildings hereafter altered or enlarged as a function of the type of construction, use group, exterior exposure and accessibility of buildings and structures for fire fighting purposes.

SECTION 501.0 GENERAL AREA AND HEIGHT LIMITATIONS

501.1 General: The areas and heights of all buildings and structures between exterior walls, or between exterior walls and fire walls, shall be governed by the type of construction and the use group classification as defined in Articles 3 and 4 and shall not exceed the limits fixed in Table 501, except as specifically modified by this section and Sections 502.0, 503.0, 504.0, 601.6, 602.3.1.4, 603.1.2, 604.2.5, 616.2, 617.2 and 905.2.

501.1.1 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, structural metal fabrication shops 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 501.

501.1.2 Open parking structures: Open parking structures shall conform to the height and area limitations in Section 607.5.

501.2 Area limit: The area limitations specified in Table 501 shall apply to the maximum horizontally projected area of all buildings fronting on a street, or public space not less than 30 feet (9144 mm) in width accessible to a public street.

501.2.1 Buildings on same lot: Two or more buildings on the same lot shall be regulated as separate buildings or shall be considered as portions of one building if the height of each building and the aggregate area of all buildings are within the limitations of Table 501 as modified by Sections 502.0 and 504.0. The provisions of this code applicable to the aggregate building shall be applicable to each building.

501.3 Height limit: The height in feet and number of stories above grade specified in Table 501 shall apply to all buildings and to all separate parts of a building enclosed within lawful fire walls complying with the provisions of

Table 501
HEIGHT AND AREA LIMITATIONS OF BUILDINGS

Height limitations of buildings (shown in upper figure as stories and feet above grade), and area limitations of one or two story buildings facing on one street or public space not less than 30 feet wide (shown in lower figure as area in square feet per floor). See Note a.

N.P. — Not permitted
N.L. — Not limited

Use Group	Note a	Type of construction									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1		Type 2			Type 3		Type 4	Type 5	
		Protected Note b		Protected		Unprotected	Protected	Unprotected	Heavy timber	Protected	Unprotected
		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
A-1 Assembly, theaters		N.L.	N.L.	5 St. 65' 19,950	3 St. 40' 13,125	2 St. 30' 8,400	3 St. 40' 11,550	2 St. 30' 8,400	3 St. 40' 12,600	1 St. 20' 8,925	1 St. 20' 4,200
A-2 Assembly, night clubs and similar uses		N.L.	4 St. 50' 7,200	3 St. 40' 5,700	2 St. 30' 3,750	1 St. 20' 2,400	2 St. 30' 3,300	1 St. 20' 2,400	2 St. 30' 3,600	1 St. 20' 2,550	1 St. 20' 1,200
A-3 Assembly	Lecture halls, recreation centers, terminals, restaurants other than night clubs	N.L.	N.L.	5 St. 65' 19,950	3 St. 40' 13,125	2 St. 30' 8,400	3 St. 40' 11,550	2 St. 30' 8,400	3 St. 40' 12,600	1 St. 20' 8,925	1 St. 20' 4,200
A-4 Assembly, churches	Note d	N.L.	N.L.	5 St. 65' 34,200	3 St. 40' 22,500	2 St. 30' 14,400	3 St. 40' 19,800	2 St. 30' 14,400	3 St. 40' 21,600	1 St. 20' 15,300	1 St. 20' 7,200
B Business		N.L.	N.L.	7 St. 85' 34,200	5 St. 65' 22,500	3 St. 40' 14,400	4 St. 50' 19,800	3 St. 40' 14,400	5 St. 65' 21,600	3 St. 40' 15,300	2 St. 30' 7,200
E Educational	Note c,d	N.L.	N.L.	5 St. 65' 34,200	3 St. 40' 22,500	2 St. 30' 14,400	3 St. 40' 19,800	2 St. 30' 14,400	3 St. 40' 21,600	1 St. 20' 15,300	1 St. 20' 7,200
F Factory and industrial	Note h	N.L.	N.L.	6 St. 75' 22,800	4 St. 50' 15,000	2 St. 30' 9,600	3 St. 40' 13,200	2 St. 30' 9,600	4 St. 50' 14,400	2 St. 30' 10,200	1 St. 20' 4,800
H High hazard	Note e	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' 6,600	1 St. 20' 4,800	2 St. 30' 7,200	1 St. 20' 5,100	N.P.
I-1 Institutional, residential care		N.L.	N.L.	9 St. 100' 19,950	4 St. 50' 13,125	3 St. 40' 8,400	4 St. 50' 11,550	3 St. 40' 8,400	4 St. 50' 12,600	3 St. 40' 8,925	2 St. 35' 4,200
I-2 Institutional, incapacitated		N.L.	8 St. 90' 21,600	4 St. 50' 17,100	2 St. 30' 11,250	1 St. 20' 7,200	1 St. 20' 9,900	N.P.	1 St. 20' 10,800	1 St. 20' 7,650	N.P.
I-3 Institutional, restrained		N.L.	6 St. 75' 18,000	4 St. 50' 14,250	2 St. 30' 9,375	1 St. 20' 6,000	2 St. 30' 8,250	1 St. 20' 6,000	2 St. 30' 9,000	1 St. 20' 6,375	N.P.

M Mercantile	N.L.	N.L.	6 St. 75' 22,800	4 St. 50' 15,000	2 St. 30' 9,600	3 St. 40' 13,200	2 St. 30' 9,600	4 St. 50' 14,400	2 St. 30' 10,200	1 St. 20' 4,800
R-1 Residential, hotels	N.L.	N.L.	9 St. 100' 22,800	4 St. 50' 15,000	3 St. 40' 9,600	4 St. 50' 13,200	3 St. 40' 9,600	4 St. 50' 14,400	3 St. 40' 10,200	2 St. 35' 4,800
R-2 Residential, multi-family	N.L.	N.L.	9 St. 100' 22,800	4 St. 50' 15,000 Note f	3 St. 40' 9,600	4 St. 50' 13,200 Note f	3 St. 40' 9,600	4 St. 50' 14,400	3 St. 40' 10,200	2 St. 35' 4,800
R-3 Residential, one and two family	N.L.	N.L.	4 St. 50' 22,800	4 St. 50' 15,000	3 St. 40' 9,600	4 St. 50' 13,200	3 St. 40' 9,600	4 St. 50' 14,400	3 St. 40' 10,200	2 St. 35' 4,800
S-1 Storage, moderate	N.L.	N.L.	5 St. 65' 19,950	4 St. 50' 13,125	2 St. 30' 8,400	3 St. 40' 11,550	2 St. 30' 8,400	4 St. 50' 12,600	2 St. 30' 8,925	1 St. 20' 4,200
S-2 Storage, low Note g	N.L.	N.L.	7 St. 85' 34,200	5 St. 65' 22,500	3 St. 40' 14,400	4 St. 50' 19,800	3 St. 40' 14,400	5 St. 65' 21,600	3 St. 40' 15,300	2 St. 30' 7,200
U Utility, miscellaneous	N.L.	N.L.								

Note a. See the following sections for general exceptions to Table 501:
Section 501.4 Allowable area reduction for multi-story buildings.
Section 502.2 Allowable area increase due to street frontage.
Section 502.3 Allowable area increase due to automatic fire suppression system installation.
Section 503.1 Allowable height increase due to automatic fire suppression system installation.
Section 504.0 Unlimited area one-story buildings.

Note b. Buildings of Type 1 construction permitted to be of unlimited tabular heights and areas are not subject to special requirements that allow increased heights and areas for other types of construction (see Section 501.5).

Note c. For tabular area increase in buildings of Use Group E, see Section 502.4.

Note d. For height exceptions for auditoriums in buildings of Use Groups A-4 and E, see Section 503.2.

Note e. For exceptions to height and area limitations for buildings of Use Group H, see Article 6 governing the specific use. For other special fireresistive requirements governing specific uses, see Section 905.0.

Note f. For exceptions to height of buildings for Use Group R-2 of Types 2B and 3A construction, see Section 905.2.

Note g. For height and area exceptions for open parking structures, see Section 607.0.

Note h. For exceptions to height and area limitations for special industrial uses, see Section 501.1.1.

Note i. 1 foot = 304.8 mm; 1 square foot = 0.093 m².

Article 9. A basement shall be considered as a story above grade when the distance from grade to the finished surface of the floor above the basement is more than 6 feet (1829 mm) for more than 50 percent of the total perimeter or more than 12 feet (3658 mm) at any point.

501.4 Multi-story buildings: The area limits for buildings two stories in height shall be the same as the area limits provided in Table 501 for one-story buildings. In buildings over two stories in height, the area limits of Table 501 for one-story buildings shall be reduced as specified in Table 501.4.

Table 501.4
PERCENT REDUCTION OF AREA LIMITS

No. of stories	Type of construction		
	1A & 1B	2A	2B, 2C, 3A, 3B, 4, 5A, 5B
1	None	None	None
2	None	None	None
3	None	5%	20%
4	None	10%	20%
5	None	15%	30%
6	None	20%	40%
7	None	25%	50%
8	None	30%	60%
9	None	35%	70%
10	None	40%	80%

501.5 Type 1 construction: Buildings of Type 1 construction permitted to be of unlimited tabular heights and areas in Table 501 are not subject to the special requirements that allow increased heights and areas for other types of construction.

SECTION 502.0 AREA MODIFICATIONS

502.1 General: The provisions of this section shall modify the area limits of Table 501 as herein specified.

502.2 Street frontage increase: When a building or structure has more than 25 percent of the building perimeter fronting on a street or other unoccupied space, the area limitations specified in Table 501 shall be increased 2 percent for each 1 percent of such excess frontage. The unoccupied space shall be on the same lot or dedicated for public use, and not less than 30 feet (9144 mm) in width accessible from a street by a posted fire lane not less than 18 feet (5486 mm) in width.

502.3 Automatic fire suppression system: When a building of other than Use Group H is equipped throughout with an approved automatic fire suppression system, the area limitation specified in Table 501 shall be increased by 200 percent for one- and two-story buildings and 100 percent for buildings more than two stories in height. An approved limited-area sprinkler system is not considered as an approved automatic fire suppression system for the purposes of this section.

502.4 School buildings: When every classroom of a one-story school building of Use Group E has at least one door opening directly to the exterior of the building, the area limitations specified in Table 501 shall be increased 200 percent. Not less than one-half of the required exits from any assembly room included in such buildings shall also open directly to the exterior of the building.

SECTION 503.0 HEIGHT MODIFICATIONS

503.1 Automatic fire suppression systems: When a building is equipped throughout with an approved automatic fire suppression system, the building height limitation specified in Table 501 shall be increased one story and 20 feet (6096 mm). This increase shall not apply to buildings of Use Group I-2 of Types 2C, 3A, 4 and 5A construction nor to buildings of Use Group H. An approved limited-area sprinkler system is not considered an approved automatic fire suppression system for the purposes of this section.

503.2 Auditoriums: The maximum height of auditoriums in Use Groups A-4 and E shall be 65 feet (19812 mm) when of Type 2B, 3A, 4 or 5A construction and 45 feet (13716 mm) when of Type 2C, 3B or 5B construction.

SECTION 504.0 UNLIMITED AREAS

504.1 One-story buildings: In other than Type 5 construction, the area of all buildings of Use Groups A-3, B, F, I-2, M and S not including high hazard uses, which do not exceed one story or 85 feet (25908 mm) in height shall not be limited provided the exit facilities comply with the provisions of Article 8, an automatic fire suppression system is provided throughout in accordance with the provisions of Section 1002.0 and the building is isolated as specified in Section 504.2.

Exceptions

1. Buildings and structures of special industrial uses according to Section 501.1.1 shall be exempt from the above height limits and fire separation distance requirements, and the automatic fire suppression system shall not be provided when such installations would be detrimental or dangerous to the specific use and occupancy as approved by the code official. When located with a fire separation distance of less than 30 feet (9144 mm), the exterior walls of such buildings shall be protected or constructed to provide a fireresistance rating of not less than 2 hours.
2. A fire suppression system shall not be required for buildings of Type 2 or Type 4 construction used exclusively for storage of noncombustible material, not packed or crated in combustible material.
3. When buildings and structures of Types 1 and 2 construction for rack storage facilities do not have access by the public, they shall not be limited in height provided they conform to the requirements of Section 504.1 and NFiPA 231C listed in Appendix A.

504.1.1 School buildings: One-story school buildings of Use Group E of Type 2, 3A or 4 construction shall not be limited in area when a direct exit to the outside of the building is provided from each classroom and the building is equipped with an approved automatic fire suppression system throughout. Exterior walls on all sides of such buildings shall comply with Section 504.2.

504.1.2 Indoor recreation buildings: Indoor participant sport areas such as tennis courts, skating rinks, swimming pools and equestrian clubs shall not be limited in area and shall be exempt from the automatic fire suppression system requirements provided the requirements of Sections 504.1.2.1 through 504.1.2.4 are met.

504.1.2.1 Exits: Direct exits to the outside are provided for all the occupants of the recreation area.

504.1.2.2 Posting: The recreation area is conspicuously posted as to use and occupant load.

504.1.2.3 Fire protective signaling system: The building is equipped with a fire system.

504.1.2.4 Fire suppression: All other areas are equipped with an automatic fire suppression system.

504.2 Exterior walls: The minimum fireresistance rating of exterior walls of one-story buildings of unlimited area shall be determined by the use group and fire separation distance as specified in Table 504.2, but not less than the fireresistance rating required by Table 401 for the type of construction.

Table 504.2
MINIMUM FIRERESISTANCE RATING OF EXTERIOR WALLS (HOURS)

Fire separation distance[a]	Use group						
	A-3	B	F	I-2	M	S-1	S-2
30 feet or greater but less than 50 feet	2	2	3	2	3	3	2
50 feet or greater	0	0	0	0	0	0	0

Note a. 1 foot = 304.8 mm.

504.2.1 Opening protectives: Openings in exterior walls required by Table 504.2 to have a fireresistance rating of 3 hours or greater shall be protected with fire assemblies having a fireresistance rating of not less than 3 hours. Openings in exterior walls required by Table 504.2 to have a fireresistance rating of 2 hours shall be protected with fire assemblies having a fireresistance rating of not less than 1½ hours.

*

SECTION 505.0 EXISTING BUILDINGS

505.1 Alteration limitations: These provisions shall not be deemed to prohibit alterations within the limitations of Sections 106.0 and 505.2, provided an unlawful change of use is not involved.

505.1.1 Minor changes: Changes, alterations or repairs to the interior of a building or to the front facing a street or other public space shall be permitted, provided such changes, in the opinion of the code 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.

505.1.2 Existing projections: A change or enlargement shall not 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 507.0 governing new construction.

505.2 Increase in height and area: It shall be unlawful to increase the height or area of an existing building or structure, unless the building or structure is of a type of construction permitted for new buildings or structures of the increased height and area as regulated by Section 501.0 and in conformance with Section 106.3.

SECTION 506.0 STREET ENCROACHMENTS

506.1 General: Except as herein provided, a part of any building hereafter erected and additions to an existing building heretofore erected shall not 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.

506.2 Below grade: A part of a building hereafter erected below grade that is necessary for structural support of the building shall not project beyond the lot lines, except that the footings of street walls or their supports located at least 8 feet (2438 mm) below grade shall not project more than 12 inches (305 mm) beyond the street lot line.

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

506.4 Projections necessary for safety: In any specific application, the code official is authorized to 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 maximum extent to which they shall project beyond the street lot line or the building line where such is established by statute, subject to all provisions and restrictions that are otherwise prescribed by law, ordinance or rule of the authorities having jurisdiction over streets or public spaces.

506.5 Permit revocable: Any permit granted or permission expressed or implied in the provisions of this code to construct a building so as to project beyond the street lot line or building line shall be revocable by the jurisdiction at will.

506.6 Existing encroachments: Parts of existing buildings and structures which already project beyond the street lot line or building line are not

required to be altered until their removal is directed by the proper authorities of the jurisdiction.

SECTION 507.0 PERMISSIBLE STREET PROJECTIONS

507.1 General: Subject to such provisions as are otherwise prescribed by law or ordinance, or by rules of the authorities having jurisdiction over streets, highways, and public spaces, the following projections, as described in Sections 507.2 through 507.11.1, shall be permitted beyond the street lot line or the building line.

507.2 Cornices and eaves: Main cornices or roof eaves located at least 12 feet (3658 mm) above the curb level shall project not more than 3 feet (914 mm).

507.3 Architectural decorations: Belt courses, lintels, sills, architraves, pediments and similar architectural decorations shall project not more than 4 inches (102 mm) when less than 10 feet (3048 mm) above the curb level, and not more than 10 inches (254 mm) when 10 feet (3048 mm) or more above the curb level.

507.4 Ornamental columns: Ornamental columns, or pilasters, including the bases and moldings which emphasize the main entrance of the building, shall project not more than 12 inches (305 mm).

507.5 Entrance steps: Entrance steps and doors shall project not more than 12 inches (305 mm) and shall be guarded by cheek pieces not less than 3 feet (914 mm) high, or shall be located between ornamental columns or pilasters.

507.6 Oriel windows: Oriel windows with the lowest portion at least 10 feet (3048 mm) above the curb level shall project not more than 2½ feet (762 mm).

507.7 Balconies: Balconies located at least 10 feet (3048 mm) above the curb level shall project not more than 3 feet (914 mm), 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 shall not exceed 4 feet (1219 mm).

507.8 Awnings: Retractable or fixed awnings shall have clearances above the grade, and shall be installed in accordance with the requirements of Section 510.0.

507.9 Awning covers or boxes: Awning covers or boxes located at least 8 feet (2438 mm) above the curb level shall not project more than 3 feet (914 mm).

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

507.10.1 Projection and clearance: The horizontal clearance between a marquee and the curb line shall be not less than 2 feet (610 mm). A marquee projecting more than two-thirds of the distance from the property line to the curb line shall be not less than 10 feet (3048 mm) above the ground or pavement below.

507.10.2 Thickness: The maximum height or thickness of a marquee measured

vertically from its lowest to its highest point shall not exceed 3 feet (914 mm) when the marquee projects more than two-thirds of the distance from the property line to the curb line, and shall not exceed 9 feet (2743 mm) when the marquee is less than two-thirds of the distance from the property line to the curb line.

507.10.3 Roof construction: Where the roof or any part thereof is a skylight, the materials shall consist of approved plastics, or wired glass not less than ¼ inch thick with a single pane not more than 18 inches (457 mm) 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.

507.10.4 Location prohibited: Every marquee shall be so located as not to interfere with the operation of any exterior standpipe, and not to obstruct the clear passage of stairways or exit discharge from the building or the installation or maintenance of street lighting.

507.10.5 Construction: A marquee shall be supported entirely from the building and constructed of noncombustible material. Marquees shall be designed and constructed to withstand wind or other lateral loads and live loads as required in Article 11 of this code. Structural members shall be protected to prevent deterioration.

507.11 Vaults: Vaults below the sidewalk level shall extend not closer than 3 feet (914 mm) to the curb line; and the construction and use of such vaults shall be subject to the terms and conditions of the authority or legislative body having jurisdiction.

507.11.1 Areaways: Areaways shall not project beyond the street lot line more than 4 feet (1219 mm); provided that every such areaway shall be covered over at the street grade by an approved grating of metal or other noncombustible material.

SECTION 508.0 PERMISSIBLE YARD AND COURT ENCROACHMENTS

508.1 General: A part of any building or structure shall not extend into side courts, inner courts or yards required for light and ventilation of habitable and occupiable rooms by the provisions of Article 7, or by the zoning law or other statutes controlling building construction, except as hereinafter provided; but the encroachment shall not exceed 20 percent of the legal area of yard or court required for light and ventilation purposes.

508.2 Roof eaves: Roof eaves shall project not more than 3 feet (914 mm) beyond the face of the wall.

508.3 Steps and architectural features: Steps, window sills, belt courses and similar architectural features, rain leaders and chimneys shall project not more than 2 feet (610 mm) beyond the face of the wall.

508.4 Exterior stairways and fire escapes: Outside stairways, smokeproof

tower balconies, fire escapes or other required elements of a means of egress shall not project more than 4 feet (1219 mm) beyond the face of the wall.

SECTION 509.0 SPECIAL AND TEMPORARY PROJECTIONS

509.1 Alley projections: The permissible projection beyond street lot lines shall apply in general to building projections into alleyways, except as is modified by the authority having jurisdiction or by special deed restriction.

509.2 Special permits: When authorized by special permit, vestibules and storm doors shall be erected for periods of time not exceeding seven months in any one year, and shall not project more than 3 feet (914 mm) nor more than one-fourth the width of the sidewalk beyond the street lot line. Temporary entrance awnings shall be erected with a minimum clearance of 7 feet (2134 mm) to the lowest portion of the hood or awning when supported on removable steel, or other approved noncombustible supports.

SECTION 510.0 AWNINGS AND CANOPIES

510.1 Permit: A permit shall be obtained from the code official for the erection, repair or replacement of any fixed awning, canopy or hood except as provided in Section 510.1.1, and for any retractable awning located at the first story level and extending over the public street or over any portion of a court or yard beside a building serving as a passage from a required exit or exit discharge to a public street.

510.1.1 Exemption from permit: A permit shall not be required for the erection, repair or replacement of fixed or retractable awnings installed on buildings of Use Group R-3 unless they project over public property, or for retractable awnings installed above the first story or where the awning does not project over the public street or over any court or yard serving as a passage from a required exit to a public street.

510.2 Retractable awnings: There shall be a minimum clearance of 7 feet (2134 mm) 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 shall have a minimum clearance of 6 feet 9 inches (2057 mm) above the sidewalk. Retractable awnings shall be securely fastened to the building and shall not extend closer than 12 inches (305 mm) in 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.

510.3 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 510.2 for retractable awnings. Fixed or permanent awnings installed above the first story shall not project more than 4 feet (1219 mm).

510.4 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 stanchions with braces anchored in an approved manner and placed not less than 2 feet (610 mm) in from the curb line. The horizontal portion of the framework shall be not less than 8 feet (2438 mm) nor more than 12 feet (3658 mm) above the sidewalk and the clearance between the covering or valance and the sidewalk shall be not less than 7 feet (2134 mm).

510.5 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 510.6 for design and construction. Such structures shall be braced as required to provide rigidity.

510.6 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 11 of this code with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration.

SECTION 511.0 TEMPORARY STRUCTURES

511.1 General: Pursuant to a variance granted by the board of appeals under the provisions of Section 123.0, the code official shall issue a permit for temporary construction as approved by the board of appeals. Such permits shall be limited as to time of service, but such temporary construction shall not be permitted for more than one year.

511.2 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 the public health, safety and general welfare.

511.3 Termination of approval: The code 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 a decision of the board of appeals.

SECTION 512.0 PHYSICALLY HANDICAPPED AND AGED

512.1 Requirements for accessibility of handicapped persons: Please see 815 KAR 7:060 for construction requirements providing accessibility, Article 33 of this code.

ARTICLE 6

SPECIAL USE AND OCCUPANCY REQUIREMENTS

SECTION 600.0 GENERAL

600.1 Scope: In addition to the general requirements of this code governing the location, construction and equipment of all buildings and structures, and the fireresistance ratings, height and area limitations of Tables 401 and 501, the provisions of this article shall control all buildings and structures designed for special uses and occupancies as herein provided.

Chemical plants, packing plants, grain elevators, refineries, flour mills and other similar structures shall be constructed in accordance with the recognized practices and requirements of the specific industry. The code official shall permit such variations from the requirements of this code as 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, the fire hazard and the exposure to surrounding property.

600.2 Special high hazards: When necessary to resist a higher degree of fire severity than specified herein, for high concentrations of combustible contents and for buildings of high hazard uses which exceed five stories or 65 feet (19812 mm) in height, the code official shall require higher fireresistance ratings than the requirements of Table 401 governing the fireresistance ratings of types of construction and protection of structural elements.

600.3 Means of egress: The means of egress for buildings of special uses and occupancies shall conform to the requirements of Article 8, except as is modified by more restrictive provisions of this article for specific uses.

600.4 Heating and venting: The requirements herein prescribed for the installation of heating and venting appliances and equipment shall be construed as supplemental to the provisions of Articles 7 and 25, and the mechanical code listed in Appendix A.

600.5 Equipment rooms: Heating and ventilating equipment in occupancies involving fire hazards from flammable vapors, dust, combustible fibers or other highly combustible substances shall be installed and protected against fire and explosion hazards in accordance with the mechanical code listed in Appendix A. Rooms containing such equipment shall be segregated by construction of not less than 2 hour fireresistance rating except as otherwise 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.

600.6 Segregation of storage spaces: All rooms and spaces used for the storage of volatile and flammable materials shall be separately enclosed and segregated with fireresistance rated construction as herein required for specific uses and occupancies.

600.7 Restricted locations: Except as otherwise specifically provided for herein, buildings of Use Group H shall not be located within 200 feet (60960 mm) of the nearest wall of a building classified in Use Group A, E or I.

600.8 Inspections: All buildings and structures involving the use and handling of flammable or explosive materials and other hazardous uses and occupancies, and buildings of Use Groups A and E, shall be inspected in accordance with the fire prevention code listed in Appendix A.

600.8.1 Coordination of inspections: The code official, fire prevention code official, health officials and other administrative agencies of the jurisdiction to whom the authority is delegated to inspect buildings and structures in respect to the maintenance of safe conditions of use and occupancy shall immediately notify the respective official of any violation of the provisions of this code or the fire prevention code listed in Appendix A and health rules and regulations.

600.8.2 Housekeeping: Periodic inspections of existing uses and occupancies shall be made by the appropriate fire official to insure maintenance of good housekeeping conditions.

SECTION 601.0 COVERED MALL BUILDINGS

601.1 Scope: The provisions of this section shall apply to buildings or structures defined herein as covered mall buildings not exceeding three floor levels in height at any one point. Except as specifically required by this section, covered mall buildings shall meet all applicable provisions of this code.

Exceptions: When approved by the code official, the following uses are not required to comply with the provisions of this section.

1. Terminals for transportation facilities.
2. Foyers and lobbies in buildings of Use Groups R-1, R-2 or B.
3. Buildings which comply totally with all other applicable provisions of this code.

601.1.1 Definitions: Terms used in this section shall have the following meanings:

Anchor store: An exterior perimeter department store or major merchandising or magnet center having direct access to a mall and having its required exits independent of the mall.

Gross leasable area: The gross leasable area is the total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the center lines of joint partitions to the outside of the tenant walls.

Mall: A mall is a roofed-over common pedestrian area serving more than one tenant located within a covered mall building.

Mall building, covered: A building enclosing a number of tenants and occupancies such as retail stores, drinking and dining establishments, entertainment and amusement facilities, offices and other similar uses wherein two or more tenants have a main entrance into one or more malls. Anchor stores shall not be considered as part of the covered mall building.

601.2 Lease plan: The permit holder shall provide both the building and fire departments with a lease plan showing the locations of each occupancy and its means of egress after the certificate of occupancy has been issued. Such plans shall be kept current. Modifications or changes in occupancy or use shall not be made from that shown on the lease plan without prior approval.

601.3 Tenant separations: Each tenant space shall be separated from other tenant spaces by a wall having a fireresistance rating of not less than 1 hour. The separation wall shall extend from the floor to the underside of the ceiling. Except as required by other provisions of this code, the ceiling need not be a fireresistive assembly. A separation is not required in attic spaces above tenant separation walls nor is a tenant separation wall required between any tenant space and a mall, except for occupancy separations required elsewhere in this code.

601.3.1 Anchor store openings: Openings between an anchor store and the pedestrian area of a mall need not be protected.

601.4 Egress: Each individual occupancy within the covered mall building shall be provided with a means of egress in accordance with other provisions of this code. Measurements shall be made to the entrance to the mall.

601.4.1 Travel distance: The maximum length of exit access travel from any point within the mall to an approved exit along the natural and unobstructed path of travel shall not exceed 200 feet (60960 mm).

601.4.2 Anchor store exits: Anchor stores shall provide the required number of exits and units of exit width directly to the exterior. The occupant load of anchor stores opening into the mall shall not be included in determining exit requirements for the mall.

601.4.3 Dead ends: The dead end of a mall shall not exceed twice its width.

601.4.4 Design occupant load: In determining required exit facilities of the mall, the number of occupants for whom exit facilities are to be provided shall be based on gross leasable area of the covered mall building (excluding anchor stores) and shall be based on Table 601.

Table 601
FLOOR AREA ALLOWANCE PER OCCUPANT FOR COVERED MALLS

Square feet per person	Gross leasable area (sq. ft.)
30	under 150,000

Table 601 (cont'd.)
FLOOR AREA ALLOWANCE PER OCCUPANT FOR COVERED MALLS

Square feet per person	Gross leasable area (sq. ft.)
40	150,001-350,000
50	over 350,000

Note a. 1 square foot = 0.093 m².

601.4.5 Exit access width: The minimum width of exit access passageways and corridors from a mall shall be 66 inches (1676 mm).

601.4.6 Exit distribution: The required units of exit width and exits shall be distributed equally throughout the mall.

601.4.7 Storage prohibited: Storage is prohibited in exit corridors which are also used for service to the tenants. Such corridors shall be posted with conspicuous signs so stating.

601.5 Mall width: The minimum width of the mall shall be 20 feet (6096 mm). There shall be a minimum of 10 feet (3048 mm) clear exit width to a height of 8 feet (2438 mm) between any projection of a tenant space bordering the mall and the nearest kiosk, vending machine, bench, display opening, or other obstruction to egress travel.

The mall width shall be sufficient to accommodate the occupant load emptying into the immediately adjacent mall as determined by Section 601.4.4 for all occupancies except Use Groups A and E which shall be determined by Section 806.0.

601.6 Structural elements: Covered mall buildings shall be of Type 1, 2 or 4 construction. Covered mall buildings three stories or less in height are exempt from the area limitations of Table 501.

601.6.1 Floor/ceiling assemblies: Floor/ceiling assemblies and their supporting columns and beams within multi-level covered malls shall be of 1-hour fireresistance rated noncombustible construction or of Type 4 construction meeting the requirements of Section 405.0.

601.6.2 Structural elements, anchor stores: An anchor store three stories or less in height shall be of Type 1, 2 or 4 construction and is exempt from the area limitations of Table 501, provided that a smoke control system conforming to Section 1019.4 is installed in the anchor store. For the purposes of the design and operation of the fire emergency ventilation system, the anchor store shall be considered a tenant space zone.

601.7 Roof coverings: Roof coverings for covered mall buildings shall be Class A, B or C as required by Section 2301.0.

601.8 Use Group A-1 and A-2 occupancies: Use Group A-1 and A-2 occupancies shall be located in the covered mall building so that their main entrance is immediately adjacent to a principal entrance to the mall and shall have not less than one-half of their required exits opening directly to the exterior of the covered mall building.

601.9 Fire suppression: The covered mall and all buildings connected thereto shall be provided throughout with an approved automatic fire suppression

system. The system shall be installed in such a manner that when any portion of the system serving tenant spaces is shut down, the portion of the system serving the mall will remain operational.

601.9.1 Supervision: All sprinkler control valves shall be electrically supervised and connected to either the fire department or to an approved supervisory service.

601.10 Standpipes: There shall be a fire department standpipe outlet connected to a supply capable of delivering 250 gallons per minute (gpm) (0.022 m^3/s) located within the mall at each entrance to an exit passageway, corridor or enclosed stairway and at exterior exits.

601.11 Smoke control: The mall and adjacent tenant spaces shall be equipped with a smoke control system conforming to Section 1019.4.

601.12 Fire department access to equipment: Controls for air conditioning systems, sprinkler risers and valves, or other fire detection, suppression or control elements shall be accessible to and properly identified for use by the fire department.

601.13 Plastic panels and plastic signs: Within every story or level and from side wall to side wall of each tenant space, approved plastic panels and signs shall be limited as specified in Sections 601.13.1 through 601.13.4.

601.13.1 Area: The panels and signs shall not exceed 20 percent of the wall area facing the mall.

601.13.2 Height and width: The panels and signs shall not exceed a height of 36 inches (914 mm); except if the panel or sign is vertical, the height shall not exceed 96 inches (2438 mm) and the width shall not exceed 36 inches (914 mm).

601.13.3 Location: The panels and signs shall be located a minimum distance of 18 inches (457 mm) from adjacent tenants.

601.13.4 Encasement: All edges and the backs shall be fully encased in metal.

601.14 Kiosks: Kiosks and similar structures (temporary or permanent) shall meet the requirements of Sections 601.14.1 through 601.14.4.

601.14.1 Construction: Combustible kiosks or other structures shall not be located within the covered mall unless constructed of fire-retardant treated wood throughout conforming to Section 903.5.

601.14.2 Fire suppression: Kiosks or similar structures that are covered or have roofs and are located within the covered mall shall be protected by an approved automatic fire suppression system.

601.14.3 Horizontal separation: The minimum horizontal separation between kiosks and other structures within the covered mall shall be 20 feet (6096 mm).

601.14.4 Maximum area: Kiosks or similar structures shall have a maximum area of 300 square feet (27.90 m^2).

601.15 Parking structures: An attached garage for the storage of passenger

vehicles having a capacity of not more than nine persons or an open parking structure shall be considered as a separate building where it is separated from the covered mall building by a fire separation wall having a fireresistance rating of not less than 2 hours or shall be considered as part of the covered mall building.

SECTION 602.0 HIGH-RISE BUILDINGS

602.1 Applicability: The provisions of this section shall apply to all buildings of Use Groups B, R-1 and R-2 when such buildings have floors used for human occupancy located more than 75 feet (22860 mm) above the lowest level of fire department vehicle access, except that the provisions of this section shall not apply to airport traffic control towers conforming to the requirements of Section 616.0.

602.2 Maintenance and inspection: All fire protection systems shall be maintained in an operative condition at all times and shall be periodically inspected and tested in accordance with the fire prevention code listed in Appendix A. Maintenance inspections shall be made quarterly and logged in a journal kept available for inspection.

602.3 Options: All buildings and structures shall be provided with either an approved automatic fire suppression system according to Section 602.3.1 or safe areas of refuge (compartmentation) according to Section 602.3.2.

602.3.1 Automatic fire suppression system: When provided as required herein, the automatic fire suppression system shall be installed throughout the building. The system shall be designed using the parameters set forth in Article 10 and the requirements of Sections 602.3.1.1 through 602.3.1.3.

602.3.1.1 Shutoff valves and water flow devices: Shutoff valves and a water flow device shall be provided for each floor.

602.3.1.2 Valve supervision: Valves shall be supervised by a continuously manned control station or central station.

602.3.1.3 Secondary water supply: In addition to the main water supply, in Seismic Zones 2 and 3, a secondary on-site supply of water equal to the hydraulically calculated sprinkler design demand plus 100 gallons per minute (0.0063 m^3/s) additional for the total standpipe system shall be provided. This supply shall have a duration of 30 minutes, but need not exceed 10,000 gallons (37.90 m^3).

602.3.1.4 Automatic fire suppression system alternatives: When a complete automatic fire suppression system is installed throughout, modifications to this code are permitted as described in Sections 602.3.1.4.1 through 602.3.1.4.7.

602.3.1.4.1 Type of construction: The minimum type of construction required by this code shall be modified as indicated in Table 602.

Table 602
TYPE OF CONSTRUCTION MODIFICATIONS PERMITTED FOR HIGH-RISE BUILDINGS

Type of construction set forth in Table 401	Modified type of construction permitted hereunder
1A	1B
1B	2A
2A	2B

602.3.1.4.2 Fireresistance ratings of walls and doors: The fireresistance rating of exit access corridors, vertical separation of tenant spaces and dwelling unit separations shall be in accordance with Sections 810.4.1 and 810.4.2.

602.3.1.4.3 Shaft enclosures: The required fireresistance rating of vertical shafts other than stairway enclosures and elevator hoistway enclosures shall be reduced to 1-hour fireresistance rating when sprinklers are installed within the shafts at alternate floors.

602.3.1.4.4 Standpipe system: The 1½-inch hose line, nozzle, rack and cabinet are not required in accordance with Section 1012.5.1.

602.3.1.4.5 Travel distance: The exit access travel distance limitations set forth in Table 807 shall be increased to 300 feet (91440 mm).

602.3.1.4.6 Smokeproof enclosures: Smokeproof enclosures as set forth in Section 818.0 are not required, but required stairways greater than 75 feet (22860 mm) in height shall be pressurized to a minimum of 0.15 inches of water column (37.33 Pa) and a maximum of 0.35 inch of water column (87.10 Pa) in the shaft relative to the building with all stairway doors closed. The stairway pressurization system shall be activated by all devices which are required to activate the voice alarm system in Section 602.5.1.

602.3.1.4.7 Fire dampers: Fire dampers, other than those needed to maintain the fireresistance rating of the floor/ceiling assembly, are not required. Where fire dampers will interfere with the operation of the smoke control system, approved alternative protective devices shall be utilized.

602.3.2 Areas of refuge (compartmentation): Areas of refuge conforming to Sections 602.3.2.1 through 602.3.2.5 shall be provided when an automatic fire suppression system is not provided in buildings up to 12 stories or 150 feet (45720 mm) in height (see Section 1002.6).

602.3.2.1 Division of floor areas: Every story shall be divided into two or more areas of approximately the same size without a single area exceeding 15,000 square feet (1395 m^2). The wall and doors between the areas of refuge shall be constructed as required for a horizontal exit in Section 814.0.

602.3.2.2 Stairways and elevators: Each area of refuge (compartment) shall contain a minimum of one enclosed exit stairway and each compartment shall have access to an elevator which shall serve one or more compartments. When elevators are directly accessible and serve more than one compartment, the

elevator lobby shall be separated from the compartments by not less than 2-hour fireresistance rated construction with tight-fitting fire doors complying with Section 916.0.

602.3.2.3 Wall construction: Walls used for compartmenting a building shall have a fireresistance rating of not less than 2 hours. Duct penetrations of this wall shall not be permitted. Ferrous or copper piping and conduit shall only penetrate or pass through the wall if the openings around such piping and conduit are sealed with impervious noncombustible materials sufficiently tight to prevent the transfer of smoke or combustion gases from one side of the wall to the other and are so maintained. The fire door serving as the horizontal exit between compartments shall be so installed, fitted and gasketed that it will provide a substantial barrier to the passage of smoke and shall comply with Section 814.2.1.

602.3.2.4 Floor/ceiling construction: The fireresistive floor or the floor/ceiling construction shall extend to and be tight against the exterior wall so that the fireresistive integrity between stories is maintained. Penetrations or other installations which will impair the fireresistive integrity of the floor or floor/ceiling assembly shall not be permitted (see Section 903.1).

602.3.2.5 Manual fire alarm system: A manual fire alarm system (pull boxes) shall be provided.

602.4 Smoke detection systems: A smoke detector suitable for the intended use shall be installed in accordance with Sections 602.4.1 through 602.4.3.

602.4.1 Room locations: A smoke detector shall be installed in every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room unless such rooms are protected with an automatic fire suppression system.

602.4.2 Duct locations: A smoke detector shall be installed in each connection to a vertical duct or riser serving two or more stories from return air ducts or plenums of heating, ventilating and air conditioning systems. In buildings of Use Group R, an approved smoke detector shall be installed as required above or shall be installed in each return air riser carrying not more than 5,000 cubic feet per minute (cfm) (2.36 m^3/s) and serving not more than ten air inlet openings.

602.4.3 Operation: The actuation of any detector required by this section shall operate the voice alarm system and shall place into operation all equipment necessary to prevent the recirculation of smoke.

602.5 Alarm and communication systems: Alarm and communication systems shall be provided. The alarm and communication systems shall be so designed and installed that damage to any terminal unit or speaker will not render more than one zone of the system inoperative.

One or more communication systems shall be designed to serve the voice alarm, public address and fire department communication system as indicated in Sections 602.5.1 through 602.5.3.

602.5.1 Voice alarm system: The operation of any smoke detector, sprinkler, water flow device or manual fire alarm station shall automatically activate a voice alarm system. Activation of the system shall automatically sound an alert signal to the desired areas. The voice alarm system shall provide a predetermined message on a selective basis to the area where the alarm originated and shall provide information and give direction to the occupants. The alarm shall be designed to be heard clearly by all occupants within the building or designated portions thereof as is required for the public address system.

The central control station shall contain controls for the voice alarm system having the capability to manually initiate a selective or general voice alarm.

The system shall be continuously electrically supervised against component failure of the audiopath, including amplifiers, speaker wiring, switches and electrical contacts and shall detect opens, shorts and grounds which might impair the function of the system.

602.5.2 Public address system: A public address communication system designed to be clearly heard by all occupants of the building shall operate from the central control station. It shall be established on a selective or general basis to the following terminal areas: elevators, elevator lobbies, corridors, exit stairways, rooms and tenant spaces exceeding 1,000 square feet (93 m^2) in area, dwelling units in Use Group R-2 and guest rooms or suites in Use Group R-1.

602.5.3 Fire department communication system: A two-way fire department communication system shall be provided for fire department use. It shall operate between the central control station and every elevator, elevator lobby and entry to an enclosed exit stairway.

602.6 Central control station: A central control station for fire department operations shall be provided in a location approved by the fire department. It shall contain the voice alarm and public address system panels; the fire department communications panel; fire detection and alarm system annunciator panels; an annunciator which visually indicates the floor location of elevators and whether they are operational; status indicators and controls for air handling systems; controls for unlocking all stairway doors simultaneously; sprinkler valve and water flow detector display panels; emergency power, light and system controls; and status indicators and a telephone for fire department use with controlled access to the public telephone system.

602.7 Smoke control: A smoke control system conforming to Section 1019.2 shall be installed. *

602.8 Elevators: Elevator operation and installation shall be in accordance with Article 26. Elevator service shall be provided for fire department emergency access to all floors. Said elevator cab shall be of such size to accommodate an ambulance cot 24 inches (610 mm) by 76 inches (1930 mm) in its horizontal open position. Except for the main entrance level, all elevators shall open into a lobby separated from the remainder of the building by 1-hour

fireresistance rated construction. Exit stairways, chutes, janitor closets, tenant spaces in Use Group R and service rooms shall not open into the elevator lobby. In use groups other than R, tenant spaces opening directly into the elevator lobby shall be provided with other means of exit access that does not require passage through the elevator lobby.

Exception: Elevator lobbies are not required when a smoke control system is installed in accordance with Section 1019.3.

602.9 Standby power, light and emergency systems: Standby power, light and emergency systems shall comply with the requirements of Sections 602.9.1 through 602.9.3.

602.9.1 Standby power: A standby power system conforming to Section 2707.0 shall be provided. If the standby system is a generator set inside a building, it shall be located in a separate room of 2-hour fireresistance rated construction. System supervision with manual start and transfer features shall be provided at the central control station.

602.9.1.1 Fuel supply: An on-premises fuel supply sufficient for not less than 2 hours full demand operation of the system shall be provided.

Exception: Where the system is supplied with pipeline natural gas and is approved.

602.9.1.2 Capacity: The standby system shall have a capacity and rating that would supply all equipment required to be operational at the same time. The generating capacity need not be sized to operate all the connected electrical equipment simultaneously.

602.9.1.3 Connected facilities: All power, lighting, signal and communication facilities specified in Sections 602.4, 602.5, 602.6, 602.7, 602.8 and 602.9 as applicable, and electrically-powered fire pumps required to maintain pressure, shall be transferable to the standby source. Service shall be provided for access to all floors by at least one elevator when standby power is connected.

Exception: Smoke control systems in accordance with Section 1019.1.2.

602.9.2 Separate circuits and fixtures: Separate lighting circuits and fixtures shall be required to provide sufficient light with an intensity of not less than 1 footcandle (10.76 lux) measured at floor level in all egress corridors, stairways, smokeproof enclosures, elevator cars and lobbies and other areas which are clearly a part of the escape route.

602.9.2.1 Other circuits: All circuits supplying lighting for the central control station and mechanical equipment rooms shall be transferable to the standby source.

602.9.3 Emergency systems: *Exit* signs, exit illumination as required by Section 824.0, and elevator car lighting, are classified as emergency systems and shall operate within 10 seconds of failure of the normal power supply.

602.10 Exits: Exits shall comply with other requirements of this code and Sections 602.10.1 and 602.10.2.

602.10.1 Door operation: All stairway doors which are to be locked from the stairway side shall have the capability of being unlocked simultaneously without unlatching upon a signal from the central control station.

602.10.2 Stairway communication system: A telephone or other two-way communications system connected to an approved emergency service which operates continuously shall be provided at not less than every fifth floor in each required stairway where other provisions of this code permit the doors to be locked.

602.11 Seismic consideration: Anchorage of elevator drive and suspension systems, emergency power and lighting facilities, fire pumps and all other fire protection equipment and systems shall be designed in accordance with Section 1113.14.

SECTION 603.0 HPM USE FACILITIES

603.1 Scope: The provisions of these sections shall apply to buildings and structures using hazardous production materials (HPM), such as in semiconductor fabrication facilities and areas of comparable research and development. Except as specifically required by this section, such buildings shall comply with the applicable requirements of this code. The specific code provisions of Sections 306.0, 502.3 and Tables 808 and 902 applicable to high hazard use shall not apply unless stated herein.

603.1.1 Fab area, general: A fabrication area (fab area) is one in which there are processes involving hazardous production materials, and includes ancillary rooms or areas such as dressing rooms and offices that are supplemental to the area processes.

603.1.2 Allowable heights, stories and area: The allowable height, number of stories and basic areas permitted for buildings and structures used for facilities using HPM shall not exceed the limits specified in Table 603.1.2. The provisions of Section 504.0 shall not apply. The area limitations are for one- or two-story buildings facing on one street or public space not less than 30 feet wide. The increases permitted in Sections 502.2 and 502.3 shall apply.

Table 603.1.2
HEIGHT, NUMBER OF STORIES AND AREA LIMITATION FOR HPM USE FACILITIES[a]

Type of construction	Number of stories	Height (feet)	Area in square feet/floor
1A and 1B	3	55	Unlimited
2A	3	55	34,200
2B	3	55	22,500
2C	3	40	14,400
3A	3	50	19,800
3B	3	40	14,400
4	3	55	21,600
5A	3	40	15,300
5B	2	30	7,200

Note a. 1 foot = 304.8mm; 1 square foot = 0.093 m².

603.1.3 Fab area size: The size of a fab area shall be determined by the density of the HPM in that space. The density of HPM shall not exceed that specified in Table 603.1.3b. The total quantity of HPM permitted shall be based on the densities in Table 603.1.3b, or the quantities in Table 603.1.3a, whichever is the larger amount.

Table 603.1.3a
PERMITTED QUANTITIES OF HPM IN A SINGLE FABRICATION AREA

Material	Maximum quantity[a]
Flammable liquids	
Class I-A	90 gal.
Class I-B	180 gal.
Class I-C	270 gal.
Combination flammable liquids containing not more than the exempt amounts of Class I-A, I-B or I-C flammable liquids	360 gal.
Combustible liquids	
Class II	360 gal.
Class III-A	750 gal.
Flammable gases	9,000 cu. ft. at one atmosphere of pressure at 70° F.
Liquified flammable gases	180 gal.
Flammable solids	1,500 lbs.
Corrosive liquids	165 gal.
Oxidizing material — gases	18,000 cu. ft.
Oxidizing material — liquids	150 gal.
Oxidizing material — solids	1,500 lbs.
Organic peroxides	30 lbs.
Highly toxic material and poisonous gas	Included in the aggregate for flammables as noted above

Note a. 1 gallon = 0.00379 m^3; 1 cubic foot = 0.028 m^3; 1 pound = 0.454 kg; degrees C. = (degrees F.) – 32 ÷ 1.8.

Table 603.1.3b
PERMITTED QUANTITIES OF HPM IN A SINGLE HPM USE FACILITY — DENSITY BASIS[a,c]

State	Units[d]	Flammable	Oxidizer	Corrosive
Solid	lbs/sq.ft.	0.001	0.003	0.003
Liquid	gal/sq.ft.	0.04[b]	0.03	0.08
Gas	cf/sq.ft.	1.250	1.250	3.000

Note a. HPM within piping shall not be included in the calculated quantities.

Note b. The maximum permitted quantities of flammable and combustible liquids shall not exceed the following quantities:

Class (I-A) + (I-B) + (I-C) (Combination flammable liquids) ..... = .025
however Class I-A shall not exceed ..... = .0025
Class II ..... = .01
Class III-A ..... = .02

Note c. Highly toxic materials and poisonous gases shall be limited by the maximum quantities specified in Table 603.1.3a.

Note d. 1 pound per square foot = 4.882 kg/m^2; 1 gallon per square foot = 0.0407 m^3/m^2; 1 cubic foot per square foot = 0.301 m^3/m^2.

603.1.4 Egress: There shall be not less than two means of egress provided for any fab area or any HPM use facility subdivision thereof larger than 200 square feet (18.62 m^2). The maximum length of exit access travel in HPM use facilities shall be 100 feet (30480 mm).

603.1.5 Separation: Fab areas shall be separated from each other, from egress corridors, and from other parts of the building by not less than 1-hour fireresistance rated assemblies in compliance with Section 903.1, with fire doors complying with Section 916.0. Floors forming part of the required separation shall be liquid-tight.

603.1.6 Floors: Floors within fab areas shall be of noncombustible construction. Unprotected openings through floors of fab areas are permitted when the interconnected levels are used solely for mechanical equipment directly related to such fab areas.

Mechanical, duct and piping penetrations within a fab area shall not extend through more than two floors. Penetrations shall be effectively draftstopped at the floor level. The fab area, including the areas through which ductwork and piping extend, shall be considered a single conditioned space or fire area.

603.1.7 Ventilation, general: Ventilation systems shall comply with the mechanical code listed in Appendix A except as otherwise provided herein. Ventilation including recirculated air shall be provided throughout the fab area at the rate of not less than 1 cfm per square foot (5074 $cm^3/s/m^2$) of floor area.

603.1.7.1 Interconnection: The exhaust system of one fab area shall not connect to another exhaust system outside that fab area within the building. The return air system from one fab area shall not connect to any other system.

603.1.7.2 Smoke detectors: Smoke detectors shall be installed in the recirculating airstream and shall initiate a signal at the emergency control station.

603.1.7.3 Shutoff switches: Automatic shutoffs are not required to be installed on air-moving equipment. A manually-operated remote switch to shut off the fab area supply or recirculation air system, or both, shall be provided at an approved location outside the fab area.

603.1.7.4 Gas detection: When HPM gas is used or dispensed and the physiological warning properties for the gas are at a higher level than the accepted permissible exposure limit for the gas, a continuous gas-monitoring system shall be provided to detect the presence of a short-term hazard condition. When dispensing occurs with the possibility of generating flammable gases or vapors in quantities exceeding 20 percent of the lower explosive limit, a continuous gas-monitoring system shall be provided. The monitoring system shall be connected to the emergency control station.

603.1.8 Transporting HPM: HPM shall be transported to fab areas through enclosed piping or tubing systems that comply with Section 603.5, through service passages, or in egress corridors as permitted in the exception to Section 603.2.

603.1.9 **Electrical:** Electrical equipment and devices within the fab area shall comply with NFiPA 70 listed in Appendix A. The requirements for hazardous locations need not be applied when the average rate of air change is at least 4 cfm per square foot (20300 $cm^3/s/m^2$) of floor area and when the rate of air change at any location is not less than 3 cfm per square foot (15200 $cm^3/s/m^2$).

603.2 **Egress corridors:** Egress corridors shall comply with Section 810.4 and shall be separated from fab areas as specified in Section 603.1.5. Egress corridors shall not be used for transporting HPM except as provided in Section 603.5.2.

Exception: In existing HPM use facilities, when there are alterations or modifications to existing fab areas, the transportation of HPM in egress corridors shall be permitted when all the following requirements are met:

1. Corridors adjacent to the fab area under alteration shall comply with Table 401, item 7, for a length determined as follows:
   a. The length of the common wall of the corridor and that fab area, and
   b. For the distance along the egress corridor to the point of entry of HPM into the egress corridor serving that fab area.
2. There shall not be openings between an egress corridor and an HPM storage cabinet in a fab area other than those in compliance with all of the following:
   a. 1-hour fire doors are installed between the egress corridor and the cabinet.
   b. The cabinet is enclosed with a 1-hour fireresistance rated assembly between it and the corridor.
   c. The cabinet shall be internally sprinklered.

603.3 **Service passages:** Service passages shall be considered as HPM use facilities. Service passages shall be separated from egress corridors as required by Section 603.1.5.

603.3.1 **Ventilation:** Service passages shall be ventilated as required by Section 603.1.7.

603.3.2 **Egress:** There shall be not less than two means of egress from a service passage. Not more than one-half of the required means of egress shall be into the fab area. Doors from service passages shall be self-closing and swing in the direction of egress travel.

603.3.3 **Travel distance:** The maximum distance of travel from any point in a service passage to an exit or door into a fab area shall not exceed 75 feet (22860 mm). Dead ends shall not exceed 4 feet (1219 mm) in length.

603.3.4 **Alarms:** Alarms shall be provided in accordance with Section 603.4.5.

603.4 **Storage of HPM, general:** Rooms used for the storage of HPM in quantities greater than that set forth in Table 306.2.1, except for that permitted within a fab area, shall comply with the provisions of NFiPA 30 listed in Appendix A, provided that the area of an HPM cutoff room shall not exceed 6,000 square feet (558 m^2). The storage area for any liquid HPM shall be provided with drains.

603.4.1 Location within building: When HPM cutoff rooms are provided, they shall be not less than 30 feet (9144 mm) from lot lines.

603.4.2 HPM drainage systems: Drainage systems shall be provided to direct liquid leakage and fire protection water to a safe location away from the building, any important valve or adjoining property. HPM flammable liquid drains shall be separated from other HPM liquid drains. Other HPM liquids in drains that are not compatible shall be separated from each other, provided that they are permitted to be combined when they have been rendered acceptable for discharge by an approved means into the public sewers.

603.4.3 Egress: There shall be two means of egress from a separate inside HPM storage room when the room exceeds 200 square feet (18.6 m^2) in area. When two means of egress are required from HPM cutoff rooms, one shall be directly to the outside of the building. All storage room egress doors shall be self-closing and swing in the direction of egress travel.

603.4.4 Ventilation: Exhaust ventilation shall be provided in accordance with Section 603.1.7 for all categories of HPM.

603.4.5 Emergency alarm: An emergency telephone system or local fire protective signaling system station shall be installed outside of each interior egress door from HPM cutoff rooms. The signal shall be relayed to the emergency control station and a local signaling device provided.

603.4.6 Electrical: HPM cutoff rooms containing flammable liquids or gases shall be classified as Class I, Division 1 hazardous locations in accordance with NFiPA 70 listed in Appendix A.

603.4.7 Gas detection: Gas detection shall be provided in accordance with Section 603.1.7.4.

603.5 Piping and tubing: HPM piping and tubing shall comply with this section and shall be installed in accordance with ASME B31.3 listed in Appendix A.

603.5.1 General: Piping and tubing systems shall be metallic unless the material being transported is incompatible with such system. Systems supplying gaseous HPM, having a health hazard of 3 or 4 as ranked by NFiPA 704 listed in Appendix A, shall be welded throughout, except for connections, valves and fittings which are within an exhausted enclosure. HPM supply piping or tubing in service passages shall be exposed to view.

603.5.2 Installation in egress corridors or above other use groups: HPM shall not be located within egress corridors or above areas not containing HPM use facilities except as permitted by this section. HPM piping and tubing shall be permitted within the space defined by the walls of egress corridors and the floor or roof above, or in concealed spaces above other use groups under the following conditions:

1. Automatic sprinklers shall be installed within the space unless the space is less than 6 inches (152 mm) in least dimension.
2. Ventilation at not less than 6 air changes per hour shall be provided. The

space shall not be used to convey air from any other area.

3. All HPM supply piping and tubing and HPM nonmetallic waste lines shall be separated from the egress corridor and from any use group other than an HPM use facility by construction having a fireresistance rating of not less than 1 hour as permitted for walls or partitions. When gypsum wallboard is used, joints on the piping side of the enclosure need not be taped, provided the joints occur over framing members.
4. When the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an approved location. The 1-hour enclosure required by item 3 herein shall not be used as part of the receptor.
5. Readily accessible manual or automatic remotely-activated fail-safe emergency shutoff valves shall be installed on piping and tubing, other than waste lines, at the following locations:
   a. At branch connections into the fab area;
   b. At entries into egress corridors.
6. Where HPM supply gas is carried in pressurized piping, a fail-safe system for excess flow control shall shut off flow due to a rupture in the piping.
7. Electrical wiring and equipment located in the piping space shall be approved for Class I, Division 2 hazardous locations in accordance with NFiPA 70 listed in Appendix A.
8. Gas detection shall be provided per Section 603.1.7.4.

Exceptions to items 1 through 8: Transverse crossings of the corridors by supply piping coaxially enclosed within a ferrous pipe or tube for the width of the corridor. An enclosing pipe or tube open to an HPM use facility is permitted.

603.5.3 Identification: Piping, tubing and HPM waste lines shall be identified in accordance with ANSI A 13.1 listed in Appendix A.

SECTION 604.0 MEMBRANE STRUCTURES

604.1 General: The provisions of this section shall apply to air-supported, air-inflated, membrane-covered cable and membrane-covered frame structures, collectively known as membrane structures, erected for a period of 90 days or longer. Those erected for a shorter period of time shall comply with applicable provisions of the fire prevention code listed in Appendix A and Section 626.0. Membrane structures covering water storage facilities, water clarifiers, water treatment plants, sewage treatment plants, and similar facilities not used for human occupancy are required to meet only the requirements of Section 604.2.2 and Section 604.5 of this section.

604.2 Construction requirements: Construction of membrane structures shall comply with Sections 604.2.1 through 604.2.5.

604.2.1 Type of construction: All noncombustible membrane structures shall be classified as Type 2C construction. Noncombustible frame- or cable-supported structures covered by an approved membrane in accordance with Section 604.2.2 shall be classified as Type 2C construction. Heavy timber frame-supported structures covered by an approved membrane in accordance with Section 604.2.2 shall be classified as Type 3B construction. A noncombustible membrane structure used exclusively as a roof and located more than 20 feet (6096 mm) above any floor, balcony or gallery is deemed to comply with the roof construction for Type 1 and Type 2 construction, provided that such a structure complies with the requirements of this section. All other membrane structures shall be classified as Type 5B construction.

604.2.2 Membrane material: Membranes shall be either noncombustible as defined by Section 903.4, or flameresistant conforming to NFiPA 701 listed in Appendix A.

Exception: Plastic less than 20-mil (500 μm) thickness used in greenhouses when occupancy by the general public is not permitted and for aquaculture pond covers are not required to be flameresistant.

604.2.3 Applicability of other provisions: Except as otherwise specifically required by this section, membrane structures shall meet all applicable provisions of this code. The membrane shall meet roof covering requirements of Section 2301.3.

604.2.4 Allowable floor areas: The area of a membrane structure shall not exceed the limits set forth in Table 501, except as provided in Section 502.0.

604.2.5 Maximum height: Membrane structures shall not exceed one story nor shall they exceed the height limits in feet set forth in Table 501.

Exception: Noncombustible membrane structures serving as roof construction only.

604.3 Inflation systems: Air-supported and air-inflated structures shall be provided with primary and auxiliary inflation systems to meet the minimum requirements of Sections 604.3.1 and 604.3.2.

604.3.1 Equipment requirements: The inflation system shall consist of one or more blowers and shall include provisions for automatic control to maintain the required inflation pressures. The system shall be so designed as to prevent overpressurization of the system.

In addition to the primary inflation system, in buildings exceeding 1,500 square feet (140 m^2) in area, an auxiliary inflation system shall be provided with sufficient capacity to maintain the inflation of the structure in case of primary system failure. The auxiliary inflation system shall operate automatically if there is a loss of internal pressure or if the primary blower system becomes inoperative.

Blower equipment shall meet the following requirements:

1. Blowers shall be powered by continuous rated motors at the maximum

power required for any flow condition as required by the structural design.

2. Blowers shall be provided with inlet screens, belt guards and other protective devices as required by the code official to provide protection from injury.
3. Blowers shall be housed within a weather-protecting structure.
4. Blowers shall be equipped with backdraft check dampers to minimize air loss when inoperative.
5. Blower inlets shall be located to provide protection from air contamination. Location of inlets shall be approved by the code official.

604.3.2 Standby power: Whenever an auxiliary inflation system is required, an approved standby power generating system shall be provided. The system shall be equipped with a suitable means for automatically starting the generator set upon failure of the normal electrical service and for automatic transfer and operation of all the required electrical functions at full power within 60 seconds of such normal service failure. Standby power shall be capable of operating independently for a minimum of 4 hours.

604.4 Support provisions: A system capable of supporting the membrane in the event of deflation shall be provided in all air-supported and air-inflated structures having an occupant load of more than 50 or when covering a swimming pool regardless of occupant load. The support system shall be capable of maintaining membrane structures used as a roof for Type 1 or Type 2 construction not less than 20 feet (6096 mm) above floor or seating areas. The support system shall be capable of maintaining all other membranes at least 7 feet (2134 mm) above the floor, seating area or surface of the water.

604.5 Engineering design: All membrane structures shall be structurally designed in accordance with criteria approved by the code official and developed by an engineer or architect licensed by the state to practice as such.

SECTION 605.0 MEZZANINES

605.1 General: A mezzanine or mezzanines in compliance with this section shall be considered a portion of the floor below. Such mezzanines shall not contribute to the building area as regulated by Section 501.2. Such mezzanines shall not contribute to the number of stories or height as regulated by Section 501.3.

605.2 Area limit: The aggregate area of a mezzanine or mezzanines within a story shall not exceed one-third of the area of that story.

Exception: The aggregate area of mezzanines in buildings and structures of Type 1 or 2 construction for special industrial uses according to Section 501.1.1 shall not exceed two-thirds of the area of that story.

605.3 Egress: Each occupant of a mezzanine with an occupant load of more than 50 or in which the travel distance to an exit exceeds 75 feet (22860 mm) shall have access to at least two independent means of egress.

SECTION 606.0 OPEN WELLS

606.1 General: The term "open well" shall mean a floor opening, series of floor openings or an atrium connecting two or more stories which does not meet requirements for a covered shaft with respect to enclosure. Open wells are to be classified as either atriums (Section 606.2) or floor openings (Section 606.3) and shall be permitted in all buildings in other than Use Group H when provided with the protection herein required.

Exceptions: The provisions of this section shall not apply to the following:

1. Stairways permitted to be unenclosed in accordance with Section 816.9.2.
2. In other than Use Group I, openings which serve only one adjacent floor, are not connected with an exit access corridor, not connected with openings serving other floors and are not concealed within the building construction.

606.1.1 Fire suppression: An approved, electrically supervised automatic fire suppression system shall be installed throughout all floor areas connected by the open well in accordance with the provisions of Article 10, except those floor areas separated from the open well by fire separation assemblies conforming to Table 401 and for floor openings meeting the exceptions in Section 606.3.

606.1.2 Use: The floor of the open well shall not be used for other than low fire hazard uses and only approved materials and decorations shall be used in the open well space.

Exception: The use of the open well floor area for any approved purpose shall not be restricted when the individual space is provided with an approved automatic fire suppression system.

606.2 Atriums: Atriums shall be constructed in accordance with Sections 606.2.1 through 606.2.4.

606.2.1 Smoke control: A smoke control system complying with Section 1019.5 shall be installed in all atriums that connect more than two stories.

606.2.2 Enclosure of atriums: Atrium spaces shall be separated from adjacent spaces by a 1-hour fire separation wall as required for corridors.

Exceptions

1. In residential occupancies, protected openings are not required when the floor area of each guest room or dwelling unit does not exceed 1,000 square feet (93 m^2) and each room or unit has an approved means of egress not entering the atrium.
2. Adjacent spaces shall be separated from the atrium by fire windows or by a tempered, wired or laminated glass wall subject to the following:
   a. The glass shall be protected by a specially designed automatic fire sprinkler system. The sprinkler system shall completely wet the entire surface of the glass wall when actuated. When there are walking

surfaces on both sides of the glass, both sides of the glass shall be so protected.

b. The glass shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.

c. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the sprinkler heads and the glass.

3. The adjacent spaces of any three floors of the atrium shall not be required to be separated from the atrium; however, these spaces shall be included in the atrium volume for the design of the smoke control system (see Section 1019.5).

606.2.3 **Alarm:** In all buildings with an atrium, an automatic fire detection system shall be required. The alarm shall be initiated by either the fire suppression system or the activation of two or more smoke detectors in the atrium. Such buildings of Use Group A, E or M shall be provided with voice alarms complying with the requirements of Section 602.5.1.

606.2.4 **Travel distance:** In other than the lowest level of the atrium, when the required means of egress is through the atrium space, the exit access travel distance shall not exceed 150 feet (45720 mm).

606.3 **Floor openings:** Floor openings including unenclosed supplemental stairways or escalators conforming to Section 2617.3 shall be permitted when protected on every floor pierced by the opening in accordance with Sections 606.3.1 and 606.3.2.

Exception: In buildings having an approved automatic fire suppression system throughout, escalator openings which are protected by a draft curtain and a closed sprinkler water curtain conforming to NFiPA 13 listed in Appendix A.

606.3.1 **Smoke control:** A smoke control system conforming to Section 1019.6 shall be installed.

606.3.2 **Draftstop:** An approved draftstop shall be installed at each story of the floor opening. The draftstop shall enclose the perimeter of the opening and shall extend from the ceiling downward at least 18 inches (457 mm) on all sides. Automatic sprinklers shall be provided around the perimeter of the opening and within 2 feet (610 mm) of The distance between the sprinklers shall not exceed 6 feet (1829 mm) center to center.

SECTION 607.0 OPEN PARKING STRUCTURES

607.1 **General:** 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 persons, wherein two or more sides of such structures are not less than 50 percent open on each floor or level for 50 percent of the distance from the floor to the ceiling, and wherein provision for the repairing

of such vehicles is not made and include the two general types indicated in Sections 607.1.1 and 607.1.2. Open parking structures are not classified as public garages.

607.1.1 Ramp-type parking 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.

607.1.2 Mechanical-type parking structures: Mechanical-type parking structures are those employing specially designed parking machines, elevators, lifts, conveyors, moving cranes, dollies or other devices for moving passenger automobiles to and from the street level.

607.2 General construction requirements: Passenger vehicle structures shall be constructed of noncombustible materials throughout, including structural framing, floors, roofs and walls. Any enclosed rooms or spaces on the premises shall comply with the applicable requirements of this code.

607.3 Basements: Basements which are not classified as open parking structures in accordance with Section 607.1 but are used for parking vehicles shall be sprinklered in accordance with the provisions of Section 1002.0 and shall be ventilated in accordance with the mechanical code listed in Appendix A.

607.4 Fuel dispensing: Areas where fuel is dispensed shall conform to the requirements of Section 609.4.

607.5 Heights and areas: Heights and areas of open parking structures shall not exceed the limits specified in Table 607, except that when at least 50 percent open on all sides and when 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 does not exceed 200 feet (60960 mm), the maximum height of open parking structures of Type 2B and 2C construction shall be 75 feet (22860 mm) and the area shall not be limited.

Table 607
HEIGHT AND AREA LIMITATION FOR OPEN PARKING STRUCTURES[b]

Type of construction	Height	Area in square feet
1A and 1B	Unlimited	Unlimited
2A	12 Stories—120 feet	Unlimited
2B	10 Stories—100 feet	50,000
2C	8 Stories— 85 feet	50,000
2B and 2C[a]	2 Stories— 25 feet	Unlimited

Note a. For exceptions to height and area limitations, see Section 607.5.
Note b. 1 foot = 304.8 mm; 1 square foot = 0.093 m².

The allowable areas of structures wherein more than 25 percent of the perimeter has frontage on street or other open space leading to a street, each of which is not less than 30 feet (9144 mm) wide, shall be increased as provided in Section 502.2. When an automatic sprinkler system is installed in accordance with Section 1004.0 in Types 2B and 2C construction, the area shall be

unlimited. The above limits of height permit parking on the roof.

607.6 Protective guardrails: All wells, shafts and other open, exposed spaces throughout, except first floor, shall be enclosed and protected with continuous walls or protective guardrails constructed in accordance with Section 827.0, except that in those structures wherein vehicles are hoisted to the desired level and placed in the parking space entirely by approved mechanical means, the continuous wall or protective guardrail is not required on the side of the parking levels adjacent to the space occupied by the hoisting and placing equipment.

607.7 Wheel guards: Wheel guards made of noncombustible material shall be placed wherever required.

607.8 Means of egress: For means of egress requirements, see Section 809.5.

607.9 Standpipe systems: For standpipe requirements, see Section 1012.2.9.

SECTION 608.0 PRIVATE GARAGES

608.1 Attached garages: Private garages located beneath rooms in buildings of Use Groups R-1, R-2, R-3 or I-1 shall have walls, partitions, floors and ceilings separating the garage space from the adjacent interior spaces constructed of not less than 1-hour fireresistance rating. Attached private garages shall be completely separated from the adjacent interior spaces and the attic area by means of ½-inch gypsum board or equivalent applied to the garage side. The sills of all door openings between the garage and adjacent interior spaces shall be raised not less than 4 inches (102 mm) above the garage floor. The door opening protectives shall be 1¾-inch solid core wood doors or approved equivalent. In lieu of the required 1¾-inch or 20-minute door, an approved automatic sprinkler head located directly above the door in the garage and properly connected to the domestic water system or an approved automatic heat detector located directly above the door in the garage shall be acceptable in private garages attached to one- and two-family dwellings.

608.1.1 Separation by breezeway: Where a garage separated by a breezeway not less than 10 feet (3048 mm) in length from a building of Use Group R-3 is of Type 5B construction, the junction of the garage and breezeway shall be firestopped to comply with Section 921.0.

608.2 Other conditions: All private garages not falling within the purview of Sections 608.1 or 608.1.1 attached to or located beneath a building shall comply with the requirements of Section 313.0 for public garages.

608.3 Means of egress: Where living quarters are located above a private garage, required means of egress facilities shall be separated from the garage area with 1-hour fireresistance rated construction.

SECTION 609.0 PUBLIC GARAGES

609.1 General: Public garages shall comply with the applicable requirements

of this section. The portions of such buildings and structures in which paint spraying is done shall comply with the requirements of Section 622.0.

609.2 Construction: All Group 1 public garages hereafter erected shall be classified as Use Group S-1 and all Group 2 public garages shall be classified as Use Group S-2 and both shall conform to the height and area limitations of Table 501 except as herein specifically provided.

609.2.1 Special height limitations: Public garage buildings shall comply with the height and area limitations of Table 501 for the classification of the use as specified in Section 609.2. The height limitations shall be increased one additional story when the building is equipped with an approved automatic fire suppression system.

609.2.2 Basements: The first floor construction of public garages of all classifications and public hangars with basements shall be constructed of not less than 2-hour fireresistance rating and shall be water- and vapor-proof. Where openings are provided in the floor, they shall be protected by a curb or ramp not less than 6 inches (152 mm) high above the floor to avoid the accumulation of explosive liquids or vapors and prevent spilling to the lower floor. There shall be not less than two means of egress from such areas.

609.2.3 Roof storage of motor vehicles: When the roof of a building is used for parking or storage of motor vehicles, it shall be provided with a parapet wall or a guardrail constructed in accordance with Section 827.0 and a wheel guard not less than 6 inches (152 mm) in height, located so as to prevent any vehicle from striking the parapet wall or guardrail.

609.2.4 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 plumbing code listed in Appendix A. The floor finish shall be of concrete or other approved nonabsorbent, noncombustible material.

> **Exception:** Floor drains are not required for detached public garages for the storage of four or less commercial motor vehicles without provision for repairing or servicing such vehicles nor the dispensing of gasoline, oil, or similar products.

609.3 Fuel dispensing areas: Fuel dispensing areas shall be located on the level nearest grade. Public garages with fuel dispensing areas shall be completely separated from any other use, both horizontally and vertically, by fire separation walls and floor/ceiling assemblies having a minimum fireresistance rating of 2 hours. The floors of the fuel dispensing areas shall be graded to a floor drainge system such that any fuel spill or leak is contained within the area. The drainage system shall conform to the requirements of the plumbing code listed in Appendix A. The fuel dispensing area shall be protected with an approved automatic fire suppression system in accordance with Section 1002.10.

609.3.1 Fuel dispensing systems: All fuel dispensing and storage systems shall conform to the requirements of the mechanical code listed in Appendix A.

609.4 Ventilation: All public garages shall be ventilated in accordance with the mechanical code listed in Appendix A. Fuel dispensing areas shall be mechanically ventilated.

609.5 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 619.0 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 5 gallons (0.019 m^3) in approved safety cans.

SECTION 610.0 USE GROUP I-2

610.1 General: All buildings or portions thereof of Use Group I-2 shall comply with the provisions of this section and all other applicable provisions of this code.

610.2 Specific use areas: The specific use areas listed in Table 610.2 shall be separated from other areas of buildings of Use Group I-2 in accordance with the requirements of Table 610.2.

610.2.1 Separation walls: Where the separation walls around specific use areas are not required to have a fireresistance rating by Table 610.2, the separation walls shall be constructed of materials consistent with the building type of construction and be capable of resisting the passage of smoke. The separation walls shall extend from the floor to the underside of a fireresistance rated floor/ceiling assembly or to the floor/roof deck above. All doors shall be self-closing or automatic closing upon detection of smoke. Doors in walls required to be fireresistance rated shall have a minimum fireresistance rating of ¾ hour and shall comply with Section 916.0.

Table 610.2
SPECIFIC USE AREAS WITHIN AN I-2 USE

Room or area[a]	Separation/protection
Boiler and heater rooms	2-hour; or 1-hour and automatic fire suppression
Employee locker rooms	1-hour; or automatic fire suppression with separation walls
Gift/retail shops	1-hour; or automatic fire suppression with separation walls
Handicraft shops	1-hour; or automatic fire suppression with separation walls
Kitchens	1-hour; or automatic fire suppression with separation walls
Laboratories which employ hazardous materials but such materials are in quantities less than that which would cause classification as Use Group H.	1-hour or automatic fire suppression with separation walls

Table 610.2 (cont'd.)
SPECIFIC USE AREAS WITHIN AN I-2 USE

Room or area[a]	Separation/protection
Laundries greater than 100 square feet	1-hour and automatic fire suppression
Paint shops employing hazardous substances and materials in quantities less than that which would cause classification as Use Group H	2-hour; or 1-hour and automatic fire suppression
Physical plant maintenance shop	2-hour; or 1-hour and automatic fire suppression
Soiled linen room	1-hour and automatic fire suppression
Storage rooms more than 50 square feet in area but not more than 100 square feet in area storing combustible material	1-hour or automatic fire suppression with separation walls
Storage rooms more than 100 square feet storing combustible material	1-hour and automatic fire suppression
Trash collection rooms	1-hour and automatic fire suppression

Note a. 1 square foot = 0.093 m².

610.3 **Corridors:** All corridors in buildings of Use Group I-2 shall be continuous to the exits and separated from all other use areas except waiting areas, nurses' stations, and mental health treatment areas conforming to Sections 610.3.1 through 610.3.5.

610.3.1 **Waiting areas on patient sleeping floors:** Waiting areas on patient sleeping floors shall not be open to the corridor, except where:

1. The area does not exceed 250 square feet (23 m²); and
2. The area is located to permit direct supervision by facility staff; and
3. The area is equipped with an approved electrically supervised smoke detection system; and
4. Not more than one such waiting area is permitted in any one smoke compartment; and
5. The area is arranged not to obstruct access to required exits; and
6. The walls and ceiling of the space are constructed as required for corridors.

610.3.2 **Waiting areas on other floors:** Waiting areas on the floors other than patient sleeping floors shall not be open to the corridor, except where:

1. Each area does not exceed 600 square feet (56 m²); and
2. The area is located to permit direct supervision by the facility staff; and
3. The area is arranged not to obstruct access to required exits; and
4. The area is equipped with an approved electrically supervised automatic smoke detection system; and
5. The walls and ceilings of the space are constructed as required for corridors.

610.3.3 **Waiting areas in sprinklered buildings:** In buildings equipped throughout with an approved automatic fire suppression system, spaces con-

structed as required for corridors shall not be open to a corridor, except where:

1. The spaces are not used for patient sleeping rooms, treatment rooms or hazardous areas as defined in Section 610.2; and
2. Each space is located to permit direct supervision by the facility staff; and
3. The space and corridors which the space opens onto in the same smoke compartment are protected by an approved electrically supervised automatic smoke detection system; and
4. The space is arranged so as not to obstruct access to required exits.

610.3.4 Nurses' stations: Space for doctors' and nurses' charting, communications and related clerical areas shall not be open to the corridor, except where the space is constructed as required for corridors.

610.3.5 Mental health treatment areas: Areas wherein only mental health patients who are capable of self-preservation are housed, group meeting or multi-purpose therapeutic spaces, other than specific use areas as defined in Section 610.2, under continuous supervision by facility staff, shall not be open to the corridor, except where:

1. Each area does not exceed 1,500 square feet (140 m^2); and
2. The area is located to permit supervision by the facility staff; and
3. The area is arranged so as not to obstruct any access to required exits; and
4. The area is equipped with an approved electrically supervised automatic smoke detection system; and
5. Not more than one such space is permitted in any one smoke compartment; and
6. The walls and ceilings of the space are constructed as required for corridors.

610.4 Corridor walls: Corridor walls shall have a 1-hour fireresistance rating extending from the floor to the underside of the floor or roof deck above.

In buildings equipped throughout with an approved automatic fire suppression system, the corridor wall fireresistance rating is not required provided the corridor walls form a barrier to limit the transfer of smoke. The walls shall extend from the floor to the underside of the floor or roof deck above or to the underside of the fireresistance rated floor/ceiling or roof/ceiling assembly above when the ceiling membrane is constructed to limit the transfer of smoke.

610.4.1 Corridor doors: All doors shall conform to Section 916.0. Doors to patient sleeping rooms shall be automatic-closing by smoke detection. All other doors shall be self-closing or automatic closing by smoke detection. In buildings equipped throughout with an approved automatic fire suppression system, corridor doors other than those in a wall required to be rated by Section 610.2 or for the enclosure of a vertical opening shall not have a required fireresistance rating, but shall provide an effective barrier to limit the

transfer of smoke. In buildings equipped throughout with an approved automatic fire suppression system, all doors except those to sleeping rooms shall be self-closing or automatic closing by smoke detection.

610.4.2 Locking devices: Locking devices which restrict access to the patient room from the corridor, which are operable only by staff from the corridor side, shall not restrict egress from the patient room except for mental health patient rooms.

610.5 Smoke barrier: Each floor of a building of Use Group I-2 shall have at least one smoke barrier creating not less than two compartments per floor with a maximum compartment length and width of 150 feet (45720 mm). The smoke barrier shall be in accordance with Section 911.0.

610.5.1 Refuge area: At least 30 net square feet (2.8 m^2) per occupant shall be provided within the aggregate area of corridors, patient rooms, treatment rooms, lounge or dining areas and other low hazard areas on each side of each smoke barrier. On floors not housing bed or litter patients at least 6 net square feet (0.56 m^2) per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining compartments.

610.5.2 Independent egress: A means of egress shall be provided from each compartment created by smoke barriers without returning through the compartment from which egress originated.

610.6 Smoke/heat detectors: An automatic fire alarm system conforming to Section 1018.0 shall be provided in patient sleeping rooms, corridors and common spaces open to the corridor as permitted by Section 610.3. Heat detectors shall be provided in unsprinklered specific use areas listed in Section 610.2 and shall sound a local alarm at a constantly attended location.

610.6.1 Rooms: Patient sleeping rooms shall be provided with a smoke detector permanently connected to house current and complying with the requirements of UL 217 or UL 268 listed in Appendix A. Such detectors shall provide a visual display on the corridor side of each patient room and shall provide an audible and visual alarm at the nursing station attending that room. Where such detectors and related devices are not combined with the nursing call system, the total system shall be electrically supervised.

> **Exception:** Smoke detectors are not required in patient rooms equipped with automatic door-closing devices with integral smoke detectors on the room sides installed in accordance with their listing, provided the integral detectors perform the required alerting function.

610.6.2 Corridors: An approved automatic fire detection system shall be installed in all corridors in buildings of Use Group I-2 which are not equipped throughout with an approved automatic fire suppression system. The automatic fire detection system required by this section shall be electrically interconnected to the fire protective signaling system.

SECTION 611.0 USE GROUP I-3

611.1 General: All buildings or portions thereof of Use Group I-3 shall comply with the provisions of this section and all other applicable provisions of this code (see Section 307.4).

611.2 Definitions: Terms used in this section shall have the following meaning:

Residential housing area: Includes sleeping areas and any contiguous day room, group activity space or other common spaces for customary access of residents.

Sallyport (security vestibule): A compartment provided with two or more doors where the intended purpose is to prevent the continuous and unobstructed passage by allowing the release of only one door at a time.

611.3 Mixed occupancies: Portions of buildings of Use Group I-3 which are classified as a different occupancy group shall meet the applicable requirements of this code for such occupancies. Where security operations necessitate the locking of required means of egress, provisions shall be made for the release of occupants during all times of use.

611.4 Means of egress: Except as modified or provided for in this section, the provisions of Article 8 shall apply.

611.4.1 Door width: Doors to resident sleeping rooms shall have a clear width of not less than 28 inches (711 mm).

611.4.2 Sliding doors: When doors in a means of egress are of the horizontal sliding type, the force to slide the door to its fully open position shall not exceed 50 pounds (222 N) with a perpendicular force against the door of 50 pounds (222 N).

611.4.3 Horizontal exits: Horizontal exits shall not be substituted for other exits unless the maximum exit travel distance specified in Table 807 is not exceeded. Horizontal exits shall be permitted to comprise 100 percent of the exits required. At least 6 square feet (0.56 m^2) of accessible space per occupant shall be provided on each side of the horizontal exit for the total number of people in adjoining compartments. Every fire compartment for which credit is allowed in connection with a horizontal exit shall not be required to have a stairway or door leading directly outside, provided the adjoining fire compartments have stairways or doors leading directly outside.

611.4.4 Spiral stairs: Spiral stairs meeting the requirements of Section 816.7 are permitted for access to and between staff locations.

611.4.5 Exit discharge: Exits are permitted to discharge into a fenced or walled courtyard, provided that not more than two walls of the courtyard are the building walls from which exit is being made. Enclosed yards or courts shall be of sufficient size to accommodate all occupants, a minimum of 50 feet (15240 mm) from the building with a net area of 15 square feet (1.4 m^2) per person.

611.4.6 Sallyports: A sallyport shall be permitted in a means of egress where

there are provisions for continuous and unobstructed passage through the sallyport during an emergency condition.

611.5 Locks: Doors from an area of refuge to the exterior are permitted to be locked with a key lock in lieu of locking methods described in Section 611.5.1. The locks shall be operable from the outside.

611.5.1 Remote release: All remote release in a means of egress shall be provided with reliable means of operation, remote from the resident living areas, to release locks on all required doors.

Exception: Provisions for remote unlocking are not required provided not more than ten locks are necessary to be unlocked in order to move all occupants from one smoke compartment to an area of refuge as promptly as required for remote unlocking. The opening of all necessary doors shall be accomplished with not more than two separate keys.

611.5.2 Power operated doors and locks: All power operated sliding doors or power operated locks for swinging doors shall be operable by a manual release mechanism at the door, and either emergency power or a remote mechanical operating release shall be provided.

611.5.3 Redundant operation: Remote release, mechanically operated sliding doors or remote release, mechanically operated locks shall be provided with a mechanically operated release mechanism at each door, or shall be provided with a redundant remote release control.

611.5.4 Relock capability: Doors remotely unlocked under emergency conditions shall not automatically relock when closed unless specific action is taken at the remote location to enable doors to relock.

611.6 Vertical openings: Vertical openings shall be enclosed in accordance with Section 915.1.

Exception: Two communicating floor levels are permitted without enclosure protection between the two levels, provided all the following conditions are met:

1. The entire normally occupied area, including all communicating floor levels, is sufficiently open and unobstructed that a fire or other dangerous condition in any part will be immediately obvious to the occupants or supervisory personnel in the area.
2. Egress capacity is simultaneously sufficient for all the occupants of all communicating levels and areas, all communicating levels in the same fire area being considered as a single floor area for purposes of determination of required egress capacity.
3. Each floor level, considered separately, has at least one-half of its individual required egress capacity accessible by exit access leading directly out of that level without traversing another communicating floor level.

611.7 Specific use areas: The specific use areas listed in Table 611.7 shall be separated from other areas of buildings of Use Group I-3 in accordance with the requirements of Table 611.7.

Table 611.7
SPECIFIC USE AREAS WITHIN AN I-3 USE

Room or area[a]	Separation/protection
Boiler and heater rooms	2-hour; or 1-hour and automatic fire suppression
Employee locker rooms	1-hour; or automatic fire suppression with separation walls
Handicraft shops	1-hour; or automatic fire suppression with separation walls
Kitchens	1-hour; or automatic fire suppression with separation walls
Laundries greater than 100 square feet	1-hour and automatic fire suppression
Paint shops employing hazardous substances and materials in quantities less than that which would cause classification as Use Group H	2-hour; or 1-hour and automatic automatic fire suppression
Physical plant maintenance shop	2-hour; or 1-hour and automatic fire suppression
Storage rooms more than 50 square feet in area but not more than 100 square feet in area storing combustible material	1-hour; or automatic fire suppression with separation walls
Storage rooms more than 100 square feet storing combustible material	1-hour and automatic fire suppression
Trash collection rooms	1-hour and automatic fire suppression
Padded cells	1-hour and automatic fire suppression

Note a. 1 square foot = 0.093 m^2.

611.7.1 Separation walls: Where the separation walls around specific use areas are not required by Table 611.7 to have a fireresistance rating, the separation walls shall be constructed of materials consistent with the building type of construction and be capable of resisting the passage of smoke. The separation walls extend from the floor to the underside of a fireresistance rated floor/roof assembly or to the floor/roof deck above. All doors shall be self-closing or automatic-closing upon detection of smoke.

611.8 Smoke barrier: All buildings of Use Group I-3 shall have smoke barriers as follows:

1. To divide every story used by residents for sleeping, or any other story having an occupant load of 50 or more persons, into at least two compartments, and
2. To limit the housing of a maximum of 200 residents in any smoke compartment, and
3. To limit the travel distance to a door in a smoke barrier:

a. From any room door required as exit access to 100 feet (30480 mm),
b. From any point in a room to 150 feet (45720 mm).

611.8.1 Refuge area: At least 6 net square feet (0.56 m²) per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining compartments.

611.8.2 Independent egress: A means of egress shall be provided from each compartment created by smoke barriers without returning through the compartment from which exiting originates.

611.9 Subdivision of resident housing areas: Any individual cell, dormitory, or other space where residents are housed shall be separated from all other spaces by substantial construction of noncombustible materials in accordance with Table 611.9.

611.9.1 Fireresistance rated doors: Doors in openings in partitions required to be fireresistive by Table 611.9 in other than required enclosures of exits or hazardous areas shall be substantial doors, of construction that will resist fire for at least 20 minutes. Wired glass vision panels are permitted. Latches and door closers are not required on cell doors.

611.9.2 Smoke-tight doors: Doors in openings in partitions required to be smoke-tight by Table 611.9 shall be substantial doors, of construction that will resist the passage of smoke. Latches and door closers are not required on cell doors.

611.10 Windowless buildings: For the purposes of this section, a windowless building or portion of a building is one with nonopenable windows, windows not readily breakable, or without windows. Windowless buildings shall be provided with vent openings, smoke shafts, or an engineered smoke control system to provide ventilation (mechanical or natural) for each windowless smoke compartment.

SECTION 612.0 BLEACHERS, GRANDSTANDS AND FOLDING OR TELESCOPIC SEATING

612.1 General: Bleachers, grandstands and folding or telescopic seating shall be constructed as required by this code and in accordance with NFiPA 102 listed in Appendix A.

612.2 Handrails: Means of egress stairways shall be provided with a handrail on at least one side and shall conform to Section 828.0. The handrail shall be broken as necessary to provide for entrance to the seating platforms.

612.3 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 exits; except that when enclosed in not less than 1-hour fireresistance rated construction, the code official shall approve the use of such spaces for other purposes provided that the safety of the public is not endangered.

Table 611.9
SUBDIVISION OF RESIDENT HOUSING AREAS

Use condition Section 307.4	II[b]		III[b]		IV[b]		V	
Feature	NS	AS	NS	AS	NS	AS	NS	AS
Room to room separation	NR	NR	NR	NR	ST	NR	FR(½)	ST
Room face to corridor separation	ST	NR	ST	NR	ST	NR	FR	ST
Room face to common space separation	NR	NR	NR < 50 ft[c,d] ST > 50 ft[c,d]	NR < 50 ft[c,d] ST > 50 ft[c,d]	ST	NR < 50 ft[c,d] ST > 50 ft[c,d]	FR	ST
Common space to corridor separation	FR	NR	FR	NR	FR	NR	FR	ST
Total openings in solid room face[a,d]	120 square inches		120 square inches		120 square inches		120 square inches Closable from inside or 120 square inches with smoke control	

AS — Protected by automatic sprinklers
NS — Not protected by automatic sprinklers
NR — No requirement
ST — Smoke-tight
FR — Fireresistance rated — 1 hour
FR(½) — Fireresistance rated — ½ hour

Note a. "Total opening in solid room face" includes all openings (undercuts, food passes, grilles, etc.), the total of which will not exceed 120 square inches. All openings shall be 36 inches or less above the floor.

Note b. Under use condition II, III, or IV, a space housing not more than 16 persons and subdivided by open construction (any combination of grating doors and grating walls or solid walls) shall be considered as one room or as separate rooms. The perimeter walls of such space shall be of smoke-tight construction. Smoke detection shall be provided in such space under use condition IV, common walls between sleeping areas within the space shall be smoke-tight and grating doors and fronts are permitted.

Note c. This is the travel distance through the common space to the exit access corridor.

Note d. 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 square inch = 645.16 mm^2.

SECTION 613.0 MOTION PICTURE PROJECTION ROOMS, SCREENING ROOMS AND SOUND STAGES

613.1 General: The provisions of this section shall apply to rooms in which ribbon-type cellulose acetate or other safety film is used in conjunction with electric arc, xenon or other light source projection equipment which develops hazardous gases, dust or radiation. Where cellulose nitrate film is used or stored, such rooms shall comply with NFiPA 40 listed in Appendix A.

Every motion picture machine projecting film as mentioned within the scope of this section shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, shall be within the projection room or in an adjacent room of equivalent construction. There shall be posted on the outside of each projection room door and within the projection room itself a conspicuous sign with 1-inch (25 mm) block letters stating: *Safety Film Only Permitted in this Room.*

613.2 Construction of projection rooms: Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings need not be protected.

The room shall have a floor area of not less than 80 square feet (7.44 m^2) for a single machine. Each motion picture projector, floodlight, spotlight or similar piece of equipment shall have a clear working space of not less than 30 inches by 30 inches (762 mm by 762 mm) on each side and at the rear thereof, but only one such space shall be required between two adjacent projectors. The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). The aggregate of openings for projection equipment shall not exceed 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 material, so as to completely close the opening.

613.3 Projection booth and equipment ventilation: Projection booths and equipment shall be ventilated in accordance with the mechanical code listed in Appendix A.

613.4 Lighting control: Provision shall be made for control of the auditorium lighting and the emergency lighting systems of theaters from inside of the room and from at least one other convenient point in the building as required in Section 824.3.1.

613.5 Miscellaneous equipment: Each projection room shall be provided with rewind and film storage facilities.

613.6 Screening rooms: Screening rooms shall provide a seating capacity of not more than 30 persons, with not less than two approved means of egress complying with Article 8. Such rooms shall be enclosed in 1-hour fire separation walls with fire doors complying with Section 916.0. All seats shall be permanently fixed in position and the arrangement shall comply with the requirements of Section 826.0.

613.7 Sound stage construction: All buildings designed or used as sound stages for motion picture or television film productions shall be protected with an approved two-source automatic sprinkler system complying with the provisions of Article 10; except that where approved, suppression of rooms designed for housing electrical equipment is not required when such rooms are constructed of Type 1 construction.

613.8 Film laboratories: Film laboratories shall not be operated in other than buildings or structures of Type 1A construction, equipped throughout with an approved automatic sprinkler system.

613.9 Film exchanges: All film exchanges and depots shall be housed in buildings and structures of Type 1A 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 613.9.1.

613.9.1 Vaults: Flammable film quantities of more than 1,000 pounds (454 kg) and not more than 10,000 pounds (4540 kg) shall be stored in vaults enclosed in floors, walls and ceilings of not less than 4-hour fireresistance rating with 3-hour fire doors complying with Section 916.0. The interior storage volume of the vault shall be not more than 1,500 cubic feet (42 m^3). The vault shall be drained and provided with scuppers.

SECTION 614.0 ROOFTOP HELIPORTS

614.1 General: This section governs the design and construction of rooftop facilities intended to accommodate the landing of helicopters. The use of a roof for landing shall be subject to the approval of the Federal Aviation Administration.

614.2 Structural loads: The roof and all pertinent building components shall be designed for the dead loads, live loads, impact loads and vibration imparted to the structure due to helicopter landing, including the single skid point landing.

614.3 Referenced standard: All rooftop heliports shall comply with NFiPA 418 listed in Appendix A.

SECTION 615.0 STAGES AND PLATFORMS

615.1 Applicability: The provisions of this section shall apply to all parts of buildings and structures which contain stages or platforms and similar appurtenances as herein defined.

615.2 Stages: A stage is a partially enclosed portion of a building which is designed or used for the presentation of plays, demonstrations or other entertainment. A stage shall be further classified as either a legitimate stage, regular stage or thrust stage.

Stage, legitimate: A stage wherein curtains, drops, leg drops, scenery, lighting devices or other stage effects are retractable horizontally or suspended overhead.

Stage, regular: A stage wherein curtains, fixed leg drops, valances, scenery and other stage effects are hung and are not retractable.
Stage, thrust: A platform extending beyond the proscenium arch and into the audience.

615.2.1 Stage floor construction: Openings through all stage floors shall be equipped with tight-fitting, solid wood trap doors not less than 2 inches in nominal thickness with approved safety locks or other materials of equal physical and fire endurance properties.

615.2.1.1 Legitimate stages: Legitimate stages shall be constructed as required for the type of construction, but not less than Type 1B construction except that the portion of the legitimate stage extending back from and 6 feet (1829 mm) beyond the full width of the proscenium opening on each side shall be permitted to be constructed of noncombustible or heavy timber construction covered with a wood floor of not less than 2 inches in nominal thickness. Except for the finished floor, combustible construction shall not extend beyond the plane of the proscenium opening.

615.2.1.2 Regular and thrust stages: Regular stages and thrust stages shall be constructed of materials as required for floors for the type of construction of the building in which they are located.

615.2.2 Stage rigging loft: The rigging loft, also referred to as a loft or fly, is the space over the stage where scenery and equipment can be out of view. The fly gallery is the narrow raised platform at the side of the legitimate stage from which the lines for flying scenery are manipulated. The gridiron is the arrangement of beams over a legitimate stage supporting the machinery for flying scenery and hanging battens from which lighting is hung. The pin rail is the beam at one side of a legitimate stage through which wooden or metal pins are driven and to which lines from the flies are fastened. The rigging loft, fly galleries, gridiron and pin rails shall be constructed of approved noncombustible materials.

615.2.3 Footlights and stage electrical equipment: Footlights and border lights shall be installed in troughs constructed of noncombustible materials. The switchboard shall be so located as to be readily accessible at all times and the storage or placing of stage equipment against it shall be prohibited.

615.2.4 Exterior stage doors: Where protection of openings is required, exit discharge door openings to the outer air shall be protected with fire doors complying with Section 916.0. All exterior openings which are located on the stage for means of egress or loading and unloading purposes, and which are likely to be open during occupancy of the theater, shall be constructed with vestibules to prevent air drafts into the auditorium.

615.2.5 Proscenium wall: Legitimate stages shall be completely separated from the seating area by a proscenium wall of not less than 2-hour fireresistance rating extending continuously from foundation to at least 4 feet (1219 mm) above the roof. There shall be no other openings in the wall separating a legitimate stage from the auditorium except the main proscenium opening;

two doorways at the stage level, one on each side thereof; and one doorway to the musician's pit from the space below the stage floor. Each such doorway shall not exceed 45 square feet (4.19 m^2) in area and shall be protected with fire doors complying with Section 916.0.

615.2.5.1 Trim, finish and decorative hangings: All moldings and decorations around the proscenium opening shall be constructed entirely of noncombustible material.

615.2.6 Proscenium curtain: The proscenium opening shall be provided with an approved curtain of noncombustible or fire-retardant material so designed and installed that it will protect against passage of flame and smoke for 5 minutes. 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 15 to 20 degrees F. per minute (0.14 degrees C. to 0.19 degrees C. per second); and by an auxiliary operating device to permit prompt and immediate manual closing of the proscenium opening.

615.2.7 Scenery: All combustible materials used in sets and scenery shall be rendered flameresistant to comply with Article 9.

615.2.8 Stage ventilation: Metal or other approved noncombustible ventilators, equipped with movable shutters or sash shall be provided over stages larger than 500 square feet (46.5 m^2) in floor area, constructed to open automatically by approved heat activated devices, with an aggregate clear area of opening not less than 5 percent of the area of the stage, except as otherwise provided in Section 615.2.9. Supplemental means shall be provided for manual operation of the ventilator. Curbs shall be provided as required for skylights in Section 2204.6.1.

615.2.9 Superimposed theaters: An addition or extension shall not be erected over the stage section of a theater, nor shall a second theater be erected above another. Where approved, the prohibition against superimposed theaters and construction above the stage shall not apply when approved access is provided for fire fighting with direct means of ventilation to the outer air from the stage portion.

615.3 Platforms: A platform is that raised area within a building used for the presentation of music, plays or other entertainment; the head table for special guests; the raised area for lectures and speakers, boxing and wrestling rings; theater-in-the-round; and similar purposes wherein there are no overhead hanging curtains, drops, scenery or stage effects other than lighting. A temporary platform is one installed for use for not more than 30 days.

615.3.1 Materials: In buildings required to be of Type 1 or Type 2 construction, where the platforms are not more than 30 inches (762 mm) above the main floor level the minimum type of construction for a permanent platform shall be Type 2C. For all types of construction, where the platforms are not more than 30 inches (762 mm) above the main floor level, not larger in area than 10 percent of the room floor area and not more than 200 square feet (19 m^2) in area, the minimum type of construction for a permanent platform shall

Type 5B. For all types of construction, where the platforms are not more an 30 inches (762 mm) above the main floor level, not larger than one-third the room floor area and not more than 3,000 square feet (279 m²) in area, minimum type of construction for a permanent platform shall be Type 4 or platform shall be constructed of fire-retardant treated wood. All other rmanent platforms shall be constructed of approved materials as required r floors for the required type of construction of the building in which it is cated. Temporary platforms shall be constructed of any approved materials.

15.3.2 **Space beneath:** The space between the floor and a temporary platform ove shall not be used for any purpose other than electrical wiring to tform equipment. Where the space between the floor and a permanent tform above is used for any purpose other than electrical wiring or plumb-g, the platform shall provide a 1-hour fireresistance rating.

615.4 **Dressing and appurtenant rooms:** Dressing and appurtenant rooms hall comply with Sections 615.4.1 through 615.4.3.

615.4.1 **Construction:** Dressing rooms, scene docks, property rooms, work-ops and storerooms and all compartments appurtenant to the stage shall be eparated from each other and from the stage and all other parts of the uilding by walls of not less than 1-hour fireresistance rating with approved pening protectives. Such rooms shall not be placed immediately over or nder the operating stage area.

Exception: Separation from the stage is not required for stages having a floor area of 500 square feet (46.5 m²) or less.

615.4.2 **Opening protectives:** Openings other than to trunk rooms and the ecessary doorways at stage level shall not connect such rooms with the stage, nd such openings shall be protected with fire doors complying with Section 16.0.

615.4.3 **Dressing room and stage exits:** Each tier of dressing rooms shall be rovided with at least two means of egress. Egress stairways from dressing and torage rooms are not required to be enclosed when located in the stage area ehind the proscenium wall. At least one approved means of egress shall be rovided from each side of the stage and from each side of the space under the tage, and from each fly gallery and from the gridiron. A steel ladder shall be rovided from the gridiron to a scuttle in the stage roof.

SECTION 616.0 AIRPORT TRAFFIC CONTROL TOWERS

616.1 **General:** The provisions of this section shall apply to airport traffic ontrol towers not exceeding 1,500 square feet (140 m²) per floor used only for ir traffic control, electrical and mechanical equipment rooms, radar and lectronics rooms, office spaces incidental to tower operation and lounges for mployees including restrooms.

616.2 **Type of construction:** Air traffic control towers shall be constructed to onform with the height and area limitations of Table 616.2.

Table 616.2
HEIGHT AND AREA LIMITATION FOR AIRPORT TRAFFIC CONTROL TOWERS

Type of construction	Height[a]	Maximum area in square feet[a]
1A, 1B	Unlimited	1,500
2A	240 feet	1,500
2B	100 feet	1,500

Note a. 1 foot= 304.8 mm; 1 square foot = 0.093 m².

616.3 Egress: A minimum of one exit stairway shall be permitted for airport traffic control towers of any height provided the occupant load per floor does not exceed 15. The stair shall conform to the requirements of Sections 816.0 and 818.0. The stair shall be separated from elevators by a minimum distance of one-half the diagonal of the area served.

Exception: Smokeproof enclosures as set forth in Section 818.0 are not required when required stairways are pressurized to a minimum of 0.15 inches of water column (37.33 Pa) and a maximum of 0.35 inch of water column (87.10 Pa) in the shaft relative to the building with all stairway doors closed.

616.4 Automatic fire detection systems: Airport traffic control towers shall be provided with an automatic fire detection system complying with Section 1018.0.

616.5 Standby power, light and emergency systems: A standby power system conforming to Section 2707.0 shall be provided in airport traffic control towers over 65 feet (19812 mm) in height. Service shall be provided to smokeproof enclosure mechanical equipment and lighting, elevator operational equipment, and automatic fire alarm systems.

SECTION 617.0 COMBUSTIBLE DUSTS, GRAIN PROCESSING AND STORAGE

617.1 General: 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 aluminum, coal, cocoa, magnesium, spices, sugar or similar material producing dust. The provisions of NFiPA 61A, 61B, 61C, 61D, 65, 85F 651, 653, 654, 655, 664 and the fire prevention code listed in Appendix A, except as herein specifically required, shall be deemed to conform to the requirements of this code.

617.2 Buildings: All such buildings and other occupied structures shall be of Type 1, Type 2 or of laminated planks or lumber sizes qualified for Type 4 construction, within the height and area limits of Table 501 for Use Group H; except that when erected of Type 1 or Type 2 construction, the height and area of grain elevators and similar structures shall be unlimited, and when of Type 4 construction, the maximum height shall be 65 feet (19812 mm) and except

further that, in isolated areas, the maximum height of Type 4 structures shall be increased to 85 feet (25908 mm).

617.2.1 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 2-hour fireresistance rating when the area is not more than 3,000 square feet (279 m^2), and of not less than 4-hour fireresistance rating when the area is greater than 3,000 square feet (279 m^2).

617.2.2 Conveyors: All conveyors, chutes, piping and similar equipment passing through the enclosures of such rooms or spaces shall be constructed dirt- and vapor-tight, and of approved noncombustible materials complying with Section 2616.0.

617.3 Explosion relief: Means for explosion relief shall be provided as specified in Section 618.0, or such spaces shall be equipped with the equivalent mechanical ventilation complying with the mechanical code listed in Appendix A.

617.4 Grain elevators: Grain elevators, malt houses and buildings for similar uses shall not be located within 30 feet (9144 mm) of interior lot lines or structures on the same lot, except when erected along a railroad right of way.

617.5 Coal pockets: Coal pockets located less than 30 feet (9144 mm) from interior lot lines or structures on the same lot shall be constructed of not less than Type 2A construction. Where more than 30 feet (9144 mm) from interior lot lines, or erected along a railroad right of way, the minimum type of construction of such structures shall be Type 4, provided they are not more than 65 feet (19812 mm) in height.

SECTION 618.0 EXPLOSION HAZARDS

618.1 Explosion relief: 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.

618.2 Venting devices: Venting devices to relieve the pressure resulting from explosive air-vapor mixtures shall consist of windows, skylights, vent flues or releasing roof or wall panels which discharge directly to the open air or to a public place or other unoccupied space not less than 20 feet (6096 mm) in width on the same lot. Such releasing device shall be so located that the discharge end shall be not less than 10 feet (3048 mm) vertically and 20 feet (6096 mm) 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.

618.3 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 prescribed below.

1. Heavy reinforced concrete frame, 1 square foot (0.093 m^2) for 80 cubic

feet (2.24 m^3) of volume.
2. Light structural steel frame and ordinary construction, 1 square foot (0.093 m^2) for 65 cubic feet (1.82 m^3) of volume.
3. Light wood frame construction, 1 square foot (0.093 m^2) for 50 cubic feet (1.40 m^3) of volume.

The combined area of open windows, pivoted sash or wall panels arranged to open under internal pressure shall not be less than 10 percent of the area of the enclosure walls, with not less than 50 percent of the opening arranged for automatic release.

618.4 Construction of vents: All explosion relief devices shall be of an approved type constructed of lightweight, noncombustible and corrosion-resistive materials, and the discharge end shall be protected with approved screens of not more than ¾-inch (19 mm) mesh, arranged to blow out under relatively low pressures.

SECTION 619.0 FLAMMABLE AND COMBUSTIBLE LIQUIDS

619.1 Main storage: Main storage systems of flammable and combustible liquids shall be constructed and installed in accordance with NFiPA 30 and the fire prevention code listed in Appendix A.

619.2 Construction of enclosures: Process rooms shall be separated from other uses and occupancies by walls, floors and ceilings of not less than 2-hour fireresistance rating with 1½-hour fire doors complying with Section 916.0. The interior door openings shall be provided with noncombustible sills not less than 6 inches (152 mm) high and the room shall be vented as required in Section 618.1. Floors shall be waterproofed and drained to comply with Section 1224.0.

619.3 Enclosure openings: Openings shall not be permitted in the enclosure walls within 11 feet (3353 mm) of adjoining property lines or with a fire separation distance of less than 11 feet (3353 mm) from any building or structure not part of the installation.

619.4 Dry cleaning plants: The construction and installation of dry cleaning plants shall be in accordance with the requirements of this code, the mechanical code, the plumbing code and NFiPA 32 listed in Appendix A.

SECTION 620.0 LIQUEFIED PETROLEUM GAS FACILITIES

620.1 General: The design and construction of propane, butane, propylene, butylene and other liquefied petroleum gas distribution facilities shall conform to the applicable provisions of this section. The storage and handling of liquefied petroleum gas systems shall conform to the fire prevention code listed in Appendix A. The design and installation of piping, equipment and systems which utilize liquefied petroleum gas shall be in accordance with the mechanical code listed in Appendix A. Liquefied petroleum gas facilities shall

be ventilated in accordance with the mechanical code listed in Appendix A and Section 620.1.1.

620.1.1 LPG distribution facilities: Liquefied petroleum gas distribution facilities shall be provided with air inlets and outlets arranged so that air movement across the floor of the facility will be as uniform as possible. The total area of both inlet and outlet openings shall be at least 1 square inch (0.00065 m^2) for each square foot (0.093 m^2) of floor area. The bottom of such openings shall not be more than 6 inches (152 mm) above the floor.

620.2 Construction: Liquefied petroleum gas distribution facilities shall be constructed in accordance with Section 620.3 for separate buildings, Section 620.4 for attached buildings or Section 620.5 for rooms within buildings.

620.3 Separate buildings: When located in separate buildings, such buildings shall be used exclusively for that purpose or for other purposes having similar hazards. Such buildings shall be limited to one story in height.

620.3.1 Floors: The floor shall not be located below ground level and any spaces beneath the floor shall be solidly filled or shall be left unenclosed.

620.3.2 Materials: Walls, floors, ceilings, columns and roofs shall be constructed of noncombustible materials. Exterior walls, ceilings and roofs shall be constructed of lightweight material designed for explosion venting or, if of heavy construction such as solid brick masonry, concrete block or reinforced concrete construction, explosion venting windows or panels in walls or roofs shall be provided having an explosion venting area of at least 1 square foot (0.093 m^2) for each 50 cubic feet (1.40 m^3) of the enclosed volume.

620.4 Attached buildings: Where liquefied petroleum gas facilities are located in an attached structure, the attached perimeter shall not exceed 50 percent of the perimeter of the space enclosed and the facility shall comply with Sections 620.3 and 620.4.1. Where the attached perimeter exceeds 50 percent, such facilities shall comply with Section 620.5.

620.4.1 Walls: Common walls at points at which structures are attached shall have a fireresistance rating of not less than 1 hour and shall not have openings. Common walls for attached structures used only for storage of LP-gas are permitted to have fire doors complying with Section 916.0. Such walls shall be designed to withstand a static pressure of at least 100 pounds per square foot (psf) (488.2 kg/m^2), except where the building to which the structure is attached is occupied by operations or processes having a similar hazard.

620.5 Rooms within buildings: When liquefied petroleum gas facilities are located in rooms within buildings, such rooms shall be located in the first story and shall have at least one exterior wall with sufficient exposed area to permit explosion venting as provided in Section 620.5.1. The building in which the room is located shall not have a basement or unventilated crawl space and the room shall comply with Sections 620.5.1 and 620.5.2.

620.5.1 Materials: Walls, floors, ceilings, and roofs of such rooms shall be

constructed of noncombustible materials. Exterior walls and ceilings shall be either of lightweight material designed for explosion venting, or, if of heavy construction such as solid brick masonry, concrete block or reinforced concrete construction shall be provided with explosion venting windows or panels in the walls or roofs having an explosion venting area of at least 1 square foot (0.093 m^2) for each 50 cubic feet (1.40 m^3) of enclosed volume.

620.5.2 Common construction: Walls and floor/ceiling assemblies common to the room and to the building within which it is located shall have a fireresistance rating of not less than 1 hour with no openings. Common walls for rooms used only for storage of LP-gas are permitted to have doorways which shall be equipped with ¾-hour opening protectives. Such walls and ceiling shall be designed to withstand a static pressure of at least 100 psf (488.2 kg/m^2). Where approved, these provisions shall not apply when the building within which the room is located is occupied by operations or processes having a similar hazard.

SECTION 621.0 MOBILE UNITS

621.1 General: Mobile units, as defined in Section 201.0, shall be designed, constructed and maintained to be transported from one location to another and not mounted on a permanent foundation. A mobile unit placed on a permanent foundation or on foundation piers shall be designed and constructed to comply with all of the requirements of this code for on-site and prefabricated construction.

621.2 Construction: Residential mobile units shall be of an approved design and constructed in accordance with the applicable ordinances and statutes. All other mobile units shall be designed and constructed in accordance with the requirements of this code. All mobile units on a permanent foundation, shall be evaluated, inspected and labeled in-plant in accordance with Section 115.2.3.

621.3 Location: Mobile units shall be located in spaces approved for such use. The provisions of this code shall not be construed to repeal, modify or constitute an alternative to any lawful zoning regulations. In case of conflict between this code or any other ordinance or statute, the most rigid requirements shall apply.

621.3.1 Anchorage and tie-down: Every parking space for mobile units shall be provided with devices for anchoring the unit to prevent overturning or uplift. The owner of the parking space shall anchor or cause to be anchored all mobile units located on the parking space. Where concrete platforms are provided for the parking of the units, anchorage shall be provided by eyelets embedded in the concrete with adequate anchor plates or hooks, or other suitable means. The anchorage shall be adequate to withstand wind forces and uplift as required in Article 11 for buildings and structures, based upon the size and weight of the units.

SECTION 622.0 PAINT SPRAYING AND SPRAY BOOTHS

622.1 General: The provisions of this section shall apply to the construction, installation and use of buildings and structures or parts thereof for the spraying of flammable paints, varnishes and lacquers or other flammable materials, mixtures or compounds used for painting, varnishing, staining or similar purposes. All such construction and equipment shall comply with NFiPA 33 and 34 in Appendix A.

622.2 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 code official in accordance with NFiPA 70 and the fire prevention code listed in Appendix A.

622.3 Spray spaces: All spray spaces shall be ventilated with an exhaust system to prevent the accumulation of flammable mist or vapors in accordance with the mechanical code listed in Appendix A. When such spaces are not separately enclosed, noncombustible spray curtains shall be provided to restrict the spread of flammable vapors.

622.3.1 Spray booths: All spray booths shall be constructed of noncombustible materials and equipped with mechanical ventilating systems in accordance with the mechanical code listed in Appendix A.

622.3.2 Spray rooms: All spray rooms shall be enclosed in partitions of not less than 1-hour fireresistance rating. Floors shall be waterproofed and drained in an approved manner.

622.3.3 Spray storage rooms: Spraying materials in quantities of not more than 20 gallons (0.076 m^3) shall be stored in approved cabinets ventilated at top and bottom. When in quantities of more than 20 gallons (0.076 m^3) and not more than 100 gallons (0.38 m^3), the spraying materials shall be stored in approved double walled noncombustible cabinets vented directly to the outer air. All spraying materials in quantities of more than 100 gallons (0.38 m^3) shall be stored in an enclosure of not less than 2-hour fireresistance rating or in a separate exterior storage building. Such storage shall not be in quantities of more than 250 gallons (0.95 m^3), except when stored in storage buildings; and except further that not more than 25 gallons (0.095 m^3) of spraying material shall be stored in buildings in which pyroxylin products are manufactured or stored.

622.4 Fire protection: Sprinkler heads shall be provided in all spray, dip and immersing spaces and storage rooms, and shall be installed in accordance with Article 10. Where buildings containing spray areas are not equipped with an approved automatic sprinkler system, the sprinklers in booths and other spray areas and storage rooms shall be permitted to be supplied from the building water supply when approved and conforming to Section 1005.0.

SECTION 623.0 RADIO AND TELEVISION TOWERS

623.1 General: Subject to the structural provisions of Section 1112.0 for wind

ads and the requirements of Section 927.0 governing the fireresistance ings of buildings for the support of roof structures, all radio and television wers shall be designed and constructed as herein provided.

3.2 Location and access: The towers shall be so located and equipped with ep bolts and ladders to be readily accessible for inspection purposes. Guy res or other accessories shall not cross or encroach upon any street or other blic space, or over any electric power lines, or encroach upon any other ivately owned property without written consent of the owner.

23.3 Construction: All towers shall be constructed of approved corrosion-sistive noncombustible material. The minimum type of construction of olated radio towers not more than 100 feet (30480 mm) in height shall be ype 4.

23.4 Loads: The structure shall be designed to resist the wind loads in ccordance with ANSI A58.1 listed in Appendix A. Consideration shall be iven to conditions involving wind load on ice-covered sections in localities ubject to sustained freezing temperatures.

23.4.1 Dead load: Towers shall be designed for the dead load plus ice load in egions where ice formation is likely to occur.

23.4.2 Uplift: Adequate foundations and anchorage shall be provided to esist two times the calculated wind uplift.

23.5 Grounding: All towers shall be permanently and effectively grounded.

SECTION 624.0 RADIO AND TELEVISION ANTENNAE

24.1 Permits not required: A building permit is not required for roof installa-ion of antennae structures not more than 12 feet (3658 mm) in height for rivate radio or television reception. Such a structure, however, shall not be rected so as to injure the roof covering, and when removed from the roof, the oof covering shall be repaired to maintain weather- and water-tightness. The nstallation of any antennae structure mounted on the roof of a building shall ot be erected nearer to the lot line than the total height of the antennae tructure above the roof, nor shall such structure be erected near electric ower lines or encroach upon any street or other public space.

624.2 Permits required: Approval shall be secured for all roof mounted antennae structures more than 12 feet (3658 mm) in height above the roof. The application shall be accompanied by detailed drawings of the structure and methods of anchorage. All connections to the roof structure shall be properly flashed to maintain water-tightness. The design and materials of construction shall comply with the requirements of Section 623.3 for character, quality and minimum dimension.

SECTION 625.0 SWIMMING POOLS

625.1 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 24 inches (610 mm) deep or having a surface area less than 250 square feet (23.25 m^2), except when such pools are permanently equipped with a water recirculating system or involve structural materials. For purposes of this code, pools are classified as private swimming pools or public swimming pools, as defined in Section 625.2. Materials and constructions used in swimming pools shall comply with the applicable requirements of this code.

625.1.1 Public facilities: The Cabinet for Human Resources, Department for Health Services shall regulate the design and construction of new facilities as related to water distribution and treatment systems for public swimming pools and the proper operation and maintenance of all such facilities. Their regulation is 902 KAR 10:120 and is titled "Kentucky Public Swimming and Bathing Facilities Regulation."

625.2 Classification of pools: Any constructed pool which is used, or intended to be used, as a swimming pool in connection with a building of Use Group R-3 and available only to the family of the householder and his private guests shall be classified as a private swimming pool. Any swimming pool other than a private swimming pool shall be classified as a public swimming pool.

625.3 Plans and permits: A swimming pool or appurtenances thereto shall not be constructed, installed, enlarged or altered until plans have been submitted and a permit has been obtained from the code official. The approval of all city, county and state authorities having jurisdiction over swimming pools shall be obtained before applying to the code official for a permit. Certified copies of these approvals shall be filed as part of the supporting data for the application for the permit.

625.3.1 Plans: Plans shall accurately show dimensions and construction of the pool and appurtenances and properly established distances to lot lines, buildings, walks and fences, as well as details of the water supply system, drainage and water disposal systems, and all appurtenances pertaining to the swimming pool. Detailed plans of structures, vertical elevations, and sections through the pool showing depth shall be included.

625.4 Locations: Private swimming pools shall not encroach on any front or side yard required by this code, or the governing zoning law, except by specific rules of the jurisdiction in which it is located. A wall of a swimming pool shall not be located less than 6 feet (1829 mm) from any rear or side property line or 10 feet (3048 mm) from any street property line, except by specific rules of the jurisdiction in which it is located.

625.5 Structural design: The pool structure shall be engineered and designed to withstand the expected forces to which it will be subjected.

625.5.1 Wall slopes: To a depth up to 2 feet 9 inches (838 mm) from the top, the wall slope shall not be more than one unit horizontal in five units vertical (1:5).

625.5.2 Floor slopes: The slope of the floor on the shallow side of the transition point shall not exceed one unit vertical to seven units horizontal

(1:7). For public pools greater than 1,200 square feet (111.6 m^2), the slope of the floor on the shallow side of transition point shall not exceed one unit vertical to ten units horizontal (1:10). The transition point between shallow and deep water shall not be more than 5 feet (1524 mm) deep.

625.5.3 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. Where skimmers are used for private pools, there shall be at least one skimming device for each 1,000 square feet (93 m^2) of surface area or fraction thereof. For public pools where water skimmers are used, there shall be at least one skimming device for each 600 square feet (55.8 m^2) of surface area or fraction thereof. Where overflow gutters are used, they shall not be less than 3 inches (76 mm) deep, pitched to a slope of one unit vertical to 48 units horizontal (1:48) toward drains, and constructed so they are safe, cleanable and that matter entering the gutters will not be washed out by a sudden surge of entering water.

625.5.4 Walkways: All public swimming pools shall have walkways not less than 4 feet (1219 mm) in width extending entirely around the pool. Where curbs or sidewalks are used around any swimming pool, they shall have a slip-resistant surface for a width of not less than 1 foot (305 mm) at the edge of the pool, and shall be so arranged to prevent return of surface water to the pool.

625.5.5 Steps and ladders: At least one means of egress shall be provided from private pools. Public pools shall provide ladders to other means of egress at both sides of the diving section and at least one means of egress at the shallow section; or at least one means of egress in the deep section and the shallow section if diving boards are not provided. Treads of steps and ladders shall have slip-resistant surfaces and handrails on both sides, except that handrails are not required when there are not more than four steps or when they extend the full width of the side or end of the pool.

625.6 Water supply: All swimming pools shall be provided with a potable water supply, free of cross connections with the pool or its equipment.

625.6.1 Water treatment: Public swimming pools shall be designed and installed so that there is a pool water turnover at least once every 8 hours. Filters shall not filter water at a rate in excess of 3 gallons per minute, per square foot (0.0020 $m^3/s \cdot m^2$) of surface area. The treatment system shall be so designed and installed to provide in the water, at all times when the pool is in use, excess chlorine of not less than 0.4 parts per million (ppm) or more than 0.6 ppm, or excess chloramine between 0.7 and 1.0 ppm, or disinfection shall be provided by other approved means. Acidity/alkalinity of the pool water shall not be below 7.0 or more than 7.5. All recirculating systems shall be provided with an approved hair and lint strainer installed in the system ahead of the pump.

Private swimming pools shall be designed and installed so that there is a pool water turnover at least once every 18 hours. Filters shall not filter water

at a rate in excess of 5 gallons per minute per square foot (0.0034 $m^3/s \cdot m^2$) of surface area. The pool owner shall be instructed in proper care and maintenance of the pool by the supplier or builder, including the use of high test calcium hypochlorite (dry chlorine) or sodium hypochlorite (liquid chlorine) or equally effective germicide and algaecide, and the importance of proper pH (alkalinity and acidity) control.

625.6.2 Drainage systems: The swimming pool and equipment shall be equipped to be completely emptied of water and the discharged water shall be disposed of in an approved manner that will not create a nuisance to adjoining property.

625.7 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 this code.

625.7.1 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.

625.8 Equipment installations: Pumps, filters, and other mechanical and electrical equipment for 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.

625.9 Swimming pool safety devices: Every person owning land on which there is situated a swimming pool, which contains 24 inches (610 mm) or more of water in depth at any point, shall erect and maintain thereon an adequate enclosure either surrounding the property or pool area, sufficient to make such body of water inaccessible to small children. Such enclosure, including gates therein, shall be not less than 4 feet (1219 mm) above the underlying ground. All gates shall be self-closing and self-latching with latches placed 4 feet (1219 mm) above the underlying ground and otherwise made inaccessible from the outside to small children.

A natural barrier, hedge, pool cover or other protective device approved by the governing body shall be an acceptable enclosure so long as the degree of protection afforded by the substituted devices or structures is not less than the protection afforded by the enclosure, gate and latch described herein.

625.9.1 Diving boards: Minimum water depths and distances for diving hoppers for pools, based on board height above water, shall comply with Table 625 for public pools and Table 625a for private pools.

Diving boards higher than 3 meters shall conform to the recommendations of the Rules and Regulations of United States Diving, Inc., listed in Appendix A.

The maximum slope permitted between point D_2 and the transition point shall not exceed one unit vertical to three units horizontal (1:3) in public pools and one unit vertical to one unit horizontal (1:1) in private pools. D_1 is the

point directly under the end of the diving boards. D_2 is the point at which the floor begins to slope upwards to the transition point. See Figure 625, next page.

Table 625
MINIMUM WATER DEPTHS AND DISTANCE BASED ON BOARD HEIGHT FOR PUBLIC POOLS

Board height	Minimum depth at D_1[a] directly under end of board	Distance[a] between D_1 and D_2	Minimum depth at[a] D_2
2'2" (⅔ meter)	7'0"	8'0"	8'6"
2'6" (¾ meter)	7'6"	9'0"	9'0"
1 meter	8'6"	10'0"	10'0"
3 meter	11'0"	10'6"	12'0"

Note a. 1 foot = 304.8 mm.

Table 625a
MINIMUM WATER DEPTHS AND DISTANCE BASED ON BOARD HEIGHT FOR PRIVATE POOLS

Board height	Minimum depth at D_1[a] directly under end of board	Distance[a] between D_1 and D_2	Minimum depth at[a] D_2
1'8" (½ meter)	6'0"	7'0"	7'6"
2'2" (⅔ meter)	6'10"	7'6"	8'0"
2'6" (¾ meter)	7'5"	8'0"	8'0"
3'4" (1 meter)	8'6"	9'0"	9'0"

Note a. 1 foot= 304.8 mm.

SECTION 626.0 TEMPORARY STRUCTURES

626.1 General: The provisions of this section shall apply to tents, membrane structures and other structures, erected for a period of less than 180 days. Those erected for a longer period of time shall comply with Section 604.0 or all applicable sections of this code when Section 604.0 is not applicable.

626.1.1 Permit required: All temporary structures including tents or membrane structures covering an area in excess of 120 square feet (11.16 m^2), including all connecting areas or spaces with a common means of egress or entrance, and used or intended to be used for gathering together of ten or more persons shall not be erected, operated or maintained for any purpose without obtaining a permit from the code official. Tents used exclusively for recreational camping purposes shall be exempt from the above requirements. Special permits required by the building code shall be secured from the code official.

626.2 Plans and specifications: A permit application and drawings shall be submitted for each installation and use with specifications indicating the location of the structure on the site and details regarding the location of egress facilities, seating capacity, construction and all mechanical and electrical equipment.

626.3 Location: All temporary structures shall be located in accordance with

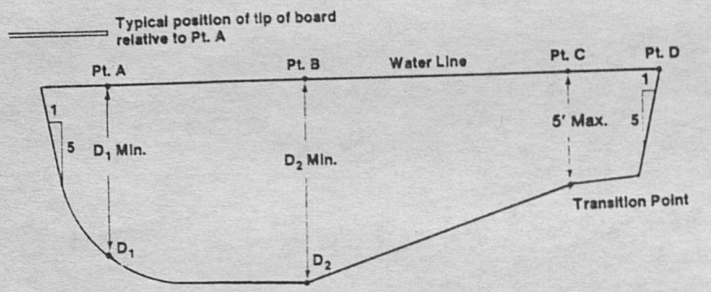


Figure 625
MINIMUM WATER DEPTHS AND DISTANCE BASED ON BOARD HEIGHT FOR PUBLIC AND PRIVATE POOLS

the requirements of Table 906.2 based on the fireresistance rating of the exterior walls for the proposed type of construction.

626.4 Construction: Tents and air-supported structures shall be constructed as required by this code and NFiPA 102 listed in Appendix A.

626.5 Membrane material: All tents shall be constructed of flameresistive materials or materials treated to render the material flameresistant in a manner approved by the code official. The membrane material shall be either noncombustible as defined in Section 903.4 or flameresistant conforming to NFiPA 701 listed in Appendix A.

626.6 Certification: An affidavit or affirmation shall be submitted to the code official and a copy retained on the premises on which the tent or air-supported structure is located, attesting to the following information relative to the flameresistance of the fabric:

1. The names and addresses of the owners of the tent or air-supported structure.
2. Date fabric was last treated with flameresistant solution.
3. Trade name or kind of chemical used in treatment.
4. The name of person or firm treating the material.
5. Name of testing agency and test standard by which the fabric was tested.

626.7 Inflation pressure: Operating pressure shall be maintained at the design pressure specified by the manufacturer to assure structural stability and to avoid excessive distortion during high wind or snow loads.

626.8 Door operation: Under high wind over 50 mph (80.45 km/h) or snow conditions, the use of doors in air-supported structures shall be controlled to avoid excessive air loss. Doors shall not be left open under any conditions.

626.9 Means of egress: All temporary structures including tents and membrane structures shall conform to the means of egress requirements of Article 8 and shall have a maximum length of exit access travel of 100 feet (30480 mm).

ARTICLE 7

INTERIOR ENVIRONMENTAL REQUIREMENTS

SECTION 700.0 GENERAL

700.1 Scope: The provisions of this article shall govern the means of light, ventilation and sound transmission control required in all buildings intended for human occupancy. 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.

700.2 Buildings on same lot: Where more than one building is hereafter placed on a lot, or where a building is placed on the same lot with existing buildings, and the several buildings are treated as a single structure for the purpose of this article, equivalent uncovered lot area or other adequate sources of light and ventilation shall be provided for all buildings intended for human occupancy.

SECTION 701.0 PLANS AND SPECIFICATIONS

701.1 General: Plans for all buildings and structures other than buildings of Use Groups R-2, R-3, and I-1 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 the mechanical code listed in Appendix A.

SECTION 702.0 EXISTING BUILDINGS
(Deleted)

SECTION 703.0 LIGHT AND VENTILATION REQUIRED

703.1 Light required: Every room or space intended for human occupancy shall be provided with natural or artificial light.

703.1.1 Bathroom and toilet room lighting: Every bathroom and toilet room shall be provided with artificial light. The illumination shall have an average intensity of 3 foot candles (32.29 lux) measured at a level of 30 inches (762 mm) above the floor.

703.2 Ventilation required: Every room or space intended for human occupancy shall be provided with natural or mechanical ventilation.

SECTION 704.0 NATURAL LIGHT

704.1 General: In the application of the provisions of this article, the standard of natural light for all habitable and occupiable rooms, unless otherwise specifically required by the provisions of Article 6 for special uses and occupancies, shall be based on 250 foot candles (2691 lux) 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 6 foot candles (64.58 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.

704.2 Minimum glazing area: Every room or space intended for human occupancy shall have an exterior glazing area of not less than 8 percent of the floor area. Natural light shall be provided by glazing areas which open onto courts or yards which comply with the requirements of Sections 710.0, 711.0 and 712.0, or by other approved means.

704.2.1 Adjoining spaces: Where natural light for rooms or spaces without exterior glazing areas is provided through an adjoining room, the unobstructed opening to the adjoining room shall be at least 8 percent of the floor area of the interior room or space, but not less than 25 square feet (2.33 m^2). The exterior glazing area shall be based on the total floor area being served.

704.3 Stairways: Interior stairways shall be provided with an exterior glazing area of not less than 10 square feet (0.93 m^2) on every floor through which the stairway passes.

704.4 Hallways: Natural light shall be capable of penetrating the full length of the hallway.

SECTION 705.0 ARTIFICIAL LIGHT

705.1 General: Artificial light shall be capable of providing a minimum illumination as specified for natural light.

SECTION 706.0 NATURAL VENTILATION

706.1 General: Natural ventilation of an occupied space shall be through windows, doors, louvres or other natural openings to the outdoor air.

706.2 Ventilation area required: The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

706.2.1 Adjoining spaces: Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the unobstructed opening to the adjoining rooms shall be at least 8 percent of the floor area of the interior room or space, but not less than 25 square feet (2.33 m^2). The ventilation openings to the outdoors shall be based on the total floor area being ventilated.

706.2.2 Openings below grade: Openings below grade shall be acceptable for natural ventilation provided the outside horizontal clear space measured

perpendicular to the opening is one and one-half times the depth below the average adjoining grade.

706.3 Contaminants exhausted: Contaminants in the breathing atmosphere shall be exhausted to the outdoor air in accordance with the mechanical code listed in Appendix A.

706.4 Openings on yards or courts: Natural ventilation shall be provided by openings onto yards or courts which comply with the requirements of Sections 710.0, 711.0 and 712.0, or by other approved means.

SECTION 707.0 MECHANICAL VENTILATION

707.1 General: Mechanical ventilation shall conform to the requirements of the mechanical code listed in Appendix A.

SECTION 708.0 ROOM DIMENSIONS

708.1 Ceiling heights: Habitable (spaces) rooms, other than kitchens, storage rooms and laundry rooms shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). Hallways, corridors, bathrooms, toilet rooms, kitchens and habitable basements for use as a recreation room only shall have a ceiling height of not less than 7 feet (2134 mm) measured to the lowest projection from the ceiling.

> **Exception:** In buildings of Use Group R-3, the maximum projection below the required ceiling height of beams and girders spaced not less than 4 feet (1219 mm) on center shall be 6 inches (152 mm).

708.1.1 Use Groups A, B, E, and M: A clear height from finished floor to ceiling or lowest projection of not less than 7 feet 6 inches (2286 mm) shall be provided in all exit access and occupiable rooms of structures of Use Group A, B, E, and M.

708.1.2 Sloping ceilings: If any room in a building has a sloping ceiling, the prescribed ceiling height for the room is required in only one-half the area thereof. Any portion of the room measuring less than 5 feet (1524 mm) from the finished floor to the finished ceiling shall not be included in any computation of the minimum area thereof.

708.1.3 Furred ceilings: If any room has a furred ceiling, the prescribed ceiling height is required in two-thirds of the area thereof, but the height of the furred ceiling shall not be less than 7 feet (2134 mm).

> **Exception:** Use Group R-3, basement recreation rooms, a furred ceiling height of 6 feet 8 inches (2032 mm) around the ducts may be made in the soffit area only for structural beams and mechanicals. The above two-thirds area requirements must still be met.

708.2 Floor area: Every dwelling unit shall have at least one room which shall have not less than 150 square feet (13.95m^2) of floor area. Other habitable rooms except kitchens shall have an area of not less than 70 square feet (6.51 m^2).

708.3 Width: A habitable room other than a kitchen shall not be less than 7 feet (2134 mm) in any dimension.

SECTION 709.0 VENTILATION OF SPECIAL SPACES

709.1 Roof spaces: Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly 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 openings shall be covered with corrosion resistant mesh not less than ¼ inch (6 mm) nor more than ½ inch (13 mm) in any direction.

709.1.1 Ventilating area: The minimum required net free ventilating area shall be 1/150 of the area of the space ventilated, except that the minimum required area shall be reduced to 1/300 where at least 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet (914 mm) above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents.

709.2 Crawl spaces: Crawl space areas, other than those used as an underfloor plenum, shall be ventilated by an approved mechanical means or by openings in exterior foundation walls. Openings shall be located as close to corners as practicable and shall provide cross ventilation on at least two approximately opposite sides. The openings shall be covered with corrosion-resistant mesh not less than ¼ inch (6 mm) nor more than ½ inch (13 mm) in any direction.

709.2.1 Opening size: Openings shall have a net area of not less than 1 square foot (0.093m²) for each 150 square feet (13.95 m²) of foundation space. Where an approved vapor barrier is installed over the ground surface, the required net area of openings shall be reduced to 10 percent of the above and vents shall have manually operable louvers.

709.3 Alternative mechanical ventilation: Enclosed attic, rafter and crawl spaces and other uninhabited spaces such as unfinished basements, which are not ventilated as herein required, shall be equipped with a mechanical ventilation system conforming to the requirements of Section M-1605 of the mechanical code listed in Appendix A.

SECTION 710.0 COURTS

710.1 General: All courts required to serve rooms for natural light or ventilation purposes shall comply with the requirements of this section.

710.2 Minimum width: Every such court shall have a minimum width of 3 inches (76 mm) for each foot (305 mm) of height or fraction thereof, but not less than 5 feet (1524 mm) for outer courts and twice these values for inner courts.

710.2.1 Irregular court width: In the case of irregular or gore shaped courts, the required minimum width of a court shall be the average width, provided that such a court shall not be less than 5 feet (1524 mm) at any point.

710.3 Area of court: The cross-sectional area of a required court shall be not less than one and one-half times the square of its width; nor shall the length of any court be more than twice its width.

).4 Access to court: A door or other means of access shall be provided at the ttom of every court that is not otherwise conveniently accessible for purses of cleaning.

).5 Air intakes: Every court serving one or more habitable rooms that does t open for its full height on one or more sides to a street or legal yard shall be nnected at or near the bottom with a street or yard by a horizontal intake or assage of fireresistive construction. Such intake or passage shall have a ross-sectional area of not less than 21 square feet (1.95 m^2) and shall remain lly open at both ends and unobstructed for its full size and length, except at grilles of noncombustible construction are permitted at the ends of the take.

10.5.1 Fireresistance rating: The walls, floors and ceilings of such intakes or assages shall have a fireresistance rating of not less than 2 hours in buildings f Types 1, 2, 3 or 4 construction and not less than 1 hour in Type 5 construction.

10.6 Court walls: When, in the opinion of the code official, windows facing n courts do not receive adequate direct light by reason of peculiar arrangement or orientation, the code official shall require the walls to be constructed f light colored masonry, or to be painted and maintained a light color to urnish additional reflected light, or shall require other approved means of roviding additional light.

10.7 Court drainage: The bottom of every court shall be properly graded and rained to a public sewer or other approved disposal system complying with he plumbing code listed in Appendix A; and shall be paved with concrete or ther nonabsorbent material when required by the code official.

SECTION 711.0 REAR YARDS

711.1 Use Groups R and I: At the rear of every building hereafter erected to be occupied as Use Group R-2, R-3, I-1 or I-3, there shall be maintained a yard of the minimum dimensions herein prescribed. When such yard serves as a required light and ventilation court, its minimum dimensions shall be those required for a court in this article.

711.1.1 Depth of yards: The depth of a required yard between the extreme rear of the building and the rear lot line shall be not less than 15 feet (4572 mm) at any point for a height of 35 feet (10668 mm), and shall increase 4 inches (102 mm) in depth for each additional foot (305 mm) of height above that limit. For a corner lot, the minimum depth shall be not less than 10 feet (3048 mm). When the lot is less than 65 feet (19812 mm) in depth, the required yard depth shall be reduced 6 inches (152 mm) for each foot (305 mm) less than 65 feet (19812 mm).

711.2 Other use groups: In buildings of other than Use Group R-2, R-3, I-1 or I-3, rear yards shall be provided to serve all habitable and occupiable rooms requiring light and ventilation from such source. The lowest level of such

ards shall begin at the sill level of the second story windows, with a depth of ot less than 10 feet (3048 mm) for a height of 35 feet (10668 mm) and shall ncrease 3 inches (76 mm) for each additional foot (305 mm) of height above at level.

SECTION 712.0 OBSTRUCTION OF COURTS AND YARDS

12.1 Permissible projections: Every required court and yard shall remain nobstructed for its required area and full height, except for the projections ermitted in Section 508.0. In Use Groups R and I, clothes poles, arbors, arden trellises and other such accessories shall not be prohibited in the open paces at ground level.

12.2 Motor vehicle parking: When approved, the use of required court and rd areas for automobile parking spaces or private garages not exceeding one tory in height when accessory to and only for the use of the occupants of a Use roup R building is permitted, provided required windows for light and entilation are not obstructed thereby.

SECTION 713.0 WINDOW CLEANING SAFEGUARDS

13.1 General: All buildings and structures over 50 feet (15240 mm) or four tories in height, in which the windows are cleaned from the outside, shall be rovided with anchors or other approved safety devices for all window penings. Such anchors, belt terminals or other devices shall be of approved esign, and constructed of corrosion-resistive materials securely attached to ne window frames or anchored in the enclosure walls of the building. Cast on or cast bronze anchors shall be prohibited.

SECTION 714.0 SOUND TRANSMISSION CONTROL IN RESIDENTIAL BUILDINGS

14.1 Scope: This section shall apply to all common interior walls, partitions nd floor/ceiling assemblies between adjacent dwelling units or between a welling unit and adjacent public areas such as halls, corridors, stairs or ervice areas in all buildings of Use Group R.

14.2 Airborne noise: Walls, partitions and floor/ceiling assemblies separat- ng dwelling units from each other or from public or service areas shall have a ound transmission class (STC) of not less than 45 for airborne noise when ested in accordance with ASTM E90 listed in Appendix A. This requirement nall not apply to dwelling unit entrance doors, but such doors shall be ght-fitting to the frame and sill.

714.3 Structure borne sound: Floor/ceiling assemblies between dwelling units and between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 45 when tested in accordance with ASTM E492 listed in Appendix A.

714.4 Tested assemblies: When approved, assemblies of building construction listed in GA 600, NCMA TEK 69A and BIA TN 5A listed in Appendix A shall be accepted as having the STC and IIC ratings specified therein for determining compliance with the requirements of this section.

ARTICLE 8

MEANS OF EGRESS

SECTION 800.0 GENERAL

800.1 Scope: The provisions of this article shall control the design, construction and arrangement of building elements required to provide a reasonably safe means of egress from all buildings and structures hereafter erected, and from all buildings hereafter altered to a new occupant load, or manner of use, or inherent fire hazard. Existing buildings and uses shall be controlled by the provisions of Section 804.0.

800.2 Modification of egress requirements: When strict compliance with the provisions of this code is not practical, the code official shall approve alternative means of egress which will accomplish the same purpose, by the procedure established in Article 1 for modification of this code, or by adoption of approved rules. Existing buildings shall not be occupied during repairs or alterations unless all existing means of egress and any existing fire protection are continuously maintained, or in lieu thereof, other measures are taken which will provide equivalent safety.

800.3 Minimum requirements: It shall be unlawful to alter any building or structure in any manner that will reduce the number of exits or the capacity of exits below the requirements of this code for new buildings of the proposed use and occupancy.

SECTION 801.0 PLANS AND SPECIFICATIONS

801.1 Arrangement of egress: The plans shall show in sufficient detail the location, construction, size and character of all exits together with the arrangement of aisles, corridors, passageways and hallways leading thereto in compliance with the provisions of this code.

801.2 Number of occupants: In other than buildings of Use Groups R-2, R-3 and I-1, the plans and the application for a permit shall designate the number of occupants to be accommodated on every floor, and in all rooms and spaces when required by the code official. When not otherwise specified, the minimum number of occupants to be accommodated by the exits shall be determined by the occupant load prescribed in Section 806.0. The posted occupant load of the building shall be limited to that number.

SECTION 802.0 USE AND OCCUPANCY REQUIREMENTS

802.1 New buildings: Every building and structure and part thereof hereafter erected shall have the prescribed number of exits of one or more of the approved types defined in this article. Exits, in combination with the exit access and exit discharge, shall provide safe and continuous means of egress to a street or to an open space with direct access to a street.

802.2 Mixed use groups: Where a building is occupied for two or more uses, the means of egress requirements shall apply to each portion of the building based on the use of that space.

802.3 Multiple tenants: When more than one tenant occupies any one floor of a building or structure, each tenant shall be provided with direct access to approved exits.

SECTION 803.0 PROHIBITED USE

803.1 General: Exits and exit access corridors shall not be used as supply or return air ducts or plenums.

Exception: The restriction on the use of the space between the corridor ceiling and the floor or roof structure above as a return air plenum shall not apply when the corridor is not required to be of fireresistance rated construction or is separated from the plenum by fireresistance rated construction or is located within a dwelling unit.

SECTION 804.0 EXISTING BUILDINGS
(Deleted)

SECTION 805.0 MAINTENANCE OF EXITS

805.1 Obstructions: It shall be unlawful to obstruct, or reduce in any manner, the clear width of any doorway, hallway, passageway or other means of egress required by the provisions of this code.

805.2 Maintenance: All exterior stairways and fire escapes shall be kept free of snow and ice. Exterior stairways and fire escapes shall be painted in an approved manner before and after erection; and shall be scraped and painted as often as necessary to maintain them in safe condition.

SECTION 806.0 OCCUPANT LOAD

806.1 Design occupant load: In determining required facilities, the number of occupants for whom exit facilities shall be provided shall be established by the largest number computed in accordance with each of Sections 806.1.1 through 806.1.3.

806.1.1 Actual number: The actual number of occupants for whom each occupied space, floor, or building is designed for.

806.1.2 Number by Table 806: The number of occupants computed at the rate of one occupant per unit of area as prescribed in Table 806.

806.1.3 Number by combination: The number of occupants of any space as computed in Sections 806.1.1 or 806.1.2 plus the number of occupants similarly computed for all spaces that discharge through the space in order to gain access to an exit.

806.1.4 Increased occupant load: The occupant load permitted in any building or portion thereof is permitted to be increased from that number established for the given use by Table 806 when all other requirements of the code are also met based on such modified number. Where required by the code official, an approved aisle, seating, or fixed equipment diagram to substantiate any increase in occupant load shall be submitted. Where required by the code official, such diagram shall be posted.

806.1.5 Maximum occupant load: The occupant load of any space or portion thereof shall not exceed one occupant per 3 square feet (0.28 m^2) of occupiable floor space.

806.1.6 Fixed seats: The occupant load for an assembly or educational area having fixed seats shall be determined by the number of fixed seats installed. The capacity of fixed seats without dividing arms shall equal one person per 18 inches (457 mm). For booths, the capacity shall be one person per 24 inches (610 mm).

806.2 Mezzanine levels: The occupant load of a mezzanine level discharging through a floor below shall be added to that floor's occupant load, and the capacity of the exits shall be designed for the total occupant load thus established.

806.3 Roofs: Roof areas occupied as roof gardens or for assembly, educational, storage or other purposes shall be provided with exit facilities to accommodate the required occupant load, but there shall not be less than two approved means of egress from roof areas of Use Groups A and E.

Table 806
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

Use	Floor area in square feet per occupant
Assembly with fixed seats	See Section 806.1.6
Assembly without fixed seats	
Concentrated (chairs only—not fixed)	7 net
Standing space	3 net
Unconcentrated (tables and chairs)	15 net
Bowling alleys, allow 5 persons for each alley including 15 feet of runway, and for additional areas	7 net
Business areas	100 gross
Court rooms — other than fixed seating areas	40 net
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Industrial areas[b]	100 gross
Institutional areas	
Inpatient treatment areas	240 gross
Outpatient areas	100 gross

Table 806 (cont'd.)
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

Use	Floor area in square feet per occupant
Sleeping areas	120 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Mercantile basement and grade floor areas	30 gross
Areas on other floors	60 gross
Storage, stock, shipping areas	300 gross
Parking garages	200 gross
Residential	200 gross
Storage areas, mechanical equipment room	300 gross

Note a. 1 foot = 304.8 mm; 1 square foot = 0.093 m².
Note b. Exception: For purposes of determining jurisdiction under Sections 108.0 and 109.0, design professional seal requirements, and Article 33 coverage, use 200 gross.

SECTION 807.0 TYPES AND LOCATION OF MEANS OF EGRESS

807.1 General: All approved means of egress, including doorways, passageways, corridors, interior stairways, exterior stairways, escalators, smokeproof enclosures, ramps, horizontal exits, bridges, balconies, fire escapes and combinations thereof shall be arranged and constructed as provided in this code.

807.2 Arrangement: All required exits shall be so located as to be discernable and accessible with unobstructed access thereto.

807.2.1 Egress through adjoining spaces: Egress from a room or space shall not open into an adjoining or intervening room or area, except where such adjoining room or area is accessory to the area served, is not a high hazard use and provides a direct means of egress to an exit. A maximum of one exit access shall be permitted to pass through a kitchen, storeroom, restroom, closet or similar space provided that it is not the only means of access to an exit. An exit access shall not pass through a room subject to locking.

Table 807
LENGTH OF EXIT ACCESS TRAVEL [in feet[b]] [a]

Use group	Without fire suppression system	With fire suppression system
A, B, E, F-1, I-1, M, R, S-1	200	250
F-2, S-2	300	400
H	—	75
I-2, I-3	150	200

Note a. See the following sections for modifications to travel distance requirements.
Section 601.4.1: For the exit access travel distance limitation in covered malls.
Section 602.3.1.4.5: For the exit access travel distance limitation in high-rise buildings under the automatic fire suppression system alternatives.
Section 603.1.4: For the exit access travel distance limitation in HPM use facilities.
Section 606.2.4: For the exit access travel distance limitation through an atrium space.
Section 626.9: For the exit access travel distance limitation in temporary structures.
– Section 807.5.1: For increased limitation in Use Groups F and S.
– Section 807.5.2: For increased limitation in Use Group A-5.
– Section 809.3: For buildings with one exit.
Note b. 1 foot = 304.8 mm.

807.2.2 Assembly buildings: All buildings used for assembly purposes shall front on at least one street on which the main entrance and exit discharge shall be located. Where there is a single main entrance, the entrance shall be capable of serving as the main exit and shall provide an egress capacity for at least one-half of the total occupant load. In addition to having access to a main exit, each level of a building of Use Group A shall be provided with additional exits which shall provide an egress capacity for at least two-thirds of the total occupant load served by that level.

807.2.3 Skating rinks: Places of assembly used for skating rinks shall not be located below the floor nearest grade.

807.2.4 Foyers and waiting spaces: The term "foyer" shall mean an enclosed space surrounding or in the rear of the auditorium of a theater or other place of assembly which is completely separated from the auditorium and is used as an assembly or waiting space for the occupants. In Use Group A-1, a foyer, waiting space, or lobby shall be provided with a net floor area, exclusive of stairs or landings, of not less than 1½ square feet (0.14 m^2) 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 exits.

807.2.4.1 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 the required minimum width of, main entrances and exits. A mirror shall not be placed so as to give the appearance of a doorway, exit or passageway.

807.2.4.2 Gradient: The rear foyer shall be at the same level as the back of the auditorium and the means of egress leading therefrom shall not have a steeper gradient than one unit vertical in eight units horizontal (1:8).

807.2.4.3 Construction: The partitions separating the foyer from the auditorium and other adjoining rooms and spaces of a theater shall be constructed of not less than 2-hour fireresistance rating. Where opening protectives are constructed of noncombustible materials, fireresistance rating of the opening protectives is not required.

807.3 Exit discharge: All exits shall discharge directly at a public way or at a yard, court or open space of the required width and size to provide all occupants with a safe access to a public way.

807.3.1 Level of exit discharge protection: In all buildings having habitable or occupiable stories or basements below grade, the floor/ceiling assemblies and supports below the level of exit discharge shall provide a fireresistance rating of not less than 1 hour.

Exceptions

1. Buildings of Use Group R-3.
2. Buildings of Type 1 construction.

3. When such floor/ceiling assemblies and supports are constructed of Type 4 construction.
4. When the floor areas below the level of exit discharge are equipped throughout with an approved automatic fire suppression system.

807.4 Remote location: Whenever more than one exit 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 and constructed to provide direct access in separate directions from any point in the area served so as to minimize the possibility that both would be blocked by any one fire or other emergency condition.

807.4.1 Remoteness: Where two exits or two exit access doors are required, they shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the building or area to be served. Where exit enclosures are provided as a portion of the required means of egress and are interconnected by a corridor conforming to the requirements for corridor construction, the exit separation distance shall be measured along the line of travel within the corridor. In all other cases, the separation distance shall be measured in a straight line between exits or exit access doors.

Exception: In buildings equipped throughout with an approved automatic fire suppression system, the minimum separation distance shall be one-fourth the length of the maximum overall diagonal dimension.

807.4.1.1 Three or more: When three or more exits or exit access doors are required, at least two exits or exit access doors shall be separated as provided in Section 807.4.1.

807.5 Length of travel: Except as modified by provisions of Section 809.3 for buildings with one exit, all exits shall be so located that the maximum length of exit access travel, measured from the most remote point to an approved exit along the natural and unobstructed line of travel, shall not exceed the distances given in Table 807. In single exit buildings covered by Section 809.3, where the area is subdivided into rooms or compartments, and the egress travel in the room or compartment is not greater than 50 feet (15240 mm) or 100 feet (30480 mm) in buildings equipped throughout with an approved automatic fire suppression system, the exit access travel distance shall be measured from the exit access entrance to the nearest exit.

807.5.1 Roof vent increase: In buildings of Use Group F or S, one story in height, equipped with automatic heat and smoke roof vents complying with Section 930.0 and equipped throughout with an approved automatic fire suppression system, the exit access travel distance limitation in Table 807 shall be increased to 400 feet (122 m).

807.5.2 Use Group A-5: Buildings and structures of Use Group A-5, where all portions of the means of egress are essentially open to the outside, shall have an exit access travel distance of not more than 400 feet (122 m), except that such buildings and structures of Type 1 or 2 construction shall not have an exit access travel distance limit.

807.6 Elevators: Elevators shall not be accepted as a required element of the means of egress.

SECTION 808.0 CAPACITY OF EGRESS COMPONENTS

808.1 General: The capacity of means of egress for a floor, balcony, tier or other occupied space shall be sufficient for the occupant load thereof.

808.2 Minimum width: The width of each means of egress component shall not be less than the width computed in accordance with Table 808 for the required capacity of the component, but not less than the minimum width as prescribed by this code for each such component.

Table 808
EGRESS WIDTH PER OCCUPANT

Use group	Without fire suppression system (inches per person)[a]		With fire suppression system (inches per person)[a]	
	Stairways	Doors, ramps and corridors	Stairways	Doors, ramps and corridors
A, B, E, F, M, R, S	0.3	0.2	0.2	0.15
H	—	—	0.3	0.2
I-1	0.4	0.2	0.2	0.2
I-2	1.0	0.7	0.6	0.5
I-3	0.3	0.2	0.3	0.2

Note a. 1 inch = 25.4 mm.

808.3 Exit design per floor: Where exits serve more than one floor, only the occupant load of each floor considered individually shall be used in computing the required capacity of the exits at that floor, provided that the exit capacity shall not decrease in the direction of egress travel.

808.4 Egress convergence: When means of egress from floors above and below converge at an intermediate floor, the capacity of the means of egress from the point of convergence shall not be less than the sum of the two.

SECTION 809.0 NUMBER OF EXITS

809.1 General: The following general requirements apply to buildings of all use groups. Where more restrictive requirements are provided in this code, such requirements shall take precedence over the general provisions of this section.

809.2 Minimum number: Every floor area shall be provided the minimum number of approved independent exits as required by Table 809.2 based on the occupant load, except as modified in Section 809.3.

Table 809.2
MINIMUM NUMBER OF EXITS FOR OCCUPANT LOAD

Occupant load	Minimum number of exits
500 or less	2
501 - 1,000	3
over 1,000	4

809.3 Buildings with one exit: Only one exit shall be required in buildings of Use Group R-3 and in buildings of the use groups and characteristics specified in Table 809.3; and in stories at the level of exit discharge having an occupant load not exceeding 50 persons and an exit access travel distance not exceeding 75 feet (22860 mm) in buildings of any use group; and in airport traffic control towers which comply with Section 616.0.

Table 809.3
BUILDINGS WITH ONE EXIT

Use group	Max. height above grade	Max. size[b]	Max. exit access travel distance[b]	Min. fire-resistance rating of exit enclosure	Min. fire-resistance rating of opening protection
R-2	2 stories	4 dwelling units per floor	50 ft.	1 hour	1 hour
B and S-2[a]	2 stories	3,500 sq. ft. per floor	75 ft.	1 hour	1 hour

Note a. For the required number of exits for open parking structures, see Section 809.5.
Note b. 1 foot = 304.8 mm; 1 square foot = 0.093 m^2.

809.4 Emergency escape: Every sleeping room below the fourth story in buildings of Use Groups R and I-1 shall have at least one operable window or exterior door approved for emergency egress or rescue. The units shall be operable from the inside without the use of separate tools. Where windows are provided as a means of egress or rescue, the windows shall have a sill height not more than 44 inches (1118 mm) above the floor. All egress or rescue windows from sleeping rooms shall have a minimum net clear opening of 5.7 square feet (0.53 m^2). The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm).

Bars, grilles or screens placed over emergency escape windows shall be releasable or removable from the inside without the use of a key, tool or excessive force.

Exceptions

1. Grade floor windows may have a minimum net clear opening of 5 square feet (0.47 m^2).
2. In buildings where the sleeping room is provided with a door to a corridor having access to two remote exits in opposite directions, an outside window or an exterior door for emergency escape from each such sleeping room is not required.
3. Buildings equipped throughout with a complete automatic fire suppression system.
4. Egress windows located on the first and second stories in multiple family dwellings (Use Groups R-2 and R-3) and one- and two-family dwellings, may have a minimum net clear opening height dimension of 22 inches (559 mm) and a minimum width dimension of 20 inches (508 mm); and

the net clear opening area may be reduced to not less than 4 square feet (0.37 m^2). The minimum total glazed area must be 5 square feet (0.47 m^2) in the case of a ground floor window and not less than 5.7 square feet (0.53 m^2) in the case of a second story window. (This exception applies only if the sash frames can be readily broken or removed.)

309.5 Open parking structures: Parking structures shall have not less than two exits from each parking tier, except only one exit is required where vehicles are mechanically parked. Unenclosed vehicle ramps shall not be considered as required exits unless pedestrian facilities are provided. Interior exit stairways are not required to be enclosed.

SECTION 810.0 EXIT ACCESS PASSAGEWAYS AND CORRIDORS

810.1 Access passageway: Direct exit access shall be provided to required exits through continuous passageways, aisles or corridors, conveniently accessible to all occupants and maintained free of obstruction.

810.1.1 Use Group I-2: Every patient sleeping room in buildings of Use Group I-2 shall have an exit access door leading directly to an exit access corridor.

Exception: Direct corridor access is not required where:

1. There is an exit door opening directly to the outside from the room at ground level;
2. One adjacent room, such as a sitting room or anteroom, intervenes and all doors along the means of egress are equipped with nonlockable hardware in accordance with Section 610.4.2, and the intervening room is not used as an exit access for more than eight patient beds.
3. A patient sleeping room is subdivided with nonfireresistance-rated, noncombustible partitions, provided that the arrangement allows for direct and constant visual supervision by nursing personnel and the suite complies with this section and Section 812.0. Such rooms which are so subdivided shall not exceed 5,000 square feet (465 m^2).

810.1.2 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 direction of exit travel under a total force of not more than 15 pounds (73.23 N).

810.1.3 Restrictions: The required width of passageways, aisles or corridors shall be maintained free of projections and restrictions; except that the minimum clear width resulting from doors opening into such spaces shall be one-half the required width. When fully open, the door shall not project more than 7 inches (178 mm) into the required width.

810.2 Dead ends: Exit access passageways and corridors in all stories which serve more than one exit shall provide direct connection to such exits in opposite directions from any point in the passageway or corridor, insofar as practicable. The length of a dead end corridor shall not be more than 20 feet (6096 mm).

810.3 Width: The minimum required width of passageways, aisles and corridors shall be determined by the greater of the following criteria:

1. 44 inches (1118 mm) where serving an occupant load of greater than 50.
2. 36 inches (914 mm) where serving an occupant load of 50 or less.
3. 96 inches (2438 mm) in buildings of Use Group I used for the movement of beds.
4. 72 inches (1829 mm) in buildings of Use Group E with more than 100 occupants.
5. The width required for capacity as determined by Section 808.0.

Aisles shall conform to the requirements of this section or Section 826.0.

810.4 Enclosures: In buildings of other than Use Group I-2, all corridors serving as exit access shall be enclosed in fire separation walls having a fireresistance rating of at least 1 hour. Corridors in buildings of Use Group I-2 shall comply with Section 610.4. Tenant and dwelling unit separations which are also corridor walls shall comply with this section and the requirements of Table 401.

Exceptions

1. In all uses other than Use Groups R-1, R-2 and I-1, a fireresistance rating is not required for exit access corridors serving 30 or fewer occupants.
2. A fireresistance rating is not required for corridors contained within a dwelling unit.

810.4.1 Automatic fire suppression system alternatives: When an approved automatic fire suppression system is installed and supervised in accordance with Section 1020.1, parts 1, 2 or 3, and has its water flow alarm device connected to an approved central station system, proprietary system or remote station system of the jurisdiction, a fireresistance rating for exit access corridors, and tenant separation walls which are also corridor walls, is not required in Use Groups A, B, E, F, M, and S. In Use Groups R-1, R-2 and I-1 the corridor enclosure walls, and dwelling unit separation walls which are also corridor walls, shall have a fireresistance rating of not less than ½ hour. Corridor walls, and dwelling unit separation walls which are also corridor walls, in Use Groups R-1, R-2 and I-1 shall be constructed tight to the underside of the ceiling directly above.

810.4.2 Opening protectives: All door assemblies from rooms opening onto a corridor required to be of fireresistance rated construction shall be fire doors complying with Section 916.0.

SECTION 811.0 LEVEL OF EXIT DISCHARGE PASSAGEWAYS USED AS AN EXIT ELEMENT

811.1 Passageways: Every required interior and exterior exit element which does not adjoin a public way shall be directly connected to the public way or to an open court leading to the public way by an enclosed passageway at the level of exit discharge or other unobstructed exit element constructed as provided in this section.

811.2 Vestibule: Where an exit discharges into an interior vestibule, the vestibule shall be used for ingress and egress only, and the vestibule shall comply with Sections 811.2.1 and 811.2.2.

811.2.1 Depth and width: The vestibule depth from the exterior of the building is not greater than 10 feet (3048 mm) and the width is not greater than 20 feet (6096 mm).

811.2.2 Separation: The vestibule is separated from the remainder of the level of discharge by self-closing doors and the equivalent of ¼ inch thick wired glass in steel frames.

811.3 Lobby: Where an exit discharges into an interior lobby located at the level of exit discharge, such lobby shall be provided with an automatic fire suppression system, and any other portion of the floor with access to the lobby shall be provided with an automatic fire suppression system or shall be separated therefrom in accordance with the requirements for the enclosure of exits.

811.4 Width and height: The effective width of the passageway shall be not less than three-quarters of the aggregate width of all required exit stairways leading thereto and all required exit doorways opening into the passageway. Such passageway shall have a minimum width of 44 inches (1118 mm) and a minimum clear ceiling height of 8 feet (2438 mm).

811.5 Maximum stairway limitations: Not more than 50 percent of the required stairways shall discharge through the same passageway. Multiple lobbies constructed in accordance with Section 811.3 located adjacent to one another shall be separated from each other in accordance with the requirements for enclosure of exits.

SECTION 812.0 MEANS OF EGRESS DOORWAYS

812.1 General: The requirements of this section shall apply to all doorways serving as a component or element of a means of egress from habitable and occupiable rooms; except as provided in Sections 816.6, 818.6.1, 818.6.2, 818.7.1 and 819.2.

812.2 Number of doorways: Every room or tenant space with an occupant load of more than 50 or in which the travel distance exceeds 75 feet (22860 mm) shall have at least two egress doorways leading from the room or tenant space to an exit or corridor.

Exceptions

1. Use Group R-3.
2. Boiler, incinerator and furnace rooms shall be provided two egress doorways when the area exceeds 500 square feet (46.5 m^2) and individual fuel-fired equipment exceeds 400,000 Btuh (117.24 W) input capacity. Doorways shall be separated by horizontal distance equal to not less than one-half of the diagonal dimension of the room. When two door-

ways are required by this exception, a fixed ladder access out of the room shall be permitted in lieu of one doorway.

3. In buildings of Use Group I-2, any room and any suite of rooms as permitted in Section 810.1.1, Exception No. 3, of more than 1,000 square feet (93 m^2), shall have at least two exit access doors remote from each other.

812.2.1 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 6 inches (152 mm) in height and legible from both inside and outside.

812.2.2 Location of doors: The required doorways opening from a room or space within a building and leading to an exit access shall be located as remote as practicable from each other and shall conform to Section 807.4.1. The distance of exit access travel from any point in a room or space to a required exit door shall not exceed the limitations of Section 807.5.

812.2.3 Door arrangement: Doors in series shall have a space between them of not less than 7 feet (2134 mm) when measured in their closed positions.

Exception: Power-operated doors and buildings of Use Groups I-1 and R-3.

812.3 Size of doors: The minimum width of each door opening shall be sufficient for the occupant load thereof and shall provide a clear width of not less than 32 inches (813 mm) except that for door openings to resident sleeping rooms in buildings of Use Group I-3 and door openings within a dwelling unit the clear width shall be not less than 28 inches (711 mm). The maximum width of a door leaf shall be 48 inches nominal. Means of egress doors in Use Group I used for the movement of beds shall be at least 44 inches (1118 mm) wide. The height of doors shall not be less than 6⅔ feet (2032 mm), except that within a dwelling unit the height of the doors shall be not less than 6½ feet (1981 mm).

Exception: An egress door serving a storage area of not more than 800 square feet (74 m^2) and which is normally unoccupied shall have a maximum width of 10 feet (3048 mm).

812.4 Door hardware: All egress doors shall be of a side-hinged swinging type. All doors shall swing in the direction of egress when serving an occupant load of 50 or more persons or a high hazard occupancy. The door latch shall release when subjected to a 15-pound (73 N) force. The door shall be set in motion when subjected to a 30-pound (146 N) force. The door shall swing to a full open position when subjected to a 15-pound (73 N) force. Forces shall be applied to the latch side.

Exceptions

1. Private garages, factory and storage areas with an occupant load of 10 or less.
2. Horizontal sliding type doors complying with Section 611.4.2 shall be permitted in a means of egress in buildings of Use Group I-3.

3. Doors within or serving a single dwelling unit.
4. Revolving doors conforming to Section 813.0.

812.4.1 Locks and latches: All egress doors shall be readily openable from the side from which egress is to be made without the use of a key or special knowledge or effort.

Exceptions

1. Key operation shall be permitted from a dwelling unit provided the key cannot be removed from the lock when the door is locked from the side from which egress is to be made.
2. Locking devices conforming to Section 610.4.2 shall be permitted in buildings of Use Group I-2.
3. Locks conforming to Section 611.5 shall be permitted in buildings of Use Group I-3.
4. Egress doors from individual dwelling units and guest rooms of Use Group R having an occupant load of 10 or less shall be permitted to be equipped with a night latch, dead bolt or security chain, provided such devices are openable from the inside without the use of a key or tool and mounted at a height not to exceed 48 inches (1219 mm) above the finished floor.
5. Special locking arrangements conforming to Section 812.4.1.2 or 812.4.2.

812.4.1.1 Flush and surface bolts: Manually-operated edge or surface-mounted flush bolts and surface bolts are prohibited, except on doors not required for egress within a dwelling unit. When egress doors are used in pairs and approved automatic flush bolts are used, the door leafs having the automatic flush bolts shall not have a door knob or surface mounted hardware. The unlatching of any leaf shall not require more than one operation.

812.4.1.2 Special locking arrangements: In Use Groups A-3, A-4, B, E, F, I, M, S and R-1, protected throughout by an approved automatic fire suppression system, or an approved automatic fire alarm system, doors in a means of egress shall be unlocked or be equipped with approved egress control devices which shall unlock in accordance with items 1 through 7 below.

1. Actuation of the automatic fire suppression system, or automatic fire alarm system.
2. Loss of power to the egress control device.
3. Loss of power to the building.
4. Be capable of being unlocked manually by a signal from a required central control station on the premises.
5. The initiation of an irreversible and automatic process which will release the latch within 15 seconds when a force of not more than 15 pounds (73 N) is applied for 1 second to the release device and not relock until the door has been opened and returned to the closed position for not less than 30 seconds. Any reopening of the door shall restart the 30-second relocking cycle. Any attempt to exit which exceeds 1 second must render

the door openable. The time delay and the minimum relocking cycle time shall not be field-adjustable.

Exceptions

1. An increase in the time delay to 30 seconds shall not be permitted except as approved by the code official.
2. An increase in the relocking cycle time to 45 seconds shall not be permitted except as approved by the code official.

6. Initiation of the irreversible process shall activate an audible alarm in the vicinity of the door.
7. A sign having block letters 1 inch (25 mm) in height shall be provided on the door above and within 12 inches (305 mm) of the release device stating *Keep pushing. This door will open in 15 seconds. Alarm will sound.*

812.4.2 Panic hardware: All doors equipped with latching or locking devices in buildings of Use Groups A and E or portions of buildings used for assembly or educational purposes and serving rooms or spaces with an occupant load greater than 100 shall be equipped with approved panic hardware. Acceptable panic hardware will be a door latching assembly incorporating a device which causes the door latch to release and the leaf to open when a force of 15 pounds (73 N) is applied in the direction of egress to a bar or panel, the activating portion of which extends not less than one-half the width of the door leaf, and applied at a height greater than 30 inches (762 mm) but less than 44 inches (1118 mm) above the floor. The force shall be applied at the lock side of the door or 30 inches (762 mm) from the hinged side, whichever is farther from the hinge. Where fire door assemblies are required to have panic hardware, approved fire exit hardware shall be used.

Exception: Panic hardware for Use Group A-3 is not required for the principal entrance/exit doors if: (1) they are free-swinging and (2) the calculated occupant load does not exceed 150, and the latch/lock device is a thumb latch/lock or a key operated device in which the key cannot be removed from the side from which egress is to be made when it is locked.

812.4.3 Power-operated doors: Where egress doors are operated by power, such as doors with a photoelectric-actuated mechanism to open the door upon the approach of a person, or doors with power-assisted manual operation, the design shall be such that in the event of power failure the door is capable of being opened manually to permit egress travel or closed where necessary to safeguard means of egress. The forces required to open these doors manually shall not exceed those specified in Section 812.4 except that the force to set the door in motion shall not exceed 50 pounds (244 N). The door shall be so designed and installed that when a force is applied to the door on the side from which egress is made, it shall be capable of swinging from any position to the full use of the opening in which it is installed.

Exception: Buildings of Use Group I-3.

812.5 Security grilles: Horizontal sliding or vertical security grilles which are a

of a required means of egress shall be openable from the inside without use of a key or special knowledge or effort when the space is occupied. The gates shall remain secured in the full open position during the period of occupancy by the general public. Grilles shall not be brought to the closed position when there are more than ten persons occupying spaces served by a single exit or 50 persons occupying spaces served by more than one exit. When two or more exits are required, not more than one-half of the exits shall be equipped with horizontal sliding or vertical grilles.

812.6 Level of exit discharge doors: Where glazed, doors at the level of exit discharge shall be glazed with approved safety glazing. Approved doors having one or more unframed edges shall be constructed of safety glazing not less than ½ inch thick.

SECTION 813.0 REVOLVING DOORS

813.1 General: All revolving doors shall comply with Sections 813.2 through 813.5. Revolving doors to be considered a component of a means of egress shall comply with Sections 813.2 through 813.6.

813.2 Collapse: Each revolving door shall be capable of collapsing into a six-fold position with parallel egress paths having an aggregate width of not less than 36 inches (914 mm). The revolving door shall collapse when a force of not more than 180 pounds (880 N) is applied within 3 inches (76 mm) of the outer edge of a wing.

Exception: The maximum collapsing force shall not apply if the force required to collapse the door is reduced to not more than 130 pounds (635 N) when:

1. There is a power failure or power is removed to the device holding the wings in position.
2. There is an actuation of the automatic sprinkler system when such system is provided.
3. There is an actuation of a smoke detection system which is installed to provide coverage in all areas within the building which are within 75 feet (22860 mm) of the revolving doors.
4. There is the actuation of a manual control switch which reduces the holding force to not more than the 130-pound (635 N) force level. Such switch shall be in an approved location and shall be clearly identified.

813.3 Dispersal area: A revolving door shall not be located within 10 feet (3048 mm) of the foot or top of stairs or escalators. A dispersal area shall be provided between the stairs or escalators and the revolving doors.

813.4 Speed control: The revolutions per minute for a revolving door shall not exceed the speeds indicated in Table 813.4.

Table 813.4
REVOLVING DOOR SPEED

Inside diameter[a]	Power-driven type speed control (rpm)	Manual-type speed control (rpm)
6'6"	11	12
7'0"	10	11
7'6"	9	11
8'0"	9	10
8'6"	8	9
9'0"	8	9
9'6"	7	8
10'0"	7	8

Note a. 1 foot= 304.8 mm; 1 inch = 25.4 mm.

813.5 Adjacent area: Each revolving door shall have a conforming side-hinged swinging door in the same wall as, and within 10 feet (3048 mm) of, the revolving door.

Exception: The adjacent swinging door is not required for street floor elevator lobbies if a stairway, escalator, or door from other parts of the building does not discharge through the lobby and the lobby does not have any occupancy or use other than as a means of travel between the elevators and street.

813.6 Means of egress: A revolving door to be considered as a component of a means of egress shall comply with Sections 813.2 through 813.5 and the following conditions:

1. Revolving doors shall not be given credit for more than 50 percent of the required exit capacity of the building.
2. Each revolving door shall not be credited with more than a 50-person capacity.
3. Each revolving door shall be capable of being collapsed when a force of not more than 130 pounds (635 N) is applied within 3 inches (76 mm) of the outer edge of a wing.

SECTION 814.0 HORIZONTAL EXITS

814.1 General: 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 shall be accomplished by protected openings in a fireresistance rated wall, by a vestibule, or by an open-air balcony or bridge.

814.2 Separation: The separation between fire areas shall be provided by at least a 2-hour fireresistance rated fire wall or fire separation wall complying with Article 9 and Table 401.

814.2.1 Opening protectives: All doorway opening protectives shall be fire doors complying with Section 916.0. All doors shall swing in the direction of egress travel. When serving as a dual element of a means of egress, there shall be adjacent openings with swinging fire doors opening in opposite directions.

814.3 Size of doors: Size of openings in fire walls and fire separation walls shall comply with the provisions of Sections 909.0 and 910.0.

814.4 Area of refuge: The discharge area of a 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 occupant load of both connected areas. The capacity of areas of refuge shall be computed on a minimum net floor area allowance for each occupant to be accommodated therein, not including areas of stairs, elevators and other shafts or courts, as follows:

1. At least 30 square feet (2.79 m^2) per patient for hospitals and nursing homes.
2. On stories not housing bed or litter patients in buildings of Use Group I-2 and in all buildings of Use Group I-3, 6 square feet (.56 m^2).
3. 3 square feet (0.28 m^2) in all other cases.

814.5 Unlocked doors: All horizontal exit doors shall be readily openable from the side or sides from which egress is to be made without the use of a key or special knowledge or effort.

814.6 Stairway exit: In multi-story buildings of other than Use Group I-3, there shall be at least one interior enclosed stairway or smokeproof enclosure 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 the length of exit access travel distance to the horizontal exit or the required exit shall not exceed the requirements of Section 807.5. Buildings of Use Group I-3 shall conform to Section 611.4.3.

814.7 Auxiliary elevator: When horizontal exits are provided in floors located 12 or more stories above the level of exit discharge, the required stairway shall be supplemented by at least one passenger elevator maintained ready for use during normal occupancy of the building.

SECTION 815.0 RAMPS

815.1 Capacity: The capacity of a ramp used as an egress component shall be computed in accordance with Section 808.0.

815.2 Minimum dimensions: The minimum dimensions of egress ramps shall comply with Sections 815.2.1 through 815.2.3.

815.2.1 Width: The minimum width of an egress ramp shall be not less than that required for corridors by Section 810.3.

815.2.2 Headroom: The minimum headroom in all parts of the egress ramp shall be not less than 6 feet 8 inches (2032 mm).

815.2.3 Restrictions: Egress ramps shall not reduce in width in the direction of egress travel. Projections into the required ramp and landing width are prohibited except for handrails and stringers. Doors opening onto a landing shall not reduce the clear width to less than 42 inches (1067 mm).

815.3 Maximum slope: The maximum slope of egress ramps shall be one unit vertical in 8 units horizontal (1:8); except ramps required for the physically

handicapped according to Section 512.0, in which case the maximum slope shall be one unit vertical in 8 units horizontal (1:8) if the rise is limited to 3 inches (76 mm), one unit vertical in ten units horizontal (1:10) if the rise is limited to 6 inches (152 mm) or one unit vertical in 12 units horizontal (1:12) otherwise.

815.4 Landings: Landings shall be provided at all points of turning, entrance and exit and at doors. Ramps with a slope of greater than one unit vertical in ten units horizontal (1:10) shall not have a vertical rise of greater than 12 feet (3658 mm) between landings. Ramps required for the physically handicapped according to Section 512.0 shall not have a vertical rise greater than 30 inches (762 mm) between landings. All landings shall have a minimum length of 60 inches (1524 mm).

815.5 Guards and handrails: Guards shall be provided on both sides and constructed in accordance with Section 827.0. Handrails conforming to Section 828.0 shall be provided on at least one side of every ramp having a slope greater than one unit vertical in 12 units horizontal (1:12). Ramps required by Section 512.0 for the physically handicapped shall have handrails on both sides of the ramp whenever the vertical rise between landings exceeds 6 inches (152 mm).

815.6 Ramp construction: Ramps used as an exit shall conform to the applicable requirements of Section 816.9 as to materials of construction and enclosure.

815.6.1 Surface: For all slopes exceeding one unit vertical in 12 units horizontal (1:12) and wherever the use is such as to involve danger of slipping, the ramp shall be surfaced with approved slip-resistant materials.

SECTION 816.0 INTERIOR STAIRWAYS

816.1 Capacity: The capacity of stairways and doors shall be computed in accordance with Section 808.0.

816.2 Minimum dimensions: The minimum dimensions of interior exit stairways shall comply with Sections 816.2.1 through 816.2.3.

816.2.1 Width: All interior exit stairways shall be not less than 44 inches (1118 mm) in width.

Exceptions

1. Exit stairways in buildings of single exit construction where permitted by Section 809.3 shall be not less than 36 inches (914 mm) in width.
2. Spiral stairways as provided in Section 816.7.
3. Exit stairways in buildings of Use Group R-3 shall not be less than 36 inches (914 mm) in width.
4. Exit stairways serving and contained within a single residential dwelling unit shall be not less than 36 inches (914 mm) in width.
5. Exit stairways in buildings having a total occupant load of 50 or less shall be not less than 36 inches (914 mm) in width.

816.2.2 Headroom: The minimum headroom in all parts of the stair enclosure shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the tread nosing or from the floor surface of the landing or platform.

816.2.3 Restrictions: Stairways shall not reduce in width in the direction of exit travel. Projections into a stairway width are prohibited, except for handrails as indicated in Section 828.2.1 and for stairway stringers which shall project not more than 1½ inches (38 mm) at each side.

816.3 Landings and platforms: Landings and platforms of interior exit stairways shall comply with Sections 816.3.1 and 816.3.2.

816.3.1 Width: The least dimension of landings and platforms shall be not less than the required width of stairway.

816.3.2 Vertical rise: In all buildings, a stairway shall not have a height of vertical rise of more than 12 feet (3658 mm) between landings and intermediate platforms.

816.4 Treads and risers: Treads and risers of interior exit stairways shall comply with Sections 816.4.1 through 816.4.3.

816.4.1 Limiting dimensions: Maximum riser height shall be 7 inches (178 mm) and minimum riser height shall be 4 inches (102 mm). Minimum tread depth shall be 11 inches (279 mm), measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge.

Exceptions

1. Winders in accordance with Section 816.4.3.
2. Spiral stairways in accordance with Section 816.7.
3. Circular stairways in accordance with Section 816.7.1.
4. Stairways serving as aisles in assembly seating areas where the stairway pitch or slope is set, for sightline reasons, by the slope of the adjacent seating area.
5. Any stairway replacing an existing stairway within a space where, because of existing construction, the pitch or slope cannot be reduced.
6. Existing stairways.
7. In Use Group R-3 and within dwelling units in Use Group R-2, the maximum riser height shall be 8¼ inches (210 mm) and the minimum tread depth shall be 9 inches (229 mm).

816.4.2 Dimensional uniformity: There shall not be variation exceeding 3/16 inch (5 mm) in the depth of adjacent treads or in the height of adjacent risers. The tolerance between the largest and smallest riser or between the largest and smallest tread shall not exceed ⅜ inch (10 mm) in any flight of stairs.

Exceptions

1. Where the bottom riser adjoins a sloping public way, walk or driveway having an established grade and serving as a landing, a variation in height of the bottom riser shall not exceed 3 inches (76 mm) in every three feet (914 mm) of stairway width.

2. On stairways serving as aisles in assembly seating, where necessitated by changes in the gradient of adjoining seating areas to maintain adequate sightlines, the maximum nonuniformity of riser heights within a flight and the nonuniformity between adjacent risers shall not apply. Where a nonuniformity exceeds 3/16 inch (5 mm) between adjacent risers, the exact location of the nonuniformity shall be indicated with a distinctive marking stripe on each tread at the nosing or leading edge adjacent to the nonuniform risers.
3. On stairways serving as aisles in assembly seating, where smaller intermediate steps are provided between larger treads level with seating platforms, such smaller intermediate steps shall have a uniform tread depth of not less than 13 inches (330 mm).

816.4.3 Winders: Winders shall not be permitted in required exit stairways except in Use Group R-3 and stairways serving a single dwelling unit and in ornamental stairways not required as an element of an exit. Such winders shall have a tread depth of not less than 9 inches (229 mm) at a point not more than 12 inches (305 mm) from the side where the tread is narrower and the minimum tread depth shall not be less than 6 inches (152 mm).

816.5 Stairway guards and handrails: Stairways shall have continuous guards and handrails on both sides, and in addition thereto, stairways more than 88 inches (2235 mm) in required width shall have intermediate handrails dividing the stairway into portions not more than 88 inches (2235 mm) wide. Only one handrail is required on stairways having a width of less than 44 inches (1118 mm). Guards shall be constructed in accordance with Section 827.0. Handrails shall be constructed in accordance with Section 828.0.

816.6 Stair exit doors: Stairway exit doors shall comply with Sections 816.6.1 through 816.6.3.

816.6.1 Width: The minimum required width of every exit door to or from a stairway shall be determined by the greater of the following criteria:

1. 28-inch (711 mm) clear width in buildings of Use Group R-3.
2. 36-inch (914 mm) minimum width of door leaf in buildings of Use Group I-2.
3. 32-inch (813 mm) clear width in all other cases.
4. The width required for the capacity of the stairway which serves the floor or area from which the exit door leads.

816.6.2 Direction of swing: All doors shall swing on a landing in the direction of egress travel. When opening, stair exit doors shall not reduce the width of landings to less than one-half the required width. When fully open, the exit door shall not project more than 7 inches (178 mm) onto the landing.

Exception: Doors leading from a room or tenant space to a stairway in buildings in which only one exit is required are not required to swing in the direction of egress travel.

816.6.3 Door construction: All doorway opening protectiyes shall be fire doors complying with Section 916.0. Labeled fire doors shall have a maxi-

num transmitted temperature end point of not more than 450 degrees F. (232 degrees C.) above ambient at the end of 30 minutes of standard fire test exposure.

816.7 Spiral stairways: Spiral stairways shall not be used as an element of a means of egress except in buildings of Use Group R-3 and within a single dwelling unit and from a mezzanine area not more than 250 square feet (23.25 m^2) in area and serving not more than five occupants. The minimum width shall be 26 inches (660 mm) with each tread having a 7½-inch (191 mm) minimum tread width at 12 inches (305 mm) from the narrow edge. All treads shall be identical and the rise shall be not more than 9½ inches (241 mm). A minimum headroom of 6 feet 6 inches (1981 mm) shall be provided.

816.7.1 Circular stairways: Circular stairways shall not be used as an element of a means of egress except where a minimum tread depth and maximum riser height are provided in accordance with Section 816.4.1 and the smaller radius is not less than twice the width of the stairway.

816.8 Supplemental stairways: Stairways which are not a required means of egress element, serve one adjacent floor, are not connected with an exit access corridor, and are not connected with a stairway serving other floors, are permitted in all use groups except Use Group I.

816.9 Stairway construction: All required interior stairways shall be built of materials consistent with the types of materials permitted in Table 401 for the type of construction of the building; except that wood handrails shall be permitted for all types of construction. Such stairways shall have solid treads and landing platforms, and all finish floor surfaces shall be of slip-resistant materials.

816.9.1 Strength: All stairways, platforms, landings and exits in other than buildings of Use Group R-3 shall be adequate to support a live load of 100 pounds per square foot (488.20 kg/ m^2) and a concentrated load of 300 pounds (136.20 kg).

816.9.2 Enclosures: Required interior exit stairways shall be enclosed in fire separation assemblies of the fireresistance rating specified in Table 401. An exit enclosure shall not be used for any purpose other than means of egress. A space below a stairway shall be enclosed as required or kept open. Only exit doors shall open into the stairway enclosure.

Exceptions

1. This section shall not apply to exits in buildings of Use Group R-3.
2. This section shall not apply to exits serving and contained within a single residential dwelling unit.
3. This section shall not apply to supplemental stairways as provided in Section 816.8.
4. This section shall not apply to exits in open parking structures as provided in Section 809.5.
5. The minimum required fireresistance rating for exit enclosures connecting three floor levels or less shall be 1 hour.

816.10 Discharge identification: Stairways which continue beyond the level of exit discharge shall be interrupted at the level of exit discharge by partitions, doors or other effective means of preventing persons from continuing past the floor of discharge while egressing. A sign shall be provided at each floor landing in all interior stairways connecting more than three stories designating the floor level above and below the level of exit discharge.

816.11 Alternating tread stairways: Alternating tread stairways of noncombustible construction are permitted as an element of a means of egress in buildings from a mezzanine area not more than 250 square feet (23 m^2) in area and serving not more than 5 occupants. Alternating tread stairways are also permitted for access to roofs as provided in Section 817.0.

816.11.1 Handrails of alternating tread stairways: Stair handrails shall be provided on both sides of alternating tread stairways and shall conform to Section 828.0.

816.11.2 Treads of alternating tread stairways: Alternating tread stairways shall have a minimum projected tread of 5 inches (127 mm), a minimum tread depth of 8½ inches (216 mm), a minimum tread width of 7 inches (178 mm) and a maximum riser to the next surface of the alternating tread of 9½ inches (241 mm). The initial tread of the stairway shall begin at the same elevation as the platform, landing or floor surface.

Exception: Alternating tread stairways of noncombustible construction used as an element of a means of egress in buildings from a mezzanine area not more than 250 square feet (23 m^2) in area and serving not more than 5 occupants shall have a minimum projected tread of 8½ inches (216 mm) with a minimum tread depth of 10½ inches (267 mm). The rise to the next alternating tread surface shall not be more than 8 inches (203 mm).

SECTION 817.0 ACCESS TO ROOF

817.1 By stairway or ladder: In buildings more than three stories in height except those with a roof slope greater than four units vertical in 12 units horizontal (4:12), access to the roof shall be provided by means of a stairway, an alternating tread stair in accordance with Section 816.11 or a ladder and trap door. The ladder shall not be on the exterior of the building. Where the roof is used as a roof garden or for other habitable purposes, sufficient stairways shall extend to the roof to provide the necessary exit facilities from the roof as required for such occupancy. Roof trap doors shall be constructed to comply with Section 927.2.

817.1.1 Optional stairway or ladder: In buildings not required to have a stairway, alternating tread stair or ladder to the roof, such devices, if provided, shall conform to the provisions of this section. Ladders placed on the exterior of the building shall be metal, and if exceeding 20 feet (6096 mm) in height, shall have a protective cage or other safety device. The siderails of exterior ladders shall be carried over the coping or parapet to afford handhold. Other design details of such exterior ladders are subject to approval.

817.2 Roof enclosures: Stairways extending through roofs shall be enclosed in roof structures of fireresistance rated construction meeting the requirements of Section 927.0.

SECTION 818.0 SMOKEPROOF ENCLOSURES

818.1 General: A smokeproof enclosure shall consist of an interior exit stairway conforming to Section 816.0, enclosed from the highest point to the lowest point, and meeting the requirements of this section. When access to the roof is required by Section 817.0, such access shall be from the smokeproof enclosure where a smokeproof enclosure is required.

818.2 Where required: At least one of the required exits shall be a smokeproof enclosure in buildings having floors used for human occupancy located more than 75 feet (22860 mm) above the lowest level of fire department vehicle access.

Exceptions

1. Buildings of Use Groups B, R-1 and R-2 complying with the area of refuge (compartmentation) option of Section 602.0.
2. Buildings of Use Group I-2.

818.2.1 Fire suppression system alternative: When the building is provided with an approved automatic fire suppression system throughout, the smokeproof enclosure is not required provided all interior exit stairways are pressurized to a minimum of 0.15 inches of water column (37.33 Pa) and a maximum of 0.35 inches of water column (87.10 Pa) in the shaft relative to the building with all stairway doors closed.

818.3 Access: Access to the smokeproof enclosure shall be from every story and shall be by way of a vestibule or by way of an open exterior balcony.

818.4 Outlet: The smokeproof enclosure shall discharge onto a street, yard or open court with direct access to a public way, or into a level of exit discharge passageway leading to a public way. The level of exit discharge passageway shall be without other openings and shall be separated from the remainder of the building by 2-hour fireresistance rated construction.

818.5 Construction: The walls of the smokeproof enclosure and the vestibule shall provide a 2-hour fireresistance rating without openings other than the required doorways. The open exterior balcony shall be constructed in accordance with the fireresistance rating requirements for floor construction.

818.6 Smokeproof enclosure by natural ventilation: The provisions of Sections 818.6.1 through 818.6.4 shall apply to ventilation of smokeproof enclosures by natural means.

818.6.1 Balcony doors: Where access to the smokeproof enclosure is by way of an open exterior balcony, the door assembly into the enclosure shall be a fire door complying with Section 916.0.

818.6.2 Vestibule doors: Where access to the smokeproof enclosure is by way

of a vestibule, the door assembly into the vestibule shall be a fire door complying with Section 916.0. The door assembly from the vestibule to the stairs shall have not less than a 20-minute fireresistance rating complying with Section 916.0.

818.6.3 Vestibule ventilation: Each vestibule shall have a minimum net area of 16 square feet (1.49 m^2) of opening in a wall facing an outer court, yard, or public way at least 20 feet (6096 mm) in width.

818.6.4 Vestibule size: The minimum dimension of the vestibule shall be not less than the required width of the corridor leading to the vestibule.

818.7 Smokeproof enclosure by mechanical ventilation: The provisions of Sections 818.7.1 through 818.7.8 shall apply to ventilation of smokeproof enclosures by mechanical means.

818.7.1 Vestibule doors: The door assembly from the building into the vestibule shall be a fire door complying with Section 916.0. The door assembly from the vestibule to the stairway shall have not less than a 20-minute fireresistance rating complying with Section 916.0. The door to the stairway shall be provided with a drop sill or other provisions to minimize air leakage.

818.7.2 Vestibule size: The vestibule shall have a minimum width of 44 inches (1118 mm) and a minimum length of 72 inches (1829 mm) in the direction of exit travel.

818.7.3 Vestibule ventilation: The vestibule shall be supplied with not less than one air change per minute, and exhausted at a rate sufficient to maintain an underpressure relative to the atmosphere of 0.05 inch of water column (12.44 Pa), and of 0.10 inch of water column (24.88 Pa) relative to the stair shaft. Supply air shall enter and exhaust air shall discharge from the vestibule through separate, tightly-constructed ducts used only for that purpose. Supply air shall enter the vestibule within 6 inches (152 mm) of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but not more than 6 inches (152 mm) down from the top of the trap and shall be entirely within the smoke trap area. Doors, when in the open position, shall not obstruct duct openings. Duct openings with controlling dampers are permitted where necessary to meet the design requirements, but dampers are not otherwise required.

818.7.3.1 Engineered ventilation system: Where a specially engineered system is used, the system shall provide 2,500 cubic feet per minute (cfm) (1.18 m^3/s) exhaust from a vestibule when in emergency operation and shall be sized to handle three vestibules simultaneously. The smoke detectors located outside each vestibule shall, upon release, open the supply and exhaust duct dampers in that affected vestibule.

818.7.4 Smoke trap: The vestibule ceiling shall be at least 20 inches (508 mm) higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward moving air column. The height shall not be decreased unless approved and justified by design and test.

818.7.5 Stair shaft air movement system: The stair shaft shall be provided with a dampered relief opening at the top and supplied with sufficient air to discharge a minimum of 2,500 cfm (1.18 m^3/s) through the relief opening while maintaining a minimum positive pressure of 0.05 inch of water column (12.44 Pa) in the shaft relative to atmosphere with all doors closed.

818.7.6 Ventilating equipment: The activation of ventilating equipment shall be by a smoke detector installed outside the vestibule door in an approved location. When the closing device for the stair shaft and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall operate at the levels specified in Sections 818.7.3 and 818.7.5.

818.7.7 Standby power: Mechanical vestibule and stair shaft ventilation systems and detector systems shall be powered by an approved standby power system conforming to Sections 2707.0 and 602.9.1.

818.7.8 Acceptance and testing: Before the mechanical equipment is approved, the system shall be tested in the code official's presence to confirm that the system is operating in compliance with these requirements.

SECTION 819.0 EXTERIOR STAIRWAYS

819.1 As required exit: Exterior stairways used as an element of a required means of egress shall conform to the requirements for interior stairways as required in Section 816.0, except as to enclosures and fire doors and except as herein specifically modified. Exterior stairways and exit access balconies in climates subject to snow or ice shall be protected to prevent accumulation of same. Exterior exit stairways shall not be used as an element of a required means of egress in the following cases.

1. Buildings of Use Group I-2 exceeding four stories or 50 feet (15240 mm) in height.
2. Buildings of Use Group I-3.
3. Floors exceeding five stories or 65 feet (19812 mm) in height above the level of exit discharge.

819.1.1 Location and arrangement: Exterior stairways utilized as a means of egress shall have at least one door from each tenant space opening onto a roofed-over open balcony served by at least two stairways, except where one stairway is permitted in Section 809.3, so located as to provide a choice of independent, unobstructed means of egress directly to the grade. The stairways shall be located remotely from each other. Balconies shall conform to the same width requirements as corridors as required by Section 810.0. The maximum travel distance from any tenant space to the nearest stairway shall be as specified in Table 807. Balconies and stairways shall be located at least 10 feet (3048 mm) from adjacent lot lines and from other buildings on the same lot unless openings in such buildings are protected by ¾-hour fireresistance rated doors or windows.

Exception: Noncombustible exterior stairways constituting not more than 50 percent of the required means of egress shall be exempt from the 10-foot fire separation distance requirement.

819.2 Opening protectives: All openings below and within 10 feet (3048 mm) horizontally of the stairway and all doors opening onto the stairway except at the top story shall be protected with approved ¾-hour fireresistance rated fixed or automatic opening protectives.

Exceptions

1. Buildings two stories or less above grade when the level of exit discharge is the first story above grade.
2. Opening protectives are not required when two independent exterior stairways serve an exterior balcony.

819.3 Location: 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 shall lead through a passageway at the level of exit discharge complying with Section 811.0. Exterior stairways shall not project beyond the street lot line.

819.4 Construction: Exterior stairs, porches and balconies shall be constructed of materials consistent with the types of materials permitted in Table 401 for the type of construction of the building to which the stairway is attached.

SECTION 820.0 ESCALATORS AND MOVING WALKS

820.1 Means of egress: Escalators and moving walks shall not constitute a part of the required means of egress.

820.2 Reference standards: Escalators and moving walks shall conform to ASME A17.1 listed in Appendix A and Section 2617.0.

SECTION 821.0 FIRE ESCAPES

821.1 Where permitted: Fire escapes shall be permitted only as provided in Sections 821.1 through 821.1.4.

821.1.1 New buildings: Fire escapes shall not constitute any part of the required means of egress in new buildings.

821.1.2 Existing fire escapes: Existing fire escapes shall be continued to be accepted as a component in the means of egress in existing buildings only.

821.1.3 New fire escapes: New fire escapes for existing buildings shall be permitted only where exterior stairs cannot be utilized due to lot lines limiting stair size or due to the sidewalks, alleys or roads at grade level. New fire escapes shall not incorporate ladders or access by windows.

821.1.4 Limitations: Fire escapes shall comply with this section and shall not constitute more than 50 percent of the required number of exits nor more than 50 percent of the required exit capacity.

821.2 Location: When located on the front of the building and projecting beyond the building line, the lowest landing shall be not less than 7 feet (2134 mm) or more than 12 feet (3658 mm) above grade, equipped with a counter-

balanced stairway to the street. In alleyways and thoroughfares less than 30 eet (9144 mm) wide, the clearance under the lowest landing shall be not less han 12 feet (3658 mm).

321.3 Construction: The fire escape shall be designed to support a live load of 100 pounds per square foot (488.20 kg/m^2) and shall be constructed of steel or other approved noncombustible materials. Fire escapes constructed of wood not less than 2 inches thick are permitted on buildings of Type 5 construction.

321.3.1 Dimensions: Stairs shall be at least 22 inches (559 mm) wide with risers not more and treads not less than 8 inches (203 mm) and landings at the foot of stairs not less than 40 inches (1016 mm) wide by 36 inches (914 mm) long, located not more than 8 inches (203 mm) below the access window or door.

321.3.2 Opening protectives: Doors and windows along the fire escape shall be protected with ¾-hour fireresistance rated opening protectives.

SECTION 822.0 SLIDESCAPES

822.1 Where permitted: Slidescapes and safety chutes shall be permitted in buildings of Use Group H, in existing school buildings of Use Group E and in existing buildings of Use Group I when approved and constructed in an approved manner.

822.2 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 823.0.

822.3 Construction: All chutes shall be constructed of approved noncombustible materials with a pitch in the line of travel of not less than 24 nor more than 42 degrees (0.42 rad to 0.73 rad), measured on the developed circumference of spiral chutes. Straight chutes shall be not less than 24 inches (610 mm) and spiral chutes not less than 28 inches (711 mm) in clear width; nor more than 44 inches (1118 mm) wide in any case. When erected on the interior of a building, they shall be enclosed as required in Section 816.9.2 for interior stairways with direct means of egress to a street or other public way.

822.4 Capacity: Slidescapes, where permitted as an element of a required exit, shall be rated at one unit of egress width per slide, with a rated capacity of 60. Slidescapes, except as permitted for buildings of Use Group H, shall not constitute more than 25 percent of the required number of units of egress width from any building or structure or any individual story.

SECTION 823.0 EXIT SIGNS AND LIGHTS

823.1 Location: In all buildings, rooms or spaces required to have more than one exit or exit access, all required means of egress shall be indicated with approved internally-illuminated signs reading *Exit*, visible from the exit access and, when necessary, supplemented by directional signs in the exit access corridors indicating the direction and way of egress. All *Exit* signs shall be located at exit doors or exit access areas, so as to be readily visible.

Exception: Exit signs are not required in sleeping room areas in buildings of Use Group I-3.

823.2 Size and color: *Exit* signs shall have red letters at least 6 inches (152 mm) high and the minimum width of each stroke shall be ¾ inch (19 mm) on a white background or in other approved distinguishable colors. If an arrow is provided as part of an *Exit* sign, the construction shall be such that the arrow direction cannot be readily changed. The word *Exit* shall be clearly discernible when the internally-illuminated sign is not energized.

823.3 Illumination: Each sign shall be illuminated by a source providing not less than five foot candles (53.82 lux) at the illuminated surface.

Exception: Approved self-luminous signs which provide evenly illuminated letters shall have a minimum luminance of 0.06 foot lamberts (0.21 cd/m^2).

823.4 Power source: All *Exit* signs shall be illuminated at all times when the building is occupied. To assure continued illumination for a duration of not less than 1 hour in case of primary power loss, the *Exit* signs shall be connected to an emergency electrical system that complies with Section 2706.0.

Exception: Approved self-luminous signs which provide continuous illumination independent of external power sources are not required to comply with Section 2706.0.

SECTION 824.0 MEANS OF EGRESS LIGHTING

824.1 Artificial lighting: All means of egress in other than buildings of Use Group R-3 shall be equipped with artificial lighting facilities to provide the intensity of illumination herein prescribed continuously during the time that conditions of occupancy of the building require that the exits be available. Lighting shall also be provided to illuminate the exit discharge. In buildings of Use Group R-2, means of egress lighting, except that lighting within a dwelling unit, shall be wired on a circuit independent of circuits within any dwelling unit. The disconnecting means and overcurrent protection device shall not be located within a dwelling unit or such that access is obtained by going through a dwelling unit.

824.2 Intensity of illumination: The intensity of floor lighting shall be not less than 1 foot candle (10.76 lux) except as provided in Section 824.3.

824.3 Use Groups A and E: In buildings of Use Groups A and E for the exhibition of motion pictures or other projections by means of directed light, the minimum required illumination of aisles during such period of projection shall be 0.2 foot candle (2.15 lux).

824.3.1 Control: The lighting of exits, aisles and auditoriums shall be controlled from a location inaccessible to unauthorized persons. Supplementary control shall be provided as specified in Section 613.4 in the motion picture projection room.

824.4 Power source: Means of egress lighting in all buildings, rooms or spaces required to have more than one exit or exit access shall be connected to an emergency electrical system that complies with Section 2706.0 to assure continued illumination for a duration of not less than 1 hour in case of emergency or primary power loss. *

SECTION 825.0 HAZARDS TO MEANS OF EGRESS

825.1 Floor openings: Manholes or floor access panels shall not be located in the line of egress which reduce the clearance to less than 32 inches (813 mm).

825.2 Protrusions: There shall not be low-hanging door closers that remain within the opening of a doorway when the door is open, or that protrude hazardously into the corridor or line of egress when the door is closed. There shall not be low-hanging signs, ceiling lights or similar fixtures which protrude into corridors or lines of egress.

825.3 Identification of hazardous exits: Doors leading to dangerous areas such as fire escapes, loading platforms, switch rooms and mechanical rooms shall be equipped with knobs, handles or push bars that have been knurled.

825.4 Floor surface: All floors of corridors and lines of egress shall have a slip-resistant surface.

825.5 Open-sided floor areas: Guards shall be located along open-sided walking surfaces, mezzanines and landings. The guards shall be constructed in accordance with Section 827.0.

825.6 Elevation change: Where changes in elevation exist in exit access corridors, exits or exit discharge, ramps shall be used when the difference in elevation is less than 12 inches (305 mm).

Exception: At exterior doors not required for the physically handicapped and aged by Section 512.0, a maximum of 8 inches (203 mm) step down shall be permitted.

SECTION 826.0 ASSEMBLY AISLES

826.1 Where required: Buildings or portions of buildings of Use Group A which contain seats, tables, displays, equipment or other material shall be provided with aisles leading to exits in accordance with this section.

826.2 Aisle width: The aisle width shall provide sufficient egress capacity for the number of persons accommodated by the catchment area served by the aisle (see Section 826.2.3). The catchment area served by an aisle is that portion of the total space that is naturally served by that section of the aisle. In establishing catchment areas the assumption shall be made that there is a balanced use of all means of egress, with the number of persons in proportion to egress capacity.

826.2.1 Converging aisles: Where aisles converge to form a single path of egress travel, the required egress capacity of that path shall be not less than the combined required capacity of the converging aisles.

826.2.2 Uniform width: Those portions of aisles, where egress is possible in either of two directions, shall be uniform in required width.

826.2.3 Capacity: The width of aisles shall provide sufficient capacity in accordance with the following formulas where clear width is measured to walls, edges of seating and tread edges; except that handrail projections are permitted.

1. At least 0.3 inch (7.5 mm) of width for each person served shall be provided on stairs having riser heights 7 inches (178 mm) or less and tread depths 11 inches (279 mm) or greater, measured horizontally between tread nosings.
2. At least 0.005 inch (0.1 mm) of additional stair width for each person shall be provided for each 0.10 inch (2.5 mm) of riser height above 7 inches (178 mm).
3. Where egress requires stair descent, at least 0.075 inch (2 mm) of additional width for each person shall be provided on those portions of stair width not having handrails within a horizontal distance of 30 inches (762 mm).
4. Level or ramped means of egress with slopes less than one unit vertical in eight units horizontal (1:8), shall have at least 0.2 inch (5 mm) of clear width for each person served.

826.2.4 Minimum width: The minimum clear width of aisles shall be: 48 inches (1219 mm) for stairs having seating on each side; 36 inches (914 mm) for stairs having seating on only one side; 23 inches (584 mm) between a stair handrail or guardrail and seating when the aisle is subdivided by a handrail (see Section 826.5); 42 inches (1067 mm) for level or ramped aisles having theater style seating on both sides; 36 inches (914 mm) for all other level or ramped aisles; and 23 inches (584 mm) between a stair handrail and seating when an aisle does not serve more than five rows on one side.

826.3 Termination: Each end of a cross aisle shall terminate at an aisle, foyer, doorway or vomitory giving access to an exit. Dead end aisles which terminate only at one end with a cross aisle, foyer, doorway or vomitory giving access to an exit shall be not greater than 20 feet (6096 mm) in length.

> **Exception:** A longer dead end aisle is permitted where seats served by the dead end aisle are not more than 24 seats from another aisle, measured along a row of seats having a minimum clear width of 12 inches (305 mm) plus 0.6 inch (15 mm) for each additional seat above seven in the row.

826.4 Walking surfaces: Aisles with a gradient of one unit vertical in eight units horizonal (1:8) or less shall consist of a ramp having a slip-resistant walking surface. Aisles with a gradient exceeding one unit vertical in eight units horizonal (1:8) shall consist of a series of risers and treads extending across the full width of aisles and complying with Sections 826.4.1 and 826.4.2.

826.4.1 Treads: Tread depths shall be a minimum of 11 inches (279 mm) and be uniform within each aisle.

Exception: Nonuniformities shall not exceed 3/16 inch (5 mm) between adjacent treads.

826.4.2 Risers: Where the gradient of aisle stairs is to be the same as the gradient of adjoining seating areas, the riser height shall be not less than 4 inches (102 mm) nor more than 8 inches (203 mm) and shall be uniform within each flight.

Exception: Riser height nonuniformity shall be limited to the extent necessitated by changes in the gradient of the adjoining seating area to maintain adequate sightlines. Where nonuniformities exceed 3/16 (5 mm) inch between adjacent risers, the exact location of such nonuniformities shall be indicated with a distinctive marking stripe on each tread at the nosing or leading edge adjacent to the nonuniform risers. Such stripe shall be a minimum of 1 inch (25 mm) wide and a maximum of 2 inches wide (51 mm).

826.5 Handrails: Ramped aisles having a gradient exceeding one unit vertical in fifteen units horizontal (1:15) and aisle stairs shall be provided with handrails located either at the side or within the aisle width.

Exceptions

1. Handrails are not required if, at the side of the aisle, there is a guardrail that complies with the requirements for handrails.
2. Handrails are not required for aisles with seating on both sides unless there is more than one riser per row of seating. The single riser shall be indicated by a distinctive marking stripe on the leading edge of the tread.

826.5.1 Discontinuous rails: Where there is seating on both sides of the aisle, the handrails shall be discontinuous with gaps or breaks at intervals not exceeding five rows to facilitate access to seating and to permit crossing from one side of the aisle to the other. These gaps or breaks shall have a clear width of at least 22 inches (559 mm) and not greater than 36 inches (914 mm), measured horizontally, and the handrail shall have rounded terminations or bends.

826.5.2 Intermediate rails: Where handrails are provided in the middle of aisle stairs, there shall be an additional intermediate handrail located approximately 12 inches (305 mm) below the main handrail.

826.6 Row width: The row minimum clear width shall be not less than 12 inches (305 mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic or self-rising seat, the measurement shall be made with the seat in the down position.

826.6.1 Dual access: For rows of seating served by aisles or doorways at both ends, there shall be not more than 100 seats per row and the row minimum clear width of 12 inches (305 mm) in rows shall be increased by 0.3 inch (7.5

mm) for every additional seat beyond 14 but the minimum clear width is not required to exceed 22 inches (559 mm).

826.6.2 Single access: For rows of seating served by an aisle or doorway at only one end of the row, the minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.6 inch (15 mm) for every additional seat beyond seven but the minimum clear width is not required to exceed 22 inches (559 mm). However, the path of travel shall not exceed 30 feet (9144 mm) from any seat to a point where a person has a choice of two paths of travel to two exits.

826.7 Guardrails: Guardrails shall be provided on balconies and galleries in accordance with Section 827.4.

SECTION 827.0 GUARDS

827.1 General: Where required by the provisions of Sections 609.2.3, 607.6, 815.5, 816.5, 825.5 and 1223.5, guards shall be designed and constructed in accordance with the requirements of this section and Section 1109.7. A guardrail system is a system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from the walking surface to the lower level.

827.2 Height: The guards shall be at least 42 inches (1067 mm) in height measured vertically above the leading edge of the tread or adjacent walking surface.

Exceptions

1. In other than buildings of Use Group E, guards shall be not less than 30 inches (762 mm) in height above the leading edge of the tread along stairs which are not more than 20 feet (6096 mm) in height or which reverse direction at an intermediate landing with 12 inches (305 mm) or less measured horizontally between successive flights.
2. Guards in buildings of Use Group R-3 shall be not less than 36 inches (914 mm) in height.

827.3 Construction: Open guards shall have intermediate rails, balusters or other construction such that a sphere with a diameter of 6 inches (152 mm) cannot pass through any opening.

Exception: In buildings of Use Groups F, H or S, the construction shall not permit a sphere with a diameter of 14 inches (356 mm) to pass through any opening.

* **827.4 Railings:** Metal or other approved noncombustible railings shall be provided on balconies and galleries as prescribed in Sections 827.4.1 through 827.4.3.

827.4.1 At fascia: At the fascia of boxes, balconies and galleries not less than 26 inches (660 mm) in height; not less than 36 inches (914 mm) in height at the

end of aisles extending to the fascia for the full width of the aisle; and not less than 42 inches (1067 mm) in height at the foot of steps for the full width of the steps.

827.4.2 At cross aisles: Along cross aisles, not less than 26 inches (660 mm) in height except where the backs of the seats along the front of the aisles project 24 inches (610 mm) or more above the floor of the aisle.

827.4.3 Successive tiers: Where seatings are arranged in successive tiers, and the height of rise between platforms exceeds 18 inches (457 mm), not less than 26 inches (660 mm) in height along the entire row of seats at the edge of the platform.

PER TERRY SLADE (6/27/88) BOTH RAILS @ BOTTOM RUN MUST EXTEND PER 828.2.3 OUTSIDE RAIL CAN BE RETURNED ON ITSELF.

SECTION 828.0 HANDRAILS

828.1 General: Where required by the provisions of Sections 612.2, 815.5, 816.5, 816.11 and 826.5, handrails shall be designed and constructed in accordance with this section and Section 1109.7. A handrail is a horizontal or sloping rail grasped by hand for guidance or support, and for arresting falls on the adjacent walking surface.

828.2 Handrail details: Handrails shall conform to the requirements of Sections 828.2.1 through 828.2.5.

828.2.1 Projection: Handrails shall not project more than 3½ inches (89 mm) into the required stair or ramp width.

828.2.2 Height: Handrails shall not be less than 34 inches (864 mm) nor more than 38 inches (965 mm), measured vertically, above the nosing of the treads or above the finished floor of the landing or walking surfaces.

Exceptions:

1. Handrails that form part of a guardrail shall have a height not less than 34 inches (864 mm) and not more than 42 inches (1067 mm).
2. Handrails within individual dwelling units shall not be less than 30 inches (762 mm) nor more than 34 inches (864 mm), measured vertically, above the nosing of the treads or above the finished floor.

828.2.3 Handrail ends: Except for stairways within a dwelling unit, handrails shall extend at least 12 inches (305 mm) beyond the top riser and at least 12 inches (305 mm) plus the width of one tread beyond the bottom riser. At the top, the handrail extension shall be parallel to the walking surface. At the bottom, the handrail shall continue to slope for a distance of the width of one tread from the bottom riser with the remainder parallel to the walking surface. The handrail ends shall be returned to wall or post. Handrails between runs of stairs shall be continuous around newel posts or shall terminate 12 inches (305 mm) beyond the last riser as required above.

828.2.4 Handrail grip size: For all stair handrails located within a dwelling unit, the maximum horizontal cross-sectional dimension of the handrail shall not exceed 2 5/8 inches (67 mm).

828.2.5 Handrails of alternating tread stairways: Stair handrails of alternating tread stairways shall be of such a configuration as to provide an adequate handhold for a person grasping the handrail to avoid falling. A minimum distance of 6 inches (152 mm) shall be provided between the stair handrail and any other object. A minimum of 12 inches (305 mm) shall be provided between the stair handrails of adjacent alternating tread stairways. Handrails on alternating tread stairways shall be spaced a minimum width of 17 inches (432 mm), not to exceed 24 inches (610 mm), between the handrails.

ARTICLE 9

FIRERESISTIVE CONSTRUCTION

SECTION 900.0 GENERAL

900.1 Scope: The provisions of this article shall govern the use and design of all materials and methods of construction in respect to required fireresistance rating and flameresistance, as determined by the potential fire hazard of the use and occupancy of the building or structure and the location and function of all integral structural and other fireresistive elements of the building; and the installation of safeguards against the spread of fire to and from adjoining structures.

900.2 Performance standards: The requirements of this article shall constitute the minimum functional performance standards for fire protection purposes; and shall not be deemed to decrease or waive any strength provisions or in any other manner decrease the requirements of this code in respect to structural safety.

900.3 Use of combustibles: All materials and forms of construction that develop the fireresistance ratings 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 in types of construction specified in Sections 402.0, 403.0, 404.0 and 405.0, and in Section 900.3.1.

900.3.1 Combustible components: Combustible aggregates are permitted in concrete mixtures approved for fireresistance rated construction as provided in Section 1604.0 for gypsum concrete, in Article 15 for cinder concrete, and any other approved component material or admixture is permitted in assemblies that meet the fireresistive test requirements of this code; and wood nailing strips or any other materials of similar combustible characteristics are permitted in concrete and masonry construction for securing trim and finish.

SECTION 901.0 PLANS AND SPECIFICATIONS

901.1 General: Plans for all buildings shall designate the type of construction and the fireresistance rating of all structure elements as required by this code.

The plans and specifications shall include documentation or supporting data substantiating all required fireresistance ratings.

901.2 Penetrations: Plans for buildings more than two stories in height shall indicate where penetrations will be made for electrical, mechanical, plumbing and communications conduits, pipes and systems, and shall also indicate the materials and methods for maintaining the required structural integrity, fireresistance rating and firestopping.

SECTION 902.0 FIRE HAZARD CLASSIFICATION

902.1 General: The degree of fire hazard of buildings and structures for each specific use group as defined by the fire grading in Table 902 shall determine the requirements for fire walls, fire separation walls, and horizontal and vertical assemblies separating mixed uses as prescribed in Section 313.0 and all structural members supporting such elements unless otherwise provided for in this code.

902.2 Unclassified uses: The code official shall determine the fire hazard classification of a building or structure designed for a use not specifically provided in Table 902 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.

Table 902
FIRE GRADING OF USE GROUPS

Use Group		Fire grading in hours
A-1	Assembly, theaters	3
A-2	Assembly, night clubs	3
A-3	Assembly, recreation centers, lecture halls, terminals, restaurants	2
A-4	Assembly, churches	1½
B	Business	2
E	Educational	1½
F	Factory and industrial	3
H	High hazard	4
I-1	Institutional, residential care	1
I-2	Institutional, incapacitated	2
I-3	Institutional, restrained	3
M	Mercantile	3
R-1	Residential, hotels	2
R-2	Residential, multi-family dwellings	1½
R-3	Residential, 1- and 2-family dwellings	1
S-1	Storage, moderate hazard	3
S-2	Storage, low hazard	2

SECTION 903.0 FIRE TESTS

903.1 Structural building assemblies: Built-up masonry units and composite assemblies of structural materials including walls, partitions, columns, girders, beams, 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 401. Floor assemblies which are required to be fireresistance rated shall extend to and be tight against exterior walls, or other provisions shall be made for maintaining the fireresistance rating of the assembly at such locations.

903.1.1 Fireresistance ratings: The fireresistance ratings of building assemblies and structural elements shall be determined in accordance with the test procedures set forth in ASTM E119 listed in Appendix A. The fireresistance rating of concrete assemblies and structural elements shall be established as heretofore required, or shall be determined in accordance with the procedures of the CRSI book *Reinforced Concrete Fire Resistance* or PCI MNL 124-77 listed in Appendix A. The fireresistance rating of protected steel shall be established as heretofore required or shall be calculated in accordance with AISI *Designing Fire Protection for Steel Columns,* AISI *Designing Fire Protection for Steel Beams* and AISI *Designing Fire Protection for Steel Trusses* listed in Appendix A. The calculations shall be based upon the fire exposure and acceptance criteria specified in ASTM E119 listed in Appendix A.

903.1.2 Tested assemblies: Assemblies of building construction shall be tested according to Section 903.1.1 or be detailed in GA-600 or in the UL *Fire Resistance Directory* listed in Appendix A as having the fireresistance ratings specified therein for determining compliance with the requirements of this code.

903.2 Alternative protection: Where it can be shown to the code official that the structural integrity of structural framing elements will not be reduced below a safe level by a fire within the building or in an adjacent building having a severity corresponding to the fireresistance rating required for the elements through the use of heat shields, separations or other approved means of protection, fireresistive coverings or insulating enclosing materials are not required for such elements.

903.3 Opening protectives: Opening protectives shall include the fire door, fire shutter, fire window, or fire damper and all required hardware, anchorage, frames and sills necessary for the assembly.

903.4 Combustibility tests: Where the behavior of materials under exposure to fire is specified in this code, the characteristics of materials shall be determined by the tests and criteria set forth in Sections 903.4.1 and 903.4.1.1.

903.4.1 Tests: The tests indicated in Sections 903.4.1.1 and 903.4.1.2 shall serve as criteria for acceptance of building materials as set forth in Sections 402.0, 403.0, 404.0 and 405.0 governing the combustibility of building mate-

rials for use in Types 1, 2, 3 and 4 construction. The term "noncombustible" does not apply to the flame spread characteristics of interior finish or trim materials. A material shall not be classed as a noncombustible building construction material which is subject to an increase in the combustible or flame spread rating beyond the limits herein established through the effects of age, moisture or other atmospheric conditions.

903.4.1.1 Elementary materials: Materials which are intended to be classified as noncombustible shall be tested in accordance with ASTM E136 listed in Appendix A. Such materials shall be acceptable as noncombustible materials when at least three of the four specimens tested meet all of the following criteria:

1. The recorded temperature of the surface and interior thermocouples shall not at any time during the test rise more than 54 degrees F. (30 degrees C.) above the furnace temperature at the beginning of the test.
2. There shall not be flaming from the specimen after the first 30 seconds.
3. If the weight loss of the specimen during testing exceeds 50 percent, the recorded temperature of the surface and interior thermocouples shall not at any time during the test rise above the furnace air temperature at the beginning of the test, and there shall not be flaming of the specimen.

903.4.1.2 Composite materials: Materials having a structural base of noncombustible material as defined in Section 903.4.1.1. with a surfacing not more than 1/8 inch thick which has a flame spread rating not greater than 50 when tested in accordance with ASTM E84 listed in Appendix A shall be acceptable as noncombustible materials.

903.5 Fire-retardant treated wood: Fire-retardant treated wood shall comply with Sections 903.5.1 and 903.5.2.

903.5.1 General: Where permitted for use as a structural element, fire-retardant treated wood shall be defined as any wood product which when impregnated with chemicals by a pressure process, or other means during manufacture, shall have, when tested in accordance with ASTM E84 listed in Appendix A, a flame spread rating not greater than 25 when the test is continued for a period of 30 minutes, without evidence of significant progressive combustion and the flame front shall not progress more than 10½ feet (3200 mm) beyond the centerline of the burner at any time during the test. The material shall bear the identification of an approved agency having a reexamination service, and such identification shall show the performance rating of the material. Fire-retardant treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for plywood before use.

903.5.2 Use limitations: An assembly of wood which has been pressure treated with fire-retardant chemicals in accordance with AWPA C20 and AWPA C27 listed in Appendix A, or treated by other approved means during manufacture, is permitted to be used in Types 1 and 2 construction for partitions, structural elements and roof framing and sheathing as indicated by Note d in

Table 401, and shall produce the required fireresistance rating when tested in accordance with ASTM E119 listed in Appendix A. When the material is to be exposed to the weather, the material shall be further identified to indicate that there is not an increase in the listed flame spread classification after being weathered in accordance with ASTM D2898 listed in Appendix A. Fire-retardant treated wood subjected to high humidity conditions shall be identified to indicate the treated wood has a moisture content of not over 28 percent when tested in accordance with ASTM D3201 listed in Appendix A at 92 percent relative humidity.

SECTION 904.0 FLAME SPREAD AND FLAMERESISTANCE TESTS

904.1 General: All materials which are required to restrict the spread of flame or to be flameresistant under the provisions of this code, including but not limited to interior finish materials, fire-retardant 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 this section.

904.2 Interior finish and trim materials: All materials used for interior finish and trim shall be classified in accordance with ASTM E84 listed in Appendix A.

904.3 Interior floor finish materials: Interior floor finish materials which are judged by the code official to represent an unusual hazard and are to be installed in exits, passageways and corridors shall be classified in accordance with ASTM E648 listed in Appendix A.

904.4 Interior hangings and decorations: Interior hangings and decorations shall comply with Section 904.4.1.

904.4.1 Acceptance criteria: Where required to be flameresistant under the provisions of this code, all materials used for artistic enhancement, decorations, draperies, curtains, scenery and hangings shall comply with this section. If treated to be flameresistant, these materials shall not generate smoke more dense than that given off by untreated wood or paper burning under comparable conditions when tested in the vertical flame test in accordance with NFiPA 701 listed in Appendix A.

SECTION 905.0 SPECIAL FIRERESISTIVE REQUIREMENTS

905.1 General: In buildings or parts thereof of the uses and types of construction herein specified, the general fireresistive requirements of Table 401 and the height and area limitations of Table 501 shall be subject to the exceptions and modifications described in Sections 905.2 and 905.3.

905.2 Use Groups B, M and R: Buildings of Use Groups B, M and R shall comply with the special fireresistive requirements of Sections 905.2.1 through 905.2.3.

905.2.1 Type 3A construction: The height limitation for buildings of Use Group R-2 of Type 3A construction shall be increased to six stories and 75 feet (22860 mm) where the first floor construction above the basement has a fireresistance rating of not less than 3 hours and the floor area is subdivided by 2-hour fire walls into fire areas of not more than 3,000 square feet (279 m^2).

905.2.2 Type 2B construction: The height limitation for buildings of Use Group R-2 of Type 2B construction shall be increased to nine stories and 100 feet (30480 mm) where the building is separated by not less than 50 feet (15240 mm) from any other building on the lot and from interior lot lines, the exits are segregated in a fire area enclosed by a fire wall of 2-hour fireresistance rating and the first floor construction has a fireresistance rating of not less than 1½ hours.

905.2.3 Use Groups B and M: The first floor of buildings of Type 2C, 3B or 5B construction shall not be occupied for Use Groups B and M, unless the floor/ceiling assembly and enclosure walls are protected to afford 1-hour fireresistance rating and the exits from the residential floors are separately enclosed in accordance with the requirements of Article 8.

905.3 Interior partitions: In buildings or structures of other than Use Groups I and R of Types 1, 2A and 2B construction, partitions of a single thickness of wood or approved composite panels, and glass or other approved materials of similar combustible characteristics, are permitted to subdivide rooms or spaces into offices, entries, or other similar compartments, provided they do not establish a corridor serving an occupant load of more than 30 in areas occupied by a single tenant and do not exceed 5,000 square feet (465 m^2) between fire separation assemblies or fire walls. The maximum allowable compartment size shall be increased to 7,500 square feet (697.5 m^2) where subdivided with fire-retardant treated wood complying with Section 903.5.

905.4 Combustible pipe: Combustible pipe shall be permitted in all use groups and construction types where approved by Article 28 of this code and the *Kentucky State Plumbing Code.*

905.4.1 Vertical combustible pipes: Vertical combustible pipes shall comply with Sections 905.4.2 and 915.4.

905.4.2 Combustible pipe penetrations: Combustible pipe penetrations of fireresistance rated assemblies shall be acceptable when installed in accordance with an approved tested assembly utilizing combustible pipe penetrations. If there is no approved tested assembly with combustible pipe penetrations, noncombustible fittings shall be required where combustible pipe penetrations enter into or exit from the fireresistance rated assembly.

SECTION 906.0 EXTERIOR WALLS

906.1 General: All exterior walls shall comply with the applicable provisions of this code and with the fireresistance rating requirements of this section and Section 401.0, except as provided in Section 906.1.1 for open parking structures.

Exception: The provisions of Sections 906.2 and 906.3 shall not apply to exterior walls which face buildings on the same lot when the buildings are such that, if combined into one structure, the resulting building would otherwise comply with the height and area limits of Section 501.0 (see Section 501.2.1).

906.1.1 Omission of exterior walls: The provisions of this code shall not be deemed to prohibit the omission of exterior walls for all or part of a story where the provisions of Section 906.2 do not require a nonloadbearing exterior wall to provide a fireresistance rating. Except as otherwise specifically permitted in Section 912.5, the piers, columns and other structural elements within the open portion shall be constructed with the fireresistance rating required for exterior bearing walls in Table 401.

Open parking structures erected without exterior walls shall have an enclosure wall having a fireresistance rating of not less than 2 hours without openings when located with a fire separation distance of less than 6 feet (1829 mm) from an interior lot line.

906.2 Fireresistance ratings: The fireresistance rating of exterior walls shall comply with Table 906.2. Loadbearing exterior walls shall also comply with the fireresistance rating requirements of Section 401.0. The fireresistance rating of exterior walls with a fire separation distance of greater than 5 feet (1524 mm) shall be rated for exposure to fire from the inside. The fireresistance rating of exterior walls with a fire separation distance of 5 feet (1524 mm) or less shall be rated for exposure to fire from both sides.

Table 906.2
EXTERIOR WALL FIRERESISTANCE RATINGS (hours)

Fire separation distance (feet)[a]	Use group				
	H	F-1, M, S-1	R-2	R-3	A, B, E, F-2, I, R-1, S-2
0 to 5	4	3	1	1	2
Greater than 5 to 10	3	2	1	0	1
Greater than 10 to 15	2	1	0	0	0
Greater than 15 to 30	1	0	0	0	0
Greater than 30	0	0	0	0	0

Note a. 1 foot = 304.8 mm.

906.2.1 Wall height: The wall shall extend the full height of the building and shall be constructed so that it will remain in place for the duration of time indicated by the required fireresistance rating.

906.2.2 Automatic fire suppression: In buildings protected throughout with an approved automatic fire suppression system, the required fireresistance rating of nonloadbearing exterior walls shall be reduced by 1 hour. This reduction shall not apply to buildings of Use Group H.

906.2.3 Noncombustible construction exemptions: One-story buildings of Type 2C construction which do not exceed 3,000 square feet (279 m^2) in area shall be exempt from all protected exterior wall requirements. This exemption

shall not apply to buildings of Use Groups A, E, H and I.

906.2.4 Unexposed surface temperature: Where protected openings are not limited by Table 906.3, the limitation on the rise of temperature on the unexposed surface of exterior walls as required by ASTM E119 listed in Appendix A shall not apply. Where protected openings are limited by Table 906.3, the limitation on the rise of temperature on the unexposed surface of exterior walls as required by ASTM E119 listed in Appendix A shall not apply provided correction is made for radiation from the unexposed exterior wall surface in accordance with the following formula:

$$A_e = A + (A_f \times F_{eo})$$

Where:

A_e = equivalent area of protected openings
A = actual area of unprotected and protected openings
A_f = area of exterior wall surface in the story under consideration exclusive of openings, on which the temperature limitations of ASTM E119 for walls is exceeded.
F_{eo} = an "equivalent opening factor" derived from Figure 906.2.4.

906.3 Openings: The maximum area of unprotected or protected openings permitted in an area of exterior wall in any story shall not exceed the values given in Table 906.3. Where both unprotected and protected openings are used in the exterior wall in any story, the total area of the openings shall comply with the following formula:

$$\frac{A}{a} + \frac{A_u}{a_u} \leq 1.0$$

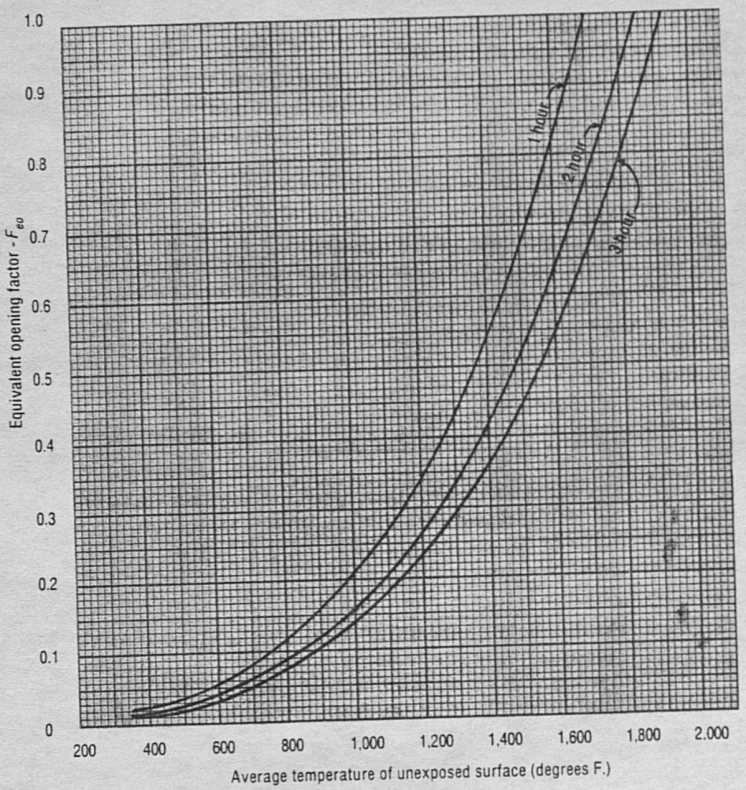
where A = actual area of protected openings, or the equivalent area of protected openings A_e (see Section 906.2.4)
a = allowable area of protected openings
A_u = actual area of unprotected openings
a_u = allowable area of unprotected openings

Table 906.3
MAXIMUM PERCENT AREA OF EXTERIOR WALL OPENINGS[b,c]

Classification of opening	Fire separation distance (feet)[d]							
	0 to 3	Greater than 3 to 5	Greater than 5 to 10	Greater than 10 to 15	Greater than 15 to 20	Greater than 20 to 25	Greater than 25 to 30	Greater than 30
Unprotected	NP	NP[a]	10%	15%	25%	45%	70%	NL
Protected	NP	15%	25%	45%	75%	NL	NL	NL

Note a. For buildings of Use Group R-3, the maximum percentage of unprotected exterior wall openings shall be 5 percent.
Note b. This table assumes that the openings are reasonably uniformly distributed. Where openings are not reasonably uniformly distributed, the portion of the wall used to calculate compliance with Table 906.3 shall be approved.
Note c. NP = not permitted; NL = no limit.
Note d. 1 foot = 304.8 mm.

Figure 906.2.4
EQUIVALENT OPENING FACTOR



906.3.1 Automatic fire suppression: In buildings equipped throughout with an approved automatic fire suppression system, other than buildings, or portions thereof, of Use Group H, the area of unprotected openings shall not exceed the tabulated limits for protected openings.

906.3.2 First story: In all buildings, other than buildings, or portions thereof, of Use Group H, unlimited unprotected openings are permitted in the first story of exterior walls facing a street and having a fire separation distance of greater than 15 feet (4572 mm).

906.4 Vertical separation of openings: Openings in exterior walls in adjacent stories shall be separated vertically to protect against fire spread on the

exterior of the buildings where the openings are within 5 feet (1524 mm) of each other horizontally and the opening in the lower story is not a protected opening in accordance with Section 907.0. Such openings shall be separated vertically at least 3 feet (914 mm) by spandrel girders, exterior walls, or other similar assemblies with a fireresistance of at least 1 hour or by flame barriers which extend horizontally at least 30 inches (762 mm) beyond the exterior wall. Flame barriers shall also have a fireresistance rating of at least 1 hour. The unexposed surface temperature limits specified in ASTM E119 listed in Appendix A shall not apply to the flame barriers or vertical separation unless otherwise required by the provisions of this code.

Exceptions

1. This section shall not apply to buildings of three stories or less in height.
2. This section shall not apply to buildings equipped throughout with an approved automatic fire suppression system.

906.5 Vertical exposure: Approved protectives shall be provided in every opening which is less than 15 feet (4572 mm) vertically above the roof of an adjoining building or adjacent structure that is within a horizontal fire separation distance of 15 feet (4572 mm) of the wall in which the opening is located, unless such roof construction affords a fireresistance rating of not less than 1 hour.

906.6 Continuity of exterior walls: Exterior walls required to be fireresistance rated by Section 906.2 because of fire separation distance, shall be continuous from the foundation to not less than 30 inches (762 mm) above the roof surface.

Exceptions

1. Where the roof deck or sheathing is constructed of approved noncombustible materials or of fire-retardant treated wood for a distance of not less than 4 feet (1219 mm) from the wall, and the roof covering has a minimum of a Class C rating, the exterior wall shall be permitted to stop at the underside of the roof deck or sheathing.
2. Exterior walls in buildings of Use Group R-3 or buildings not exceeding 1,000 square feet (93 m^3) in area.
3. Exterior walls of a building where the roof has an angle of more than 20 degrees (0.35 rad.) with the horizontal.

SECTION 907.0 EXTERIOR OPENING PROTECTIVES

907.1 Where required: Exterior opening protectives shall be provided in all exterior wall openings required to be protected by Section 906.0.

907.1.1 Outside sprinklers: Approved outside automatic sprinklers used for the protection of exterior openings shall be installed in accordance with NFiPA 13 listed in Appendix A, shall have an automatic source of water supply and shall be provided with a fire department connection.

907.2 Automatic protection: Approved fire protective assemblies shall be fixed, self-closing or equipped with approved automatic closing devices meet-

ing the requirements of this section and Sections 903.0, 916.0, 917.0, 918.0 and 919.0.

907.3 Fireresistance rating: An exterior opening in a wall required by Section 906.0 to have a fireresistance rating greater than 1 hour shall be protected with an assembly having a fireresistance rating of not less than 1½ hours. An exterior opening in a wall required by Section 906.0 to have a fireresistance rating of 1 hour shall be protected with an assembly having a fireresistance rating of not less than ¾ hour.

907.4 Unprotected openings: Where protected openings are not required by Section 906.0, windows and doors shall be constructed of any approved materials. Glazing shall conform to the requirements of Articles 20, 21 and 22.

SECTION 908.0 FIRE WALLS AND PARTY WALLS

908.1 General: Walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall, and shall be constructed of any approved noncombustible materials providing the required strength and fireresistance rating specified in Table 401 for the type of construction, but not less than the fire grading of the use group specified in Table 902. Strength and stability shall comply with the provisions of Articles 11 and 21.

908.2 Cutting walls: A wall 8 inches or less in thickness shall not be cut for chases or socketed for insertion of structural members subsequent to erection (see Section 1413.0).

908.3 Hollow walls: When combustible members frame into hollow walls or walls of hollow units, all hollow spaces shall be solidly filled for the full thickness of the wall and for a distance not less than 4 inches (102 mm) above, below and between the structural members with noncombustible materials approved for firestopping in Section 921.0. The wall shall be not less than the minimum thickness specified in NBS 211 for nonreinforced masonry, NBS H74 for reinforced masonry, BIA *Building Code Requirements for Engineered Brick Masonry*, NCMA TR75-B or ACI 531 listed in Appendix A.

908.4 Combustible insulation: The code official shall permit the application of cork, fiber board or other combustible insulation where laid up without intervening air spaces and attached directly to the face of the wall, and protected on the exposed surface as provided in Sections 1709.0 and 928.0.

908.5 Continuity of walls: In all buildings or structures, walls shall be continuous from foundation to 2 feet 8 inches (813 mm) above the roof surface, except as provided in Sections 908.5.1 through 908.5.3. Fire walls shall be made smoke-tight at their junction with exterior walls. In exterior wall construction employing studs, the wall shall extend through the stud space to the exterior sheathing.

908.5.1 Noncombustible roofs: The wall is permitted to terminate at the underside of the roof deck where the roof is of noncombustible construction

and is properly firestopped at the wall.

908.5.2 Combustible roofs: The wall is permitted to terminate at the underside of the roof deck in Types 3, 4 and 5 construction where all of the following conditions below are met.

1. The wall is properly firestopped at the deck.
2. The roof sheathing or deck is constructed of approved noncombustible materials, or fire-retardant treated wood, for a distance of 4 feet (1219 mm) on either side of the wall.
3. Combustible material does not extend through the wall.
4. The roof covering has a minimum of a Class C rating.

908.5.3 Noncombustible frame: The wall shall not be supported on the structural frame in buildings of noncombustible construction unless such supporting frame has a fireresistance rating at least equal to that required for the wall.

908.6 Offset fire walls: Where fire walls are offset at intermediate floor levels in 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.

SECTION 909.0 FIRE WALL OPENINGS

909.1 General: 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 903.0 and 907.0.

909.2 Size of opening: Except in sprinklered buildings, an opening through a fire wall shall not exceed 120 square feet (11.16 m^2) in area, and the aggregate width of all openings at any floor level shall not exceed 25 percent of the length of the wall.

909.2.1 First story: Where the entire first story areas on both sides of a fire wall are provided with an approved automatic fire suppression system complying with the requirements of Article 10, the maximum allowable size of openings on the first story of the building designed for the passage of trucks shall be increased to 240 square feet (22.32 m^2) in area with a minimum distance of 3 feet (914 mm) between adjoining openings. Such openings shall be protected with approved automatic opening protectives of 3-hour fireresistance rating, and provided with an approved water curtain in addition to all other requirements.

909.3 Opening protectives: Every opening in a fire wall shall be protected with an approved automatic opening protective assembly as herein required or the approved labeled equivalent in accordance with Section 916.2, except as provided in Section 814.2.1 for horizontal exit openings.

909.3.1 Hold-open devices: Heat actuated hold-open devices shall be installed on both sides of the wall, interconnected so that the operation of any single device will permit the door to close. Heat detectors or fusible links shall be installed at the door opening and at the ceiling in conformance with NFiPA 80

listed in Appendix A for the particular type of door to be installed. Swinging fire doors, where the ceiling is less than 3 feet (914 mm) above each side of the opening, are permitted to be actuated by a single fusible link incorporated in the hold-open arm of an approved automatic door closer. Doors opening in a means of egress shall be closed by an approved door closer, or shall be closed by actuation of a smoke detector located in conformance with NFiPA 80 listed in Appendix A.

SECTION 910.0 FIRE SEPARATION WALLS

910.1 General: Fire separation walls used for subdividing purposes shall be constructed of the types of materials and shall have the minimum fireresistance rating as prescribed by Table 401 for the type of construction, except as provided in Section 910.4.

910.2 Mixed uses: When a building contains more than one occupancy, and each part of the building is separately classified as to use, the mixed uses shall be completely separated with fire separation walls as specified in Section 313.0.

910.3 Multiple single-family dwellings: Single-family dwelling units (Use Group R-3) located above or adjacent to other single-family dwelling units (Use Group R-3) shall be considered as one building classified as Use Group R-3 for the purpose of determining the applicable provisions of this code, provided each dwelling unit is completely separated from the adjacent dwelling unit(s) by fire separation wall(s) and floor/ceiling assemblies of not less than 1-hour fireresistance rated construction and each unit has independent means of egress.

910.4 Exits: Fire separation walls required for the enclosure of exits and areas of refuge shall be constructed of masonry, reinforced concrete or any other approved noncombustible materials having the minimum fireresistance rating prescribed by Table 401. Such walls, where permitted to be of combustible materials by Section 816.9, shall comply with Section 910.4.1.

910.4.1 Combustible stair enclosures: Where permitted by Section 816.9, combustible stair enclosures shall be 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 exits from the unprotected areas of the building. Such enclosures shall be firestopped to comply with Section 921.0.

910.4.2 Openings for lighting: Openings for the purpose of providing light in combustible stair enclosures are permitted to be protected with wired glass with single panes not more than 360 square inches (0.23 m^2) in area and a total area in one story of not more than 720 square inches (0.46 m^2). Such light panels shall comply with the provisions of Section 919.0, and shall be contained in stationary sash and frames of steel or other approved noncombustible material.

910.5 Openings: Exit doors located in fire separation walls shall be limited to a maximum aggregate width of 25 percent of the length of the wall and the maximum area of any single opening shall not exceed 48 square feet (4.46 m^2).

910.5.1 Protectives: All opening protectives in fire separation walls shall comply with the provisions of Section 903.0 and shall have the minimum fireresistance rating as set forth in Section 916.0.

910.6 Continuity: All fire separation walls shall extend from the top of the fireresistance rated floor/ceiling assembly below to the fireresistance rated floor/ceiling or roof/ceiling assembly above, unless otherwise provided for in this code, and shall be securely attached thereto. Where these walls enclose required exits, areas of refuge and shafts, or where these walls separate mixed uses, they shall be continuous through all concealed spaces such as the space above a suspended ceiling, and they shall be constructed tight to the underside of the floor slab or roof deck above. The supporting construction shall be protected to afford the required fireresistance rating of the wall supported, except for exit access corridor walls in buildings of Types 2C, 3B and 5B construction. All hollow vertical spaces shall be firestopped at every floor level as required in Section 921.0.

910.7 Exterior walls: Where exterior walls serve as a part of a required fireresistance rated enclosure, such walls shall comply with the requirements of Table 401 for exterior walls and the fireresistance rated enclosure requirements shall not apply.

SECTION 911.0 SMOKE BARRIERS

911.1 Where required: Smoke barriers shall be provided as required in Section 610.5 for buildings of Use Group I-2 and Section 611.8 for buildings of Use Group I-3.

911.2 Construction: Smoke barriers shall have a fireresistance rating of not less than 1 hour. Such barriers shall form an effective membrane continuous from outside wall to outside wall and from floor slab to floor or roof deck above, including continuity through all concealed spaces, such as those found above suspended ceilings, and including interstitial structural and mechanical spaces. Transfer grilles, whether equipped with fusible link-operated dampers or not, shall not be used in these partitions. The supporting construction shall be protected to afford the required fireresistance rating of the wall supported in buildings of other than Types 2C, 3B and 5B construction.

Exceptions

1. Smoke barriers are not required in interstitial spaces when such spaces are designed and constructed with ceilings that provide resistance to the passage of fire and smoke equivalent to that provided by smoke barriers.
2. Smoke barriers in buildings of Use Group I-3 are permitted to be constructed of nominal 0.10 inch thick steel plate.

911.3 Doors: Doorways separating corridors in adjoining smoke compart-

ments shall be equipped with a pair of swinging type doors, each swinging in a direction opposite from the other, and the minimum clear width of each door shall be 44 inches (1118 mm) for corridors used for the movement of beds and 32 inches (813 mm) for other corridors. Other doors in smoke barriers shall be of the swinging type of required width.

Exception: Horizontal sliding doors complying with Section 611.0 are permitted to be used in smoke barriers in buildings of Use Group I-3.

911.4 Opening protectives: Doors in smoke barriers shall have a fireresistance rating of not less than 20 minutes when tested in accordance with ASTM E152 listed in Appendix A without the hose stream and labeled by an approved agency. Double egress corridor doors shall have vision panels of ¼ inch thick labeled wired glass mounted in approved steel frames. Vision panels provided in other doors in smoke barriers shall be ¼ inch thick labeled wired glass mounted in approved steel frames. The glass area of the vision panels shall be limited to 1,296 square inches (0.84 m^2) for each door. The doors shall close the openings with only the clearance necessary for proper operation under self-closing or automatic closing and shall be without undercuts, louvres or grilles. Rabbets or astragals are required at the meeting edges of double egress doors, and stops are required on the head and jambs of all doors in smoke barriers. Positive latching devices are required on double egress corridor doors.

Exceptions

1. Protection at the meeting edges of doors and stops at the head and sides of door frames shall not be required in buildings equipped throughout with an approved engineered smoke control system. The engineered smoke control system shall respond automatically, preventing the transfer of smoke across the barrier.
2. In buildings of Use Group I-2, positive latching devices are not required on double egress doors, and center mullions are prohibited.

911.4.1 Door closers: Doors in smoke barriers shall be self-closing or shall be provided with approved door hold-open devices of the fail-safe type which shall release the doors, causing them to close upon the actuation of smoke detectors as well as upon the application of a maximum manual pull of 50 pounds (244 N) against the hold-open device.

911.5 Smoke damper: An approved damper designed to resist the passage of smoke shall be provided at each point a duct penetrates a smoke barrier. The damper shall close upon detection of smoke by an approved smoke detector located within the duct.

Exceptions

1. In lieu of an approved smoke detector located within the duct, ducts which penetrate smoke barriers above smoke barrier doors required by Section 911.4 shall have the approved damper arranged to close upon detection of smoke by the local device designed to detect smoke on either side of the smoke barrier door opening.

2. Dampers are not required in buildings equipped throughout with an approved engineered smoke control system.
3. Dampers are not required where the openings in ducts are limited to a single smoke compartment and the ducts are of steel construction.

SECTION 912.0 FIRERESISTANCE RATING OF STRUCTURAL MEMBERS

912.1 Requirements: The fireresistance rating of structural members and assemblies shall comply with the requirements for the type of construction and not less than the rating required for the fireresistance rated assemblies supported, except as provided in Section 910.6 for support of exit access corridor walls and in Section 911.2 for support of smoke barriers.

912.2 Protection of structural members: Columns, girders, trusses, beams, lintels, or other structural members that are required to have a fireresistance rating and that support more than two floors or one floor and roof, or support a bearing wall or a nonbearing wall more than two stories high, shall be individually protected on all sides for their length or height with materials having the required fireresistance rating. All other structural members required to have a fireresistance rating shall be protected by individual encasement, by a membrane or ceiling protection as specified in Section 913.0, or by a combination of both.

912.3 Embedments and enclosures: Pipes, wires, conduits, ducts or other service facilities shall not be embedded in the required fire protective covering of a structural member that is required to be individually encased.

912.4 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, but not less than 5 feet (1524 mm) from the finished floor.

912.5 Exterior structural members: Structural members located in exterior walls or along the outer lines of a building or structure shall be protected as required by Table 401 for exterior bearing walls for the type of construction involved and shall be protected against corrosion by an approved method complying with Section 1808.1. The interior faces of exterior structural members shall be protected with coverings of not less than the required fireresistance rating specified for interior structural members in Table 401. Where a fireresistance rating is required in Table 401 for exterior bearing walls in buildings of Type 2C, 3B and 5B construction, the interior faces of any exterior structural member of such buildings shall be protected to provide a fireresistance rating not less than that required for exterior bearing walls.

* **912.6 Bottom flange protection:** Fire protection is not required for the bottom flange of lintels, shelf angles and plates not a part of the structural frame or with a span of 6 feet (1829 mm) or less.

912.7 Stone lintels: The use of stone lintels on spans exceeding 4 feet (1219 mm) shall not be permitted, unless supplemented by fireresistance rated structural members or masonry arches of the required strength to support the superimposed loads.

SECTION 913.0 FIRERESISTANCE RATED FLOOR/ROOF/CEILING ASSEMBLIES

913.1 Installation of ceiling fixtures: Openings to accommodate noncombustible piping, ducts or electric outlets in fireresistive ceilings which constitute an integral part of a floor or roof assembly to meet a required fireresistance rating shall be not greater in aggregate area than 100 square inches (0.065 m^2) in any 100 square feet (9.30 m^2) of ceiling area. The fixtures and attachments shall be installed so as not to decrease the fireresistance rating of the assembly. All duct openings shall be protected with approved noncombustible ceiling dampers.

Exception: Ceiling dampers shall not be required when fire tests show that the integrity of the fireresistance rated assembly is maintained without the ceiling dampers.

913.2 Ceiling panels: Where the weight of lay-in ceiling panels, used as part of fireresistance rated floor/ceiling or roof/ceiling assemblies, is not adequate to resist an upward force of 1 psf (4.88 kg/m^2), wire or other approved devices shall be installed above the panels to prevent vertical displacement under such upward force.

913.3 Unusable space: In an assembly required to have a 1-hour fireresistance rating, the ceiling membrane of a tested assembly is not required to be installed over unusable space, or the flooring is not required to be installed where unusable space occurs above.

913.4 Openings in fireresistance rated floors: The required fireresistance rating of floor or floor/ceiling assemblies shall be maintained where a penetration is made for electrical, mechanical, plumbing and communication conduits, pipes and systems.

SECTION 914.0 ROOF CONSTRUCTION

914.1 General: Roofs shall be constructed of materials or assemblies of materials designed to afford the fireresistance rating required by Table 401 as herein modified.

914.2 Stadiums: The roof construction, including beams, trusses, framing, arches and roof decks, enclosing stadiums of Type 1 or Type 2 construction shall be of noncombustible materials without a specified fireresistance rating or of Type 4 construction.

914.3 Roofs 20 feet or higher: Where every part of the structural framework of roofs in buildings of Type 1 or Type 2 construction is 20 feet (6096 mm) or more above the floor immediately below, omission of all fire protection of the structural members is permitted, including the protection of trusses, roof framing and decking.

914.4 Roof slabs, arches and decking: Where the omission of fire protection from roof trusses, roof framing and decking is permitted, roofs in buildings of Type 1 and Type 2 construction shall be constructed of noncombustible materials without a specified fireresistance rating, or of Type 4 construction in buildings not over five stories or 65 feet (19812 mm) in height.

914.5 Firestopping: Firestopping of ceiling and attic spaces shall be provided as required by Section 921.0.

SECTION 915.0 VERTICAL SHAFTS

915.1 General: The provisions of this section shall apply to all vertical shaft enclosures, except as provided for stairway enclosures in Sections 816.9 and 910.0, refuse chutes in Section 2506.0, and elevator and dumbwaiter hoistways in Section 2608.0.

915.2 Open shaft enclosures: The enclosing walls of shafts that are open to the outer air at the top shall be constructed of materials specified in Article 21 for exterior walls of buildings and structures of the required fireresistance rating specified in Table 401.

915.3 Covered shaft enclosures: The enclosing walls of interior covered shafts shall be constructed of approved materials with the fireresistance rating specified in Table 401. The tops of covered shafts shall comply with Section 915.5.

Exceptions

1. Shafts in buildings of Use Group R-3 and serving a single dwelling unit are not required to be enclosed.
2. The minimum required fireresistance rating for shaft enclosures connecting three floor levels or less shall be 1 hour.

915.4 Duct and pipe shafts: In all buildings other than buildings of Use Group R-3, vertical pipes arranged in groups of two or more which penetrate two or more floors and occupy an area of more than 1 square foot (0.093 m²), and vertical ducts which penetrate two or more floors, shall be enclosed by construction having the fireresistance rating specified in Table 401. All combustible pipes and ducts connecting two or more stories shall be enclosed as indicated herein.

Exceptions

1. In all buildings of Use Group R-2, vertical noncombustible ducts shall not be required to have a 1-hour enclosure provided:
   a. the cross-sectional area does not exceed 35 square inches (0.022 m²);
   b. the duct does not penetrate more than three floors;
   c. the duct serves no more than one dwelling unit and shall not join other ducts except above the top level for the purpose of utilizing a single roof penetration; and
   d. these ducts are restricted for use as a bathroom or kitchen exhaust, combustion air supply and relief, and flues for gas equipment.

2. Combustible pipe shall be permitted where approved by Article 28 of this code. Noncombustible fittings shall be required where branch lines enter into or exit from rated walls, with no requirement for 1-hour enclosure.

915.4.1 Shaft alternative: Where a shaft is required by Section 915.4, a shaft shall not be required where a pipe penetration protection system tested according to ASTM E814 listed in Appendix A is provided and has an F rating and T rating of 1 hour but not less than the required fireresistance rating of the assembly being penetrated. The test shall be conducted with a minimum positive pressure differential of 0.03 inches of water column (7.5 P).

915.5 Top enclosure: A shaft that does not extend to the underside of the roof deck of the building shall be enclosed with top construction of the same strength and fireresistance rating as the floors of the building or structure in which it occurs, but not less than that of the fireresistance rating of the shaft enclosure.

915.6 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 rating as the lowest floor through which it passes, but not with a fireresistance rating less than that of the shaft enclosure.

915.7 Shaft openings: Openings other than those necessary for the purpose of the shaftway shall not be constructed in shaft enclosures. All openings shall be protected with approved fire doors, fire windows or fire dampers complying with the provisions of Sections 907.0, 916.0, 917.0, and 918.0.

915.7.1 Shaft wall penetrations: Noncombustible pipe, tube and conduit penetrating a shaft wall shall have approved firestopping installed around the penetrating pipe, tube and conduit. Such firestopping shall be capable of maintaining the integrity of the shaft wall when subjected to the test temperatures prescribed in ASTM E119 listed in Appendix A for the duration of time equal to the rating of the assembly to be penetrated and then subjected to the hose stream test as prescribed in ASTM E119 listed in Appendix A. Each penetration of a shaft wall by a combustible pipe, tube or conduit shall be protected by a through-penetration firestop system that has been tested according to ASTM E814 listed in Appendix A or a system that has been tested according to ASTM E119 listed in Appendix A. The through-penetration firestop system tested according to ASTM E814 shall have an F rating and T rating not less than the required fireresistance rating of the shaft wall penetrated. The system tested according to ASTM E119 shall have a fireresistance rating not less than the required fireresistance rating of the shaft wall penetrated. The ASTM E814 test shall be conducted with a minimum positive pressure differential of 0.03 inches of water column (7.5 P).

SECTION 916.0 FIRE DOOR ASSEMBLIES

916.1 Fire door assemblies: Approved fire door assemblies as defined in this code shall be constructed of any material or an assembly of component

materials which meets the test requirements of ASTM E152 listed in Appendix A and the fireresistance rating herein required in Table 916, unless otherwise specifically provided for in this code.

Table 916
FIRE DOOR FIRERESISTANCE RATINGS

Location	Fireresistance rating in hours
Exit access corridor enclosures of 1-hour construction	1/3[a]
Fire walls and fire separation walls of 3 or more hour construction	3
Fire walls, fire separation walls and exit enclosures of 1½ or 2-hour construction	1½
Shaft and exit enclosures of 1-hour construction	1
Shaft enclosures and elevator hoistways of 2-hour construction	1½
Other fire separation walls of 1-hour construction	¾

Note a. For testing requirements, see Section 916.1.1.

916.1.1 Twenty-minute doors: One-third hour (20-minute) fire doors shall be tested in accordance with ASTM E152 listed in Appendix A without the hose stream test.

916.2 Labeled protective assemblies: All fire door assemblies shall be labeled by an approved agency. Labeled protective assemblies meeting the requirements of this section or UL 10A, 14B and 14C for tin-clad fire door assemblies, and NFiPA 80 listed in Appendix A, shall be approved for use as provided for in this code.

916.2.1 Labeling requirements: Fire doors shall have a label or other identification showing the name of the manufacturer, the fireresistance rating and, where required for stairway fire doors by Section 816.6.3, the maximum transmitted temperature end point. Such label shall be approved and shall be permanently affixed. The label shall be applied at the factory where fabrication and assembly are done. Inspection shall be made by an approved agency.

916.2.2 Oversize doors: Approval of doors which cannot be labeled because of size shall be based on a certificate of inspection furnished by an approved testing agency for such oversize doors. The certificate shall state that the door conforms to the requirements of design, materials and construction, but has not been subjected to the fire test.

916.3 Multiple doors in fire walls: Two doors, each with a fireresistance rating of 1½ hours, installed on opposite sides of the same opening in a fire wall, shall be deemed equivalent in fireresistance rating to one 3-hour fire door.

916.4 Glass panels: Wired glass panels shall be permitted in fire doors within the limitations of Section 919.0 and as herein specifically prescribed.

916.5 Closing devices: Except as otherwise provided for openings in fire walls and fire separation walls, all fire doors shall be self-closing and shall be closed during occupancy of the building or part thereof. The use of rate-of-rise heat-actuated devices, fusible links, or smoke detection devices on doors that

are normally required to be open for ventilation or other specified purposes shall be permitted when the safety of the occupants is not endangered thereby.

916.5.1 Smoke-actuated closing devices: Where fire doors open onto an exit access, exit or horizontal exit and are not self-closing, door closers shall be smoke-actuated.

916.5.2 Closing time: Doors which are automatic-closing by smoke detection or by rate-of-rise detection, or self-closing, shall not have a delay in closing or reclosing of more than 10 seconds.

SECTION 917.0 FIRE WINDOWS AND SHUTTERS

917.1 Fireresistance rating: Approved assemblies of fire windows and fire shutters shall meet the test requirements of ASTM E163 listed in Appendix A. Fire windows shall be in the fixed closed position or be automatic-closing.

917.1.1 Exception: Steel window frame assemblies of ⅛-inch (3 mm) minimum solid section or of not less than nominal 0.048 inch thick formed sheet steel members fabricated by pressing, mitering, riveting, interlocking or welding and having provision for glazing with ¼-inch wired glass as required in Section 919.0 when securely installed in the building construction and glazed with ¼-inch labeled wired glass, shall be deemed to meet the requirements for a ¾-hour fire window assembly.

917.2 Window mullions: All metal mullions which exceed a nominal height of 12 feet shall be protected with materials to afford the same fireresistance rating as required for the wall construction in which the protective is located.

917.3 Swinging fire shutters: When fire shutters of the swinging type are used in exterior openings, not less than one row in every three vertical rows shall be arranged to be readily opened from the outside, and shall be identified by distinguishing marks or letters not less than 6 inches (152 mm) high.

917.4 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.

SECTION 918.0 FIRE DAMPERS

918.1 Approval: Fire dampers shall comply with UL 555 listed in Appendix A and shall bear the label of an approved agency. Fire dampers shall be installed in accordance with the manufacturer's installation instructions. Fire dampers shall be capable of maintaining the integrity of the required fireresistance rating.

918.2 Where required: Fire dampers shall be provided at locations where air distribution systems penetrate assemblies required to have a fireresistance rating.

Exceptions: Fire dampers are not required:

1. Where proper fire tests have shown that fire dampers are not necessary to maintain the integrity of the fireresistance rated assembly.

2. Where an exhaust duct penetrates a fireresistance rated shaft wall and the subduct extends not less than 22 inches (559 mm) vertically upward.
3. At penetrations of tenant separation and corridor walls in buildings equipped throughout with an approved automatic fire suppression system.
4. Where the ducts are constructed of steel and are part of an engineered smoke removal system.
5. At penetrations of corridor walls when the ducts are constructed of steel and do not have openings which communicate the corridor with adjacent spaces or rooms.
6. At penetrations of a roof assembly when ducts are open to the atmosphere.
7. In hazardous exhaust systems as defined in the mechanical code listed in Appendix A.
8. Where ceiling dampers are installed in accordance with Section 913.1.

918.3 Accessibility: Fire dampers shall be accessible.

SECTION 919.0 WIRED GLASS

919.1 Maximum size: One-quarter inch wired glass, which has been labeled for use in approved labeled opening protectives, shall conform to the size limitations set forth in Table 919.

Table 919
LIMITING SIZE OF WIRED GLASS PANELS

Rating, opening	Max. area sq. in.	Max. height inches	Max. width inches
3-hour	0	0	0
1½-hour doors in exterior walls	0	0	0
1-and 1½-hour	100	33	10
¾-hour	1,296	54	54
Fire windows	1,296	54	54

Note a. 1 inch = 25.4 mm; 1 square inch = 0.0006452 m^2.

919.1.1 Fire walls: Wired glass in fire doors located in fire walls shall be prohibited except that where serving as a horizontal exit, a self-closing swinging door shall be permitted to have a vision panel of not more than 100 square inches (0.065 m^2) without a dimension exceeding 10 inches (254 mm).

919.1.2 Fire separation walls: Wired glass vision panels shall not be used in fire doors of 1½-hour fireresistance rating intended for use in fire separation walls, unless the glass panels are not more than 100 square inches (0.065 m^2) in area.

919.2 Exit and elevator protectives: Unless specifically required by Article 6 to be solid in such locations where unusually hazardous conditions prevail, approved wired glass vision panels used in fire doors in elevator and stairway shaft enclosures shall be so located as to furnish clear vision of the passageway

or approach to the elevator or stairway and shall not exceed the size limitations specified in Table 919.

919.3 Fire separation walls: One-quarter inch wired glass panels shall not be used in fire separation walls used for subdividing purposes as set forth in Section 910.1 when the required fireresistance rating of the wall exceeds 1 hour. The maximum size of such panels shall not exceed the limitations for a ¾-hour door.

SECTION 920.0 FIRERESISTIVE REQUIREMENTS FOR PLASTER

920.1 Thickness of plaster: The required thickness of fireresistance rated 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 1601.0 for interior plastering and Section 1602.0 for exterior plastering. The thickness in all cases shall be measured from the face of the lath when applied to gypsum lath or metal lath.

920.2 Plaster equivalents: For fireresistive purposes, ½ inch (13 mm) of unsanded gypsum plaster shall be deemed equivalent to ¾ inches (19 mm) of one-to-three sanded gypsum or 1 inch (25 mm) portland cement sand plaster.

920.3 Noncombustible furring: In Types 1 and 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 protection more than 1 inch (25 mm) in thickness shall be reinforced with an additional layer of approved lath embedded at least ¾ inch (19 mm) from the outer surface and fixed securely in place.

920.5 Plaster alternates for concrete: In reinforced concrete construction, gypsum or portland cement plaster is permitted to be substituted for ½ inch (13 mm) of the required poured concrete protection, except that a minimum thickness of ⅜ inch (10 mm) of poured concrete shall be provided in all reinforced concrete floors and 1 inch (25 mm) in reinforced concrete columns in addition to the plaster finish. The concrete base shall be prepared in accordance with Section 1602.0.

SECTION 921.0 FIRESTOPPING AND DRAFTSTOPPING

921.1 General: To prevent the free passage of flame and products of combustion through concealed spaces or openings in the event of fire, provisions shall be made to provide effective firestops or draftstops as herein specified.

921.2 Firestopping materials: All firestopping shall consist of approved noncombustible materials securely fastened in place. Firestops of approved noncombustible materials or of materials of two thicknesses of 1-inch lumber with broken lap-joint, or one thickness of $^{23}/_{32}$-inch plywood with joints backed by $^{23}/_{32}$-inch plywood, or of 2-inch lumber installed with tight joints, shall be used in open spaces of wood framing.

921.3 Draftstopping materials: Draftstopping materials shall be not less than ½-inch gypsum board, ⅜-inch plywood or other approved materials adequately supported.

921.4 Integrity: The integrity of all firestopping and draftstopping shall be continuously maintained.

921.5 Required inspection: Firestopping and draftstopping shall not be concealed from view until inspected and approved.

921.6 Firestopping required: Firestopping shall be provided in the locations specified in Sections 921.6.1 through 921.6.7.

921.6.1 Concealed wall spaces: In concealed spaces of stud walls and partitions, including furred or studded-off spaces of masonry or concrete walls, at the ceiling and floor or roof levels.

921.6.2 Connections between horizontal and vertical spaces: At all interconnections between vertical and horizontal spaces such as occur at soffits over cabinets, drop ceilings, cove ceilings and similar locations.

921.6.3 Stairs: In concealed spaces between stair stringers at the top and bottom of the run.

921.6.4 Ceiling and floor openings: At openings around vents, pipes, ducts, chimneys and fireplaces at ceiling and floor levels, with noncombustible materials.

921.6.5 Architectural trim: In exterior cornices and other exterior architectural elements where permitted of combustible construction in Section 926.0, or when erected with combustible frames, at maximum intervals of 20 feet (6096 mm). If noncontinuous, they shall have closed ends, with at least 4 inches (102 mm) of separation between sections.

921.6.6 Combustible finish and trim: In the space behind combustible trim and finish where permitted under this code and all other hollow spaces where permitted in fireresistance rated construction at 10 foot (3048 mm) intervals; or the space shall be solidly filled with noncombustible materials.

921.6.7 Concealed sleeper spaces: In concealed spaces formed by floor sleepers in areas of not more than 100 square feet (9.30 m^2); or the space shall be solidly filled with noncombustible materials.

921.7 Draftstopping required: Draftstopping shall be provided in Types 3, 4 and 5 construction in the locations specified by Sections 921.7.1 and 921.7.2.

921.7.1 Floors: Where ceilings are suspended below solid wood joists or suspended or attached directly to the bottom of open web wood floor trusses, the space between the ceiling and the floor above shall be divided by providing draftstopping as specified in Sections 921.7.1.1 through 921.7.1.3.

921.7.1.1 Use Groups R-1 and R-2: In buildings of Use Groups R-1 and R-2, draftstopping shall be in line with the tenant separation walls when the walls do not extend to the floor sheathing above.

921.7.1.2 Use Group R-3: In buildings of Use Group R-3, the space shall be divided into approximately equal areas not greater than 500 square feet (46.5 m^2). The draftstopping shall be provided parallel to the main framing members.

921.7.1.3 Other use groups: In all other use groups, draftstopping shall be provided so that horizontal areas do not exceed 1,000 square feet (93 m^2).

Exception: Where the space above a ceiling is of combustible construction and the building is sprinklered above and below the ceiling, the draftstopping is not required.

921.7.2 Attics and concealed spaces: Attics and concealed roof spaces shall be provided with draftstopping as specified in Sections 921.7.2.1 and 921.7.2.2.

921.7.2.1 Use Group R: In buildings of Use Group R, in the attic, mansard, overhang or other concealed roof space, above and in line with the tenant separation walls which do not extend to the roof sheathing above.

Exceptions

1. Where corridor walls provide a tenant separation, draftstopping shall only be required above one of the corridor walls.
2. Where flat roofs with solid joist construction are used, draftstopping over tenant separation walls is not required.
3. Where the space above a ceiling is of combustible construction and the building is sprinklered above and below the ceiling, the draftstopping is not required.
4. Draftstopping is not required in detached one- and two-family dwellings.

921.7.2.2 Other use groups: In attics and concealed roof spaces, so that any horizontal area does not exceed 3,000 square feet (279 m^2).

Exceptions

1. Where flat roofs with solid joist construction are used, draftstopping over tenant separation walls is not required.
2. Where the space above a ceiling is of combustible construction and the building is sprinklered above and below the ceiling, the draftstopping is not required.

921.8 Ventilation: Ventilation of concealed roof spaces shall be maintained in accordance with Section 709.0.

921.9 Access to attics: A readily-accessible access opening not less than 22 inches by 30 inches (559 mm by 762 mm) shall be provided to any attic area having a clear height of over 30 inches (762 mm). When doors or other openings are provided in the draftstopping, they shall be self-closing and of approved materials specified in this section, and the construction shall be tightly fitted around all pipes, ducts or other assemblies piercing the draftstopping.

SECTION 922.0 INTERIOR FINISH AND TRIM

922.1 General: Interior finish and trim of buildings shall conform to the

requirements of this section. Interior finish shall include all wainscoting and paneling or other finish applied structurally or for acoustical treatment, insulation, decoration or similar purposes. The use of a surface finish of paper or of material of not greater fire hazard than paper shall not be prohibited provided such finish does not exceed 1/28 inch (1 mm) in thickness and is applied directly to a noncombustible base or substrate meeting the requirements of Section 903.5.2. Show windows in the first story of buildings are permitted to be of wood or unprotected metal framing.

922.2 Exposed construction: These requirements shall not be considered as requiring the installation of interior finish, but where construction or fire protection materials are exposed in rooms or spaces used for the occupancies specified in Section 922.5, the hazard from rate of flame spread of such exposed materials shall be not greater than that of the interior finish permitted for such occupancy or use. Exposed portions of structural members complying with the requirements for Type 4 construction in Sections 405.0 and 1702.0 shall not be subject to interior finish regulations.

922.3 Smoke or gases: Interior finish materials shall not be permitted that have a smoke developed rating greater than 450 when tested in accordance with ASTM E84 listed in Appendix A. When restrictions are not otherwise established in this code, interior finish is not controlled, except that pyroxylin or similar finishes shall not be applied which, as dry films, produce excessive smoke or toxic fumes when exposed to fire.

922.4 Materials: Materials shall only be used for interior finish and trim as specifically provided in this code for the occupancy or use of the space in which it is installed. Use of any material for floor finish, interior finish, and trim in a building of Type 1 or 2 construction within the scope permitted in this section or Section 924.0 shall not declassify the building with respect to its type of construction.

922.4.1 Foam plastics: Foam plastics shall not be used as interior trim or finish except in compliance with this section and Section 2002.0.

922.5 Interior finish: Interior finish of walls and ceilings shall have a flame spread rating not greater than that designated by the class prescribed for the various use groups listed in Table 922.5, when tested in accordance with the requirements of Section 904.2.

922.5.1 Basements: In buildings or structures other than Use Group R-3, Class I or II interior finish shall be used in all basements or other underground spaces from which there is not direct exit to the outside of the building, if subject to occupancy for any purpose other than storage or service facilities.

922.5.2 Maximum flame spread: Interior finish materials with flame spread classifications greater than 200 shall not be used in any room or space subject to human occupancy, except to such extent as specifically approved on the basis of a finding that such use does not significantly increase the life hazard.

922.5.3 Flame spread classifications: The classifications of interior finishes

referred to herein correspond to flame spread ratings determined by ASTM E84 listed in Appendix A as follows: Class I flame spread, 0 - 25; Class II flame spread, 26 - 75; Class III flame spread, 76 - 200.

Table 922.5
INTERIOR FINISH REQUIREMENTS[g]

Use groups	Required vertical exits and passageways[c]	Corridors providing exit access	Rooms or enclosed spaces[a]
A-1 Assembly, theaters	I	I[e]	II[b]
A-2 Assembly, night clubs	I	I[e]	II[b]
A-3 Assembly halls, terminals, restaurants	I	I[e]	II[b]
A-4 Assembly, churches	I	II	III
B Business	I	II	III
E Educational	I	II	III
F Factory and industrial	I	II	III[f]
H High hazard	I	II	III
I-1 Institutional, residential care	I	II	III
I-2 Institutional, incapacitated	I[h]	I[h]	I[h]
I-3 Institutional, restrained	I	I	III
M Mercantile walls, ceilings	I	II	III
	I	II	II[d]
R-1 Residential, hotels	I	II	III
R-2 Residential, multi-family dwellings	I	II	III
R-3 Residential, 1- and 2-family dwellings	III	III	III
S-1 Storage, moderate hazard	II	II	III
S-2 Storage, low hazard	II	II	III

Note a. For requirements applicable to rooms and enclosed spaces, see Section 922.5.4.
Note b. Class III interior finish materials are permitted in places of assembly with a capacity of 300 persons or less.
Note c. Class III interior finish materials are permitted for wainscoting or paneling for not more than 1,000 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 firestopped as required by Section 923.0.
Note d. Class III interior finish materials are permitted in mercantile occupancies of 3,000 square feet or less gross area used for sales purposes on the street floor only (balcony permitted).
Note e. Lobby areas shall be not less than Class II.
Note f. Where building height is over two stories, Class II shall be required.
Note g. For the classifications of interior finishes referred to herein, see Section 922.5.3. For interior finish requirements for exposed insulation, see Section 928.2.
Note h. Walls and ceilings shall be a minimum of Class II materials in individual rooms of not over four persons capacity. Where a complete approved automatic fire suppression system is provided, the minimum requirement for interior finish shall be Class II.
Note i. 1 square foot = 0.093 m^2.

922.5.4 Rooms and enclosed spaces: Requirements for rooms or enclosed spaces are based upon spaces enclosed in partitions of the building or structure, and where fireresistance rating 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 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 use group classification of the building or structure. Where an approved automatic fire suppression system is provided, interior finish of Class II or III materials is permitted to be used in place of Class I or II materials respectively, where required in Table 922.5.

922.6 Interior trim: Baseboards, chairrails, mouldings, trim around openings and other interior trim, not in excess of 10 percent of the aggregate wall and ceiling areas of any room or space, shall be of Class I, II or III materials, except that trim around fire windows and fire doors shall comply with the requirements of Sections 916.0 and 917.0.

922.7 Interior floor finish: Finished floors or floor covering materials of a traditional type, such as wood, vinyl, linoleum, terrazzo and other resilient floor covering materials are exempt from the requirements of this section. Floor coverings judged by the code official to represent an unusual hazard shall meet the classification prescribed for the various use groups listed in Table 922.7 when tested in accordance with the requirements of Section 904.3.

Table 922.7
INTERIOR FLOOR FINISH REQUIREMENTS[c]

Use groups		Required vertical exits and passageways	Corridors providing exit access	Rooms or enclosed spaces[a]
A-1	Assembly, theaters	II	II	DOC FF-1[b]
A-2	Assembly, night clubs	II	II	DOC FF-1[b]
A-3	Assembly halls, terminals restaurants	II	II	DOC FF-1[b]
A-4	Assembly, churches	II	II	DOC FF-1[b]
B	Business	II	II	DOC FF-1[b]
E	Educational	II	II	DOC FF-1[b]
F	Factory and Industrial	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1[b]
H	High hazard	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1[b]
I-1	Institutional, residential care	II	II	DOC FF-1[b]
I-2	Institutional, incapacitated	I	I	DOC FF-1[b]
I-3	Institutional, restrained	II	II	DOC FF-1[b]
M	Mercantile	II	II	DOC FF-1[b]
R-1	Residential, hotels	II	II	DOC FF-1[b]
R-2	Residential, multi-family dwellings	II	II	DOC FF-1[b]
R-3	Residential, 1- and 2-family dwellings	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1[b]
S-1	Storage, moderate hazard	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1[b]
S-2	Storage, low hazard	DOC FF-1[b]	DOC FF-1[b]	DOC FF-1[b]

Note a. For requirements for rooms and enclosed spaces, see Section 922.7.3
Note b. For requirements for use of other than carpet materials, see Section 922.7.4.
Note c. For classifications of floor finishes required herein, see Section 922.7.5.

922.7.1 Suppression system exception: Where an approved automatic fire suppression system is provided, Class II materials are permitted in any area

where Class I materials are required and materials complying with the DOC FF-1 "pill test" listed in Appendix A are permitted in any area where Class II materials are required.

922.7.2 Test report: All carpet required by this section to meet critical radiant flux limits in accordance with Section 904.3 shall be tested by an approved agency. A copy of the test report identifying and representing the style to be installed shall be provided to the code official upon request. The test report shall identify the carpet by manufacturer (or supplier) and style name, and shall be representative of the current construction of the carpet.

The carpet shall be identified as to manufacturer (or supplier) and style by a hang tag or other suitable method, which shall indicate the classification of the material based upon the limits specified in Section 904.3.

922.7.3 Rooms and enclosed spaces: Requirements for rooms or enclosed spaces are based upon the spaces being enclosed with partitions extending from the floor to the ceiling. Where partitions do not satisfy this criteria, the room or space is considered part of the corridor.

922.7.4 Other materials: All carpet manufactured for sale in the United States is required by Federal regulations to pass the DOC FF-1 "pill test" (16 CFR, Part 1630) listed in Appendix A. If a material other than carpet is used, the material shall be shown to be at least as resistant to flame propagation as a material which passes DOC FF-1 (minimum critical radiant flux of 0.04 Watts/cm^2).

922.7.5 Classifications: The classifications in Table 922.7 correspond to that determined by ASTM E648 listed in Appendix A as follows: Class I, 0.45 Watts/cm^2; Class II, 0.22 Watts/cm^2.

SECTION 923.0 APPLICATION OF INTERIOR FINISH

923.1 Attachment: Where interior finish is regulated by the requirements of this code, interior finish materials shall be applied or otherwise fastened in such a manner that they will not readily become detached when subjected to room temperatures of 200 degrees F. (93 degrees C.) or less for 30 minutes, or otherwise become loose through changes in the setting medium from the effects of time or conditions of occupancy.

923.2 Application to structural elements: Interior finish materials applied to walls, ceilings or structural elements of a building or structure which are required to be fireresistance rated 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 10 feet (3048 mm) in any dimension (see Section 921.6.6).

923.3 Furred construction: Where walls, ceilings or other structural elements are required to be fireresistance rated or to be constructed of noncombustible component materials and interior finish is set out or dropped dis-

tances greater than 1¾ inches (44 mm) from the surface of such elements, only material of which both faces qualify as Class I shall be used.

Exceptions

1. Class II finish materials shall be permitted when protected on both sides by an approved automatic fire suppression system.
2. Class II or III materials shall be permitted when attached to a noncombustible backing complying with Section 923.6 or to furring strips applied directly to such backing as provided in Section 923.2.

923.4 Type 4 construction: Interior finish materials shall be applied directly to the wood members and decking of Type 4 construction, or to furring strips applied to such members or wood decking as provided in Section 923.2.

923.5 Class II and III materials: Interior finish materials, other than Class I materials, which are less than ¼ inch in thickness shall be applied directly against a noncombustible backing or a backing complying with the requirements of Section 903.5.2 unless the tests under which such material has been classified were made with the materials suspended from the noncombustible backing.

923.6 Backing material: 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 shall be of fire-retardant treated wood or any materials meeting the requirements of this code for noncombustible classification of material under Section 903.4.1. When the 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 923.2, or shall be suspended from the structural members at any distance provided concealed spaces created thereby shall be firestopped in accordance with Section 921.0.

SECTION 924.0 COMBUSTIBLE MATERIALS PERMITTED IN FLOORS OF TYPES 1 AND 2 CONSTRUCTION

924.1 General: Except as provided in Section 816.0 for stairs and Section 615.0, the use of combustible materials in or on floors of buildings of Types 1 and 2 construction shall be as herein specified.

924.2 Sleepers, bucks, and grounds: Floor sleepers, bucks, nailing blocks and grounds shall not be constructed of combustible materials, unless the space between the fireresistance rated floor construction and the flooring is either solidly filled with noncombustible materials or firestopped in accordance with Section 921.6.7, and provided such open spaces shall not extend under or through permanent partitions or walls.

924.3 Flooring: Wood finish flooring is permitted to be attached directly to the embedded or firestopped wood sleepers, and shall be permitted when cemented directly to the top surface of approved fireresistance rated construction or directly to a wood subfloor attached to sleepers as provided in Section

924.2. Combustible insulating boards not more than ½ inch thick and covered with approved finished flooring are permitted for sound deadening or heat insulating when attached directly to a noncombustible floor assembly or to wood subflooring attached to sleepers as provided in Section 924.2.

SECTION 925.0 DECORATIVE MATERIAL RESTRICTIONS

925.1 General: In buildings of Use Groups A, E, I-2, I-3 and R-1, all curtains, draperies, hangings and other decorative materials suspended from walls or ceilings shall be noncombustible or maintained flameresistant meeting the requirements of Section 904.0 as herein specified.

925.2 Noncombustible: The permissible amount of noncombustible decorative hangings shall not be limited.

925.3 Flameresistant: The permissible amount of flameresistant decorative hangings shall not exceed 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 or structures of other than Type 5 construction, buildings of Use Group R-3 and private garages and similar accessory buildings shall be constructed of noncombustible materials.

926.2 Architectural trim: Architectural trim shall be constructed and installed in accordance with Sections 926.2.1 through 926.2.3.

926.2.1 Construction requirements: All architectural trim, such as cornices, veneers and other exterior architectural elements, which exceeds 40 feet (12192 mm) in height above grade shall be constructed of approved noncombustible materials and shall be secured to the wall with metal or other approved noncombustible brackets. Combustible architectural trim, other than fire-retardant treated wood complying with Section 903.5 for exterior use, shall not exceed 10 percent of an exterior wall surface area where the fire separation distance is 5 feet (1524 mm) or less.

926.2.2 Location: Where combustible architectural trim is located along the top of exterior walls, it shall be completely backed up by the exterior wall and shall not extend over or above the top of exterior walls.

926.2.3 Firestopping: Continuous exterior architectural trim constructed of combustible materials shall be firestopped as required in Section 921.0.

926.3 Combustible half-timbering: In buildings of Types 3 and 4 construction that do not exceed three stories or 40 feet (12192 mm) in height above grade, exterior half-timbering and similar architectural decorations are permitted to be constructed of wood or other equivalent combustible materials, provided such trim is backed up solidly with approved noncombustible materials.

926.4 Balconies and similar appendages: All balconies, porches, decks and supplemental exterior stairs attached to or supported by buildings of Types I

and 2 construction shall be constructed of noncombustible materials. Such appendages attached to or supported by buildings of Types 3, 4 and 5 construction shall be of either noncombustible or combustible construction. Such appendages of combustible construction, other than fire-retardant treated wood, shall afford the fireresistance rating required by Table 401 for floor construction or shall be of Type 4 construction as described in Section 405.0 and the aggregate length shall not exceed 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 of other than Type 5 construction shall be of noncombustible construction, framed with brackets of steel, concrete or other approved noncombustible materials.

SECTION 927.0 ROOF STRUCTURES

927.1 General: All construction, other than aerial supports, clothes dryers and similar structures less than 12 feet (3658 mm) high, water tanks and cooling towers as hereinafter provided and flag poles erected above the roof of any part of any building or structure more than 40 feet (12192 mm) in height shall be constructed of noncombustible materials.

927.2 Scuttles: Trap doors and scuttles as required by Section 817.0 shall be not less than 2 feet by 3 feet (610 mm by 914 mm) in size. In Types 1 and 2 construction, trap doors and scuttles shall be of approved noncombustible materials.

927.3 Penthouses: Penthouses shall be considered a part of the next lower story, and the enclosure shall conform to the requirements for exterior walls of the building type as regulated by Table 401 and Article 21 except as modified herein.

927.3.1 Recessed walls: When the exterior wall of a penthouse is recessed 5 feet (1524 mm) or more from the exterior wall of the next lower story and the exterior wall of the next lower story is required to have a fireresistance rating of greater than 1½ hours, the penthouse exterior wall shall be constructed with a fireresistance rating of not less than 1½ hours, covered on the outside with noncombustible, weatherproof material and supported on protected steel or reinforced concrete construction.

927.3.2 Doors, frames, and sash: Doors, frames and window sash, except where otherwise specifically required to be fireresistance rated under this code, shall be constructed the same as other similar elements in the building or structure.

927.4 Other enclosed roof structures: Enclosed roof structures, other than penthouses as defined in Article 2, shall be considered a story of the building and shall conform to the requirements for the building type as regulated by Table 401 and Article 21.

927.5 Mansards and other sloping roofs: Mansards and other sloping roofs shall comply with Sections 927.5.1 and 927.5.2.

927.5.1 High slope roofs: Every mansard roof or other sloping roof having a pitch of more than 60 degrees (1.05 rad) to the horizontal hereafter erected on any building or structure of other than Type 5 construction more than three stories or 40 feet (12192 mm) in height shall be constructed of noncombustible materials with a fireresistance rating of not less than 1 hour. When the building is more than seven stories or 85 feet (25908 mm) in height, such roofs shall afford the same fireresistance rating required for the exterior walls of the building, but need not exceed 1½-hour fireresistance rating.

927.5.2 Low slope roofs: Where the pitch is 60 degrees (1.05 rad) or less to the horizontal, the mansard or other sloping roof located on any building shall be constructed of not less than the same materials as required for the roof of the building.

927.6 Dormers: The sides and roofs of dormers shall be of the same type of construction as the main roof, except that where a side of the dormer is a vertical extension of an exterior wall it shall be subject to the same fireresistance rating requirements as apply to the wall of the building. The roofs of dormers shall be protected with approved roof coverings complying with Section 2301.0. The sides of dormers shall be protected with approved roof coverings or with material permitted for covering the exterior walls of the building.

927.7 Water tanks: Water tanks shall be constructed and installed in accordance with Sections 927.7.1 through 927.7.5.

927.7.1 Supports: Water tanks having a capacity of more than 500 gallons (1.90 m^3) placed in or on a building shall be supported on masonry, reinforced concrete, steel or other approved noncombustible framing or on timber conforming to Type 4 construction; provided that, when such supports are located in the building above the lowest story, they shall be fireresistance rated as required for Type 1A construction.

927.7.2 Emergency discharge: A pipe or outlet shall be located in the bottom or in the side close to the bottom, or the tank shall be fitted with a quick-opening valve, to enable the contents to be discharged in an emergency to a suitable drain complying with the plumbing code listed in Appendix A.

927.7.3 Location: A tank shall not be located over or near a stairway or elevator shaft unless a solid roof or floor deck is constructed underneath the tank.

927.7.4 Tank cover: All roof tanks exposed to the weather shall have approved covers sloping towards the outer edges.

927.7.5 Hoop and strap protection: When metal hoops are used in the construction of wood tanks, they shall be protected with approved corrosion-resistive coatings or manufactured from approved corrosion-resistive alloys.

927.8 Cooling towers: Cooling towers erected on the roofs of buildings when the base of the tower is more than 55 feet (16764 mm) above grade shall be constructed of noncombustible materials or of fire-retardant treated wood

except that drip bars are not required to be of noncombustible material or of fire-retardant treated wood.

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 Table 401 and 501. When the height of such appurtenant structures exceeds 85 feet (25908 mm) above grade or when the area at any horizontal section of the tower, spire, dormer or cupola exceeds 200 square feet (18.6 m^2), or when it is used for any purpose other than as a belfry or architectural embellishment, the structure and its supports shall be of Type 1 or 2 construction, or of fire-retardant treated wood complying with Section 903.5. Radio and television towers and antennae shall be constructed to comply with Sections 623.0 and 624.0.

SECTION 928.0 THERMAL AND SOUND INSULATING MATERIALS

928.1 General: Insulating batts, blankets, fills or similar types of materials, other than fiberboard insulation, including vapor barriers and breather papers or other coverings, incorporated in construction elements shall be installed as required by this section. Fiber board insulation shall be installed as required by Section 1709.0.

928.2 Exposed installations: Such materials, when exposed as installed in rooms or spaces, including attics and crawl spaces of buildings of any type construction, shall have a flame spread rating of 25 or less and a smoke developed rating of 450 or less when tested in accordance with ASTM E84 listed in Appendix A. Plenum installations shall comply with the requirements of Section 929.0 and the mechanical code listed in Appendix A.

928.3 Concealed installations: Insulating materials, when concealed as installed in buildings of any type construction, shall have a flame spread rating of 75 or less and a smoke developed rating of 450 or less when tested in accordance with ASTM E84 listed in Appendix A.

928.3.1 Facings: Where such materials are installed in concealed spaces such as wall, floor or ceiling cavities, attics or crawl spaces in buildings of Types 3, 4 and 5 construction, the flame spread and smoke developed rating limitations do not apply to facings, provided that the facing is installed behind and in substantial contact with the unexposed surface of the ceiling, floor or wall finish.

928.4 Cellulosic insulation: Cellulosic insulation shall meet the requirements of CPSC Standard 16 CFR, Parts 1209 and 1404, listed in Appendix A.

SECTION 929.0 PLENUMS

929.1 General: Supply and return air plenums shall be limited to uninhabited crawl spaces, areas above a ceiling or below the floor, or attic spaces. Plenums shall be limited to one fire area. Fuel-fired equipment shall not be installed within a plenum. Plenums shall be classified as noncombustible plenums

(929.2), as combustible plenums (929.3) or as stud and joist space plenums (929.4).

929.2 Noncombustible plenums: Plenums shall be constructed with noncombustible material. Combustible material shall not be exposed within a plenum except as permitted in Sections 929.2.1 through 929.2.5.

929.2.1 Pipe: Pipe shall be noncombustible and, where insulated, the insulation shall have a flame spread of 25 or less and smoke developed rating of 50 or less when tested in accordance with ASTM E84 listed in Appendix A.

929.2.2 Ceiling and thermal material: Thermal and acoustical materials shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84 listed in Appendix A.

929.2.3 Ducts: Rigid or flexible ducts and connectors shall conform to the mechanical code listed in Appendix A.

929.2.4 Duct coverings: Duct coverings, linings, tape and connectors shall conform to the mechanical code listed in Appendix A.

929.2.5 Wire: Wire shall be low voltage or power-limited wire or cable. Wire shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15 and a flame spread of not greater than 5.0 feet when tested in accordance with UL 910 listed in Appendix A and shall bear the label of an approved agency.

929.3 Combustible plenums: In Types 3, 4 and 5 construction, the plenum shall be constructed with approved material. Combustible material, pipe or wire exposed within the plenum shall be permitted.

929.3.1 Size: Combustible plenums shall be draftstopped every 3,000 square feet in area.

> **Exception:** Plenums shall be limited to one fire area without draftstopping in buildings equipped throughout with an approved automatic fire suppression system.

929.4 Stud and joist spaces: The space between studs or joists shall not be used as a plenum for supply air. The space between studs or joists used as a plenum for return air shall not be part of a required fireresistance rated assembly. Air shall be removed from one floor level only. All connections shall be firestopped and draftstopped.

SECTION 930.0 SMOKE AND HEAT VENTS

930.1 General: Where exit access travel distance is increased in accordance with Section 807.5.1, smoke and heat vents shall be constructed and installed in accordance with this section.

930.2 Vent size and spacing: The vent area and the spacing of the vents shall comply with Table 930.

930.2.1 Releasing devices: Smoke and heat vents shall open automatically by

activation of a heat-responsive device rated at 100 degrees F. (38 degrees C.) to 220 degrees F. (104 degees C.) above ambient. The releasing mechanism shall be capable of operation such that the vent shall fully open when the vent is exposed to a time-temperature gradient that reaches an air temperature of 500 degrees F. (260 degrees C.) within 5 minutes. Vents shall be capable of being opened by an approved manual operation.

930.3 Curtain boards construction: Curtain boards shall be provided to subdivide a vented building. Curtain boards shall be constructed of material that will resist the passage of smoke and is consistent with the building type of construction. Curtain board location and depth shall comply with Table 930. The bottom of the curtain board shall be level.

Table 930
SMOKE AND HEAT
VENT SIZE AND SPACING[b]

Use Group	Hazard classification[a]	Vent height above the floor (H)	Minimum curtain board depth from vent bottom	Maximum area formed by curtain boards	Vent area to floor area ratio	Maximum spacing of vent centers	Maximum distance from wall of curtain boards	Maximum distance between curtain boards
F	—	—	0.2 × H but ≥ 4 ft.	50,000 sq. ft.	1:100	120 ft.	60 ft.	8 × H but ≤ 250 ft.
S	I thru IV	20 ft. or less	6 ft.	10,000 sq. ft.	1:100	100 ft.	60 ft.	8 × H
S	I thru IV	Over 20 ft. to 40 ft.	6 ft.	8,000 sq. ft.	1:75	100 ft.	55 ft.	8 × H but ≤ 250 ft.
S	I thru IV	20 ft. or less	4 ft.	3,000 sq. ft.	1:75	100 ft.	55 ft.	8 × H
S	I thru IV	Over 20 ft. to 40 ft.	4 ft.	3,000 sq. ft.	1:50	100 ft.	50 ft.	8 × H but ≤ 250 ft.
S	V	20 ft. or less	6 ft.	6,000 sq. ft.	1:50	100 ft.	50 ft.	8 × H
S	V	Over 20 ft. to 30 ft.	6 ft.	6,000 sq. ft.	1:40	90 ft.	45 ft.	8 × H
S	V	30 ft. or more	4 ft.	2,000 sq. ft.	1:30	75 ft.	40 ft.	8 × H but ≤ 100 ft.

Note a. See NFiPA 231C listed in Appendix A for classification of Contents Class I through IV. Class V commodities are products which present special fire hazards beyond those of Class I, II, III or IV, such as aerosols, foamed plastic, PVC, PU, PS and asphalt paper.
Note b. 1 foot = 304.8 mm; 1 square foot = 0.093 m^2.

ARTICLE 10

FIRE PROTECTION SYSTEMS

SECTION 1000.0 GENERAL

1000.1 Scope: The provisions of this article shall specify where fire protection systems are required in all buildings or structures or portions thereof.

1000.2 Installation requirements: The installation methods, repair, operation and maintenance of fire protection systems shall be in accordance with this code and the fire prevention code listed in Appendix A.

1000.3 Maintenance: The owner, tenant or lessee of every building or structure shall be responsible for the care and maintenance of all fire protection systems, including equipment and devices, to insure the safety and welfare of the occupants. Fire protection systems shall not be disconnected or otherwise rendered unserviceable without first notifying the fire department. When installations of required fire protection systems are interrupted for repairs or other necessary reasons, the owner, tenant or lessee shall immediately advise the fire department and shall diligently prosecute the restoration of the protection.

1000.4 Threads: All threads provided for fire department connections to sprinkler systems, standpipe systems, yard hydrants or any other fire hose connections shall be uniform to those used by the local fire department.

1000.5 Signs: Where fire suppression control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering for such sign shall be of a conspicuous color and shall be at least 4 inches (102 mm) in height, and shall read *Sprinkler Control Valves* or *Standpipe Control Valves* or indicate other types of systems (see Sections 1012.4.1 and 1014.8 for additional signs).

1000.6 Tests: Where required by this article and the standards referenced herein, all flow test connections and points of fluid discharge shall be reasonably accessible and acceptable to the administrative authority.

SECTION 1001.0 PLANS AND SPECIFICATIONS

1001.1 Required: Plans shall be submitted to indicate conformance with this code and shall be reviewed by the department prior to issuance of the permit.

Note: Since the fire department is responsible for inspection for the proper maintenance of fire protection systems in buildings, the administrative authority shall cooperate with the fire department in the discharging of responsiblity to enforce this article.

1001.2 Plans: The plans and specifications submitted to the department shall contain sufficient detail to evaluate the hazard and the effectiveness of the system. The details on the hazards shall include materials involved, the location and arrangement, and the exposure to the hazard.

1001.3 Calculations: The details on the fire protection system shall include the design considerations, calculations and other information as required by this code.

SECTION 1002.0 FIRE SUPPRESSION SYSTEMS

1002.1 Where required: Fire suppression systems shall be installed and maintained in full operating condition, as specified in this code, in the locations indicated in Sections 1002.2 through 1002.21.

Exception: Buildings of Use Group R-3.

1002.2 Use Group A-1: In all buildings or structures or portions thereof of Use Group A-1.

Exception: Auditoriums, foyers, lobbies, and toilet rooms.

1002.3 Use Group A-2: In all buildings or structures or portions thereof of Use Group A-2:

1. When more than 5,000 square feet (465 m^2) in area; or
2. When more than one story in height.

1002.4 Use Group A-3: In all buildings or structures or portions thereof of Use Group A-3 when more than 12,000 square feet (1116 m^2) in area.

1002.5 Stages and enclosed platforms: Stages under the roof and gridiron, in the tie and fly galleries, and in all places behind the proscenium wall of the stage; over and within enclosed platforms in excess of 500 square feet (46.5 m^2) in area; and in dressing rooms, lounges, workshops and storerooms accessory to such stages or enclosed platforms.

Exceptions

1. Stages or enclosed platforms open to the auditorium room on three or more sides.
2. Altars, pulpits or similar platforms and their accessory rooms.
3. Stage gridirons when sidewall sprinklers with 135 degrees F. (57 degrees C.) rated heads with heat-baffle plates are installed around the perimeter of the stage except for the proscenium opening at points not more than 30 inches (762 mm) below the gridiron nor more than 6 inches (152 mm) below the baffle plate.
4. Under stage or under enclosed platform areas less than 4 feet (1219 mm) in clear height used exclusively for chair or table storage and lined on the inside with materials approved for 1-hour fireresistance rated construction.

1002.6 Use Groups B, R-1 and R-2: In all buildings or structures of Use Groups B, R-1 and R-2 when more than 12 stories or 150 feet (45720 mm) in height.

Exception: In buildings of Use Group R, sprinklers are not required in bathrooms not greater than 55 square feet (5.12 m²) in area.

1002.7 Use Group H: In all buildings or structures or portions thereof of Use Group H.

1002.8 Use Group I: In all buildings or structures or portions thereof of Use Group I.

Exceptions

1. Use Group I-2 hospitals of Type 1 construction not over five stories and 75 feet (22860 mm), hospitals of Type 2A construction not over 3 stories and 45 feet (13716 mm), and hospitals of Type 2B construction not over one story in height.
2. Use Group I-2 nursing homes of Types 1, 2A or 2B construction, not over one story in height.
3. Use Group I-2 child care facilities not over one story in height which accommodate 100 children or less with each room having an exit directly to the outside.
4. Buildings of Use Group I-1 two stories or less in height and having an occupant load of less than 20.
5. Buildings of Use Group I-3 having an occupant load of less than six.

1002.9 Use Groups M, S-1 and F-1: In all buildings or structures or portions thereof of Use Groups M, S-1 and F-1:

1. When more than 12,000 square feet (1116 m²) in area; or
2. When more than 24,000 square feet (2232 m²) in total area on all floors; or
3. When more than three stories in height.

1002.10 Public garages (Group 1): In all Group 1 public garages:

1. When more than 10,000 square feet (930 m²) in area.
2. When more than 7,500 square feet (697.5 m²) in area and more than one story in height.
3. When more than 5,000 square feet (465 m²) in area and more than two stories in height.
4. When more than three stories in height.
5. When located in buildings where the upper stories are designed for other uses.
6. When located in any story that is more than 50 percent below grade.
7. In fuel dispensing areas.

1002.11 Public garages (Group 2): In all Group 2 public garages:

1. When more than 10,000 square feet (930 m²) in area and more than one story in height.
2. When more than two stories in height.
3. When located in buildings where the upper stories are designed for other uses.

Exception: Open parking structures or portions of buildings classified as open parking structures according to the definition in Section 607.1.

1002.12 Bus garages: In all bus garages:

1. When required by Section 1002.10.
2. When used as passenger terminals for four or more buses.
3. When used for storage or loading of four or more buses.

1002.13 Unlimited area buildings: In unlimited area buildings as required by Section 504.0.

Exception: Special industrial uses as indicated in Section 501.1.1.

1002.14 Storage and workshop areas: In all portions of Use Groups A, B, E, I, R-1 and R-2 occupied for storage, workshop or similar purposes and as provided in Sections 610.2 and 611.7 for Use Groups I-2 and I-3 respectively.

Exceptions

1. Individual storage or workshop area located entirely within unsprinklered dwelling units.
2. Storage and workshop rooms less than 24 square feet (2.23 m^2) in area.

1002.15 Windowless story: In every story or basement of all buildings where there is not provided at least 20 square feet (1.86 m^2) of opening entirely above the adjoining ground level in each 50 lineal feet (15240 mm) or fraction thereof of exterior wall in the story or basement, on at least one side of the building. Openings shall have minimum dimensions of not less than 22 inches (559 mm). Such openings shall be accessible to the fire department from the exterior and shall be unobstructed to allow firefighting and rescue operations from the exterior.

When openings in a story are provided on only one side and the opposite wall of such story is more than 75 feet (22860 mm) from such openings, the story shall be provided with an approved automatic fire suppression system, or openings as specified above shall be provided on at least two sides of the exterior walls of the story. If any portion of a basement is located more than 75 feet (22860 mm) from openings required in this section, the basement shall be provided with an approved automatic fire suppression system.

1002.16 Painting rooms: In spray painting rooms or shops where painting, brushing, dipping or mixing is regularly conducted using flammable materials.

1002.17 Trash rooms and chutes: In rooms or areas used for incineration, trash and laundry collection or similar uses; and at alternate floor levels and at the top of all chutes used in conjunction with these rooms or areas.

1002.18 Furnace rooms: In furnace rooms, boiler rooms and rooms for similar uses and as provided in Sections 610.2 and 611.7 for Use Groups I-2 and I-3 respectively.

Exception: Such a room located entirely within and serving a single dwelling unit.

1002.19 Unenclosed vertical openings: In unenclosed vertical openings

between floors as required by Section 606.3.

1002.20 Kitchen exhaust systems: In commercial kitchen exhaust systems when such systems are required by the mechanical code listed in Appendix A.

1002.21 Hazardous exhaust systems: In duct systems exhausting hazardous material in accordance with the mechanical code listed in Appendix A.

1002.22 Alternative protection: In special use areas of buildings or structures, an automatic fire detection system shall be installed in lieu of a fire suppression system where such fire suppression system installation would be detrimental or dangerous to the specific use or occupancy, as approved by the code official and the fire prevention code official.

1002.22.1 Telephone central office equipment buildings: Within telephone central office equipment buildings, the automatic fire suppression system is not required in the following rooms or areas when such rooms or areas are protected with an approved automatic fire alarm system.

1. Generator and transformer rooms.
2. Communication equipment areas when such areas are separated from the remainder of the building by 1-hour fireresistance rated wall and 2-hour fireresistance rated floor/ceiling assemblies, and are used exclusively for such equipment.

SECTION 1003.0 SUPPRESSION SYSTEM SELECTION

1003.1 General: To guide the administrative authority with the selection of the proper type of fixed fire suppression system, the extinguishing agents for each type of hazard or fire are classified as follows.

Class A: Fires involving ordinary combustible materials (such as wood, cloth, paper, rubber and many plastics) requiring the heat-absorbing (cooling) effects of water, water solutions, or the coating effects of certain dry chemicals which retard combustion.

Class B: Fires involving flammable or combustible liquids, flammable gases, greases and similar materials where extinguishment is most readily secured by excluding air (oxygen), inhibiting the release of combustible vapors, or interrupting the combustion chain reaction.

Class C: Fires involving energized electrical equipment where safety to the operator requires the use of electrically nonconductive extinguishing agents.

> **Note:** Portable Class A or B extinguishers and hand-held solid stream nozzles are inappropriate for fighting electrical fires. However, fixed water spray systems are appropriate for fighting fires in energized electrical systems.

1003.2 Special hazards: In rooms or buildings containing combustibles such as aluminum powder, calcium carbide, calcium phosphide, metallic sodium and potassium, quick-lime, magnesium powder or sodium peroxide, which are incompatible with the use of water as an extinguishing agent, other extinguishing agents shall be used.

1003.3 Types: Where a fire suppression system is required in this code, Table 1003 provides the code official with information to assist in the determination of the type of suppression system suitable for the hazard involved, if not otherwise specified in this code.

Table 1003
GUIDE FOR SUPPRESSION SYSTEM SELECTION

Hazard	Water sprinklers or spray 1004.0 to 1006.0	Foam 1007.0	Carbon dioxide or halogenated 1008.0 to 1009.0	Dry chemical 1010.0	Wet chemical 1011.0
Class A fire potential	X	X	X	X	X
Class B fire potential	X	X	X	X	X
Class C fire potential	X		X		
SPECIAL FIRE HAZARD AREAS[a]					
Aircraft hangars	X	X	X	X	
Alcohol storage	X	X	X	X	
Ammunition loading	X				
Ammunition magazines	X				
Asphalt impregnating	X	X			
Battery rooms			X		
Carburetor overhaul shops	X	X	X	X	
Cleaning plant equipment	X	X	X	X	
Computer rooms	X		X		
Dowtherm	X				
Drying ovens	X		X	X	
Engine test cells	X	X	X		
Escalator, stair wells	X				
Explosives: manufacturing, storage	X				
Flammable liquids storage	X	X	X		
Flammable solids storage	X				
Fuel oil storage	X	X			
Hangar decks	X	X			
High piled storage in excess of 15 feet in height	X	X			
HPM use facility:					
Fabrication areas (Ordinary Hazard Group 3)	X				
Service passages (Ordinary Hazard Group 3)	X				
Separate inside HPM storage rooms without dispensing (Ordinary Hazard Group 3)	X				
Separate inside HPM storage rooms with dispensing (Extra Hazard Group 2)	X				
Egress corridors (Ordinary Hazard Group 3)	X				
Hydraulic oil, lubricating oil	X		X		

Table 1003 (cont'd.)
GUIDE FOR SUPPRESSION SYSTEM SELECTION

Hazard	Water sprinklers or spray 1004.0 to 1006.0	Foam 1007.0	Carbon dioxide or halogenated 1008.0 to 1009.0	Dry chemical 1010.0	Wet chemical 1011.0
Hydroturbine generators	X		X		
Jet engine test cells	X	X	X		
Library stacks	X		X		
Lignite storage and handling	X				
Liquefied petroleum gas storage	X				
Oil quenching bath	X	X	X	X	
Paints: manufacturing, storage	X	X	X	X	
Paint spray booths	X		X	X	
Petrochemical storage	X	X	X		
Petroleum testing laboratories	X	X	X		
Printing presses	X		X		
Rack and palletized storage in excess of 12 feet (3658 mm) in height	X	X			
Range hoods	X		X	X	X
Reactor and fractionating towers	X				
Record vaults			X		
Rubber mixing and heat treating	X				
Service stations (inside buildings)	X		X		
Shipboard storage	X		X		
Solvent cleaning tanks		X	X	X	
Solvent thinned coatings		X	X	X	
Switchgear rooms			X		
Transformers, circuit breakers (outdoors)	X				
Transformers, circuit breakers (indoors)	X		X		
Turbine lubricating oil	X	X	X	X	
Vegetable oil, solvent extraction	X	X			

Note a. Within buildings or areas, so classified, as to require a suppression system.

1003.4 Installation: Fixed fire suppression systems shall be of an approved type designed and installed in accordance with the requirements of this code.

1003.5 Tests: All tests required by this code and the standards listed in this code shall be conducted at the expense of the owner or the owner's representative.

SECTION 1004.0 WATER SPRINKLER SYSTEMS

1004.1 General: Water sprinkler extinguishing systems shall be of an

approved type and installed in accordance with the provisions of this code and NFiPA 13 listed in Appendix A.

1004.2 Occupancy sprinkler system: Within a building of mixed occupancies and where an occupancy is required by this code to be sprinklered with more than 20 sprinklers, the use group requiring sprinklers shall be separated from other uses by fire separation walls and floor/ceiling assemblies having a fireresistance rating corresponding to the highest fire grading prescribed in Table 902 for the separate uses and equipped throughout with a complete automatic sprinkler system.

1004.3 Design: The details of the system supplied with the plans and specifications shall include information and the calculations of the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used. The design of the sprinkler system for a HPM use facility shall be in accordance with NFiPA 13 listed in Appendix A, and not less than that required for the special fire hazard areas shown in Table 1003.

1004.4 Actuation: Water sprinkler extinguishing systems shall be automatically actuated unless otherwise specifically provided in this code.

1004.5 Sprinkler alarms: Approved audible or visual alarm devices shall be connected to every water sprinkler system. Such alarm devices shall be activated by water flow and shall be located in an approved location.

Exception: Alarms and alarm attachments shall not be required for limited area sprinkler systems (see Section 1005.5).

1004.5.1 Additional alarms: At least one additional audible or visual alarm device shall be installed within the building.

1004.6 Water control valve tags: Identification tags shall be provided in accordance with NFiPA 26 listed in Appendix A.

1004.7 Sprinkler riser: A sprinkler system riser which also serves as the wet standpipe riser in buildings required to have or having both systems shall conform to Section 1012.4.1.

1004.8 Tests: A completed system shall be tested hydrostatically for 2 hours without visible leakage at not less than 200 psi (1379 kPa) or at 50 psi (345 kPa) in excess of the maximum static pressure when the maximum static pressure is greater than 150 psi (1034 kPa).

SECTION 1005.0 LIMITED AREA SPRINKLER SYSTEMS

1005.1 General: A limited area sprinkler system shall be of an approved type and installed in accordance with the provisions of this section.

1005.2 Installation: Where the provisions of this code require a limited number of sprinklers, a limited area sprinkler system is permitted to be installed to comply with these requirements.

1005.3 Design: The details of the system supplied with the plans and specifications shall include information and the calculations of the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used.

1005.4 Actuation: A limited area sprinkler system shall be automatically actuated.

1005.5 Sprinkler alarms: Alarms and alarm attachments shall not be required.

1005.6 Standpipe connection: The water supply for the limited area sprinkler system shall be from the building standpipe system when the building is equipped with a standpipe system that is sized for 500 gallons per minute (0.032 m^3/s) minimum flow and has an automatic water supply (see Section 1012.4.1).

1005.6.1 Domestic supply: Where limited area sprinklers are supplied from the domestic water system, the domestic water system shall be designed to adequately support the design flow of the largest number of sprinklers in any one of the enclosed areas. When supplied by the domestic water system, the maximum number of sprinklers in any one enclosed room or area shall not exceed 20, and the sprinklers shall be capable of totally protecting the room or area.

1005.6.2 Fire department connections: A fire department connection is not required for limited area sprinkler systems supplied from the domestic water system.

1005.6.3 Cross connection: There shall not be a cross connection between the domestic water system and the standpipe system.

1005.6.4 Domestic connection: A check valve shall be provided at the point where the suppression system piping is connected to the domestic water piping to prevent contamination of the domestic water supply. Shutoff valves shall not be permitted in the suppression system piping. Water supply shall be controlled by the riser control valve to the domestic water piping.

1005.7 Use: Limited area sprinklers shall be used only in rooms or areas enclosed with construction assemblies as required by this code.

SECTION 1006.0 WATER-SPRAY FIXED SYSTEMS

1006.1 General: Water-spray extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 15 listed in Appendix A.

1006.2 Design: The details of the system supplied with the plans and specifications shall include information and the calculations of the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used.

1006.3 Actuation: Water-spray extinguishing systems shall be automatically actuated with supplementary manual tripping capability.

1006.4 Tests: All new system piping shall be hydrostatically tested in accordance with the provisions of NFiPA 15 listed in Appendix A.

SECTION 1007.0 FOAM EXTINGUISHING SYSTEMS

1007.1 General: Foam extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 11, 11A and 16 listed in Appendix A.

1007.2 Design: The details of the system supplied with the plans and specifications shall include complete computations showing pressure drop in all system piping, friction loss calculations of liquid lines and a detailed layout of the entire hazard area to be protected. Hydraulic characteristics of foam proportioners and foam makers as determined by tests shall be supplied by the manufacturer to the department (including the range of operating conditions required for the proposed installation) to permit determination of the adequacy of the hydraulics of the proposed protection.

1007.3 Actuation: A foam extinguishing system shall be automatically actuated with supplementary manual tripping capability.

1007.4 Tests: All piping, except that piping which handles expanded foam, shall be subjected to a 2-hour hydrostatic pressure test of 200 psi (1379 kPa) or 50 psi (345 kPa) in excess of the maximum pressure anticipated, whichever is greater, without leakage. The system shall be subjected to a flow test to insure that the hazard area is fully protected in conformance with the design specifications, and to determine the flow pressures, actual discharge capacity, foam quality, consumption rate of foam-producing materials, manpower requirements and other operating characteristics.

SECTION 1008.0 CARBON DIOXIDE EXTINGUISHING SYSTEMS

1008.1 General: Carbon dioxide extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 12 listed in Appendix A.

1008.2 Design: The details of the system supplied with the plans and specifications shall include information and calculations of the amount of carbon dioxide, the location and flow rate of each nozzle including equivalent orifice area and the location, size and the carbon dioxide storage facility. Information shall be submitted pertaining to the location and function of the detection devices, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

1008.3 Actuation: Carbon dioxide extinguishing systems shall be automatically actuated with supplementary manual tripping capability.

1008.4 Safety requirements: In any proposed use of a carbon dioxide system where there is a possiblity that persons will enter or be trapped in atmospheres made hazardous by a carbon dioxide discharge, warning signs, discharge alarms and breathing apparatus shall be provided to insure prompt evacuation of and to prevent entry into such atmospheres, and also to provide means for prompt rescue of any trapped personnel.

1008.5 Tests: A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labeling of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multi-cylinder high pressure systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis test shall be made. All tests are to be conducted as indicated in NFiPA 12 listed in Appendix A.

1008.6 Range hoods: In addition to the requirements of this section, Section 1002.20 and the mechanical code listed in Appendix A, range hood CO_2 systems shall bear the label of an approved agency. The system shall be installed in accordance with the manufacturer's installation instructions. *

SECTION 1009.0 HALOGENATED FIRE EXTINGUISHING SYSTEMS

1009.1 General: Halogenated fire extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 12A and 12B listed in Appendix A.

1009.2 Design: The details of the system supplied with the plans and specifications shall include information and calculations of the amount of extinguishing agent; container storage pressure; the location and flow rate of each nozzle including equivalent orifice area; the location, size and equivalent lengths of pipe, fittings and hose; and the location and size of the storage facility. Information shall be submitted pertaining to the location and function of the detection devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

1009.3 Actuation: Halogenated fire extinguishing systems shall be automatically actuated with supplementary manual tripping capability.

1009.4 Safety requirements: In any proposed use of a halogenated fire extingushing system where there is a possibility that persons will enter or be trapped in atmospheres made hazardous by a discharge, warning signs, discharge alarms and breathing apparatus shall be provided to insure prompt evacuation of and to prevent entry into such atmospheres, and also to provide means for prompt rescue of any trapped personnel.

1009.5 Tests: A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow

beyond the selector valve. The labeling of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multi-cylinder systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis shall be made. All tests are to be conducted as indicated in NFiPA 12A and 12B listed in Appendix A.

SECTION 1010.0 DRY CHEMICAL EXTINGUISHING SYSTEMS

1010.1 General: Dry chemical extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFiPA 17 listed in Appendix A.

1010.2 Design: The details of the system supplied with the plans and specifications shall include sufficient information and calculations of the amount of dry chemical; the size, length, and arrangement of connected piping, or piping and hose; description and location of nozzles so that the adequacy of the system can be determined. Information shall be submitted pertaining to the location and function of detection devices, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained.

1010.3 Actuation: Dry chemical extinguishing systems shall be automatically actuated with supplementary manual tripping capability.

1010.4 Safety requirements: Where there is a possibility that personnel will be exposed to a dry chemical discharge, warning signs, discharge alarms and breathing apparatus shall be provided to ensure prompt evacuation of such locations, and also to provide means for prompt rescue for any trapped personnel.

1010.5 Tests: A completed system shall be tested by a discharge of expellant gas through the piping and nozzles. Observations for gas leakage and for continuity of piping with free unobstructed flow shall be made. Observations shall be made of the flow of expellant gas through all nozzles. The labeling of devices with proper designations and instructions shall be checked. After testing, all piping and nozzles are to be blown clean, using compressed air or nitrogen and the system properly charged and placed in the normal "set" condition. All tests are to be conducted as indicated in NFiPA 17 listed in Appendix A.

1010.6 Range hoods: In addition to the requirements of this section, Section 1002.20 and the mechanical code listed in Appendix A, range hood dry chemical systems shall bear the label of an approved agency. The system shall be installed in accordance with the manufacturer's installation instructions. The dry chemical agent of the system shall be nontoxic.

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SECTION 1011.0 WET CHEMICAL RANGE HOOD EXTINGUISHING SYSTEMS

1011.1 General: Wet chemical extinguishing systems shall be installed in accordance with the provisions of this section, and the mechanical code and NFiPA 17A listed in Appendix A. The system shall bear the label of an approved agency and be installed in accordance with the manufacturer's installation instructions. Wet chemical is defined as a solution of water and potassium-carbonate-based chemical, potassium-acetate-based chemical or a combination thereof which forms the extinguishing agent.

1011.2 Tests: A completed system shall be tested by a discharge of wet chemical in sufficient amounts to verify that the system is properly installed and functional. Tests shall include a check of the detection systems, alarms, and releasing devices, including manual stations, fuel and power shutoff devices and other associated equipment. All tests are to be conducted as indicated in NFiPA 17A listed in Appendix A.

SECTION 1012.0 STANDPIPE SYSTEMS

1012.1 General: Standpipe systems shall be an approved type and installed and maintained in accordance with the provisions of this code, the fire prevention code and NFiPA 14 listed in Appendix A.

1012.2 Where required: Standpipe systems shall be installed in the locations prescribed in Sections 1012.2.1 through 1012.2.11.

1012.2.1 Use Group A: In all buildings or structures or portions thereof of Use Group A when:

1. Two or more stories in height of Use Group A-1, A-2, or A-3, and having an occupant load of more than 300; or
2. Three or more stories in height regardless of the area per floor; or
3. Having an auditorium seating over 500. Standpipes shall be located 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.
4. Having a stage. Standpipe shall be locked on each side of the stage. Such standpipes shall be not less than 2½-inch diameter, equipped with 1½-inch hose and 3/8-inch nozzles.

1012.2.2. Use Group B: In all buildings or structures or portions thereof of Use Group B when:

1. Three or more stories in height, and more than 3,000 square feet (279m²) in area per floor; or
2. Four or more stories in height regardless of the area per floor.

1012.2.3 Use Group E: In all buildings or structures or portions thereof of Use Group E when three or more stories in height regardless of the area per floor or when having a stage or auditorium in accordance with Sections 1012.2.1(3) and 1012.2.1(4).

1012.2.4 Use Group F: In all buildings or structures or portions thereof of Use

Group F when:

1. Three or more stories in height, and more than 3,000 square feet (279 m^2) in area per floor; or
2. Four or more stories in height regardless of the area per floor.

1012.2.5 Use Group H: In all buildings or structures or portions thereof of Use Group H when:

1. Three or more stories in height, and more than 10,000 square feet (930 m^2) in area per floor; or
2. Four or more stories in height regardless of the area per floor.

1012.2.6 Use Group I: In all buildings or structures or portions thereof of Use Group I three or more stories in height regardless of the area per floor.

Exception: Use Group I-1 when three stories in height and less than 10,000 square feet (930 m^2) in area per floor.

1012.2.7 Use Group M: In all buildings or structures or portions thereof of Use Group M when:

1. Three stories or more in height, and more than 3,000 square feet (279 m^2) in area per floor; or
2. Four or more stories in height regardless of the area per floor; or
3. Classified as a covered mall building within the mall portions (see Section 601.10).

1012.2.8 Use Group R: In all buildings or structures or portions thereof of Use Group R when:

1. Three or more stories in height and of Use Group R-1 regardless of the area per floor; or
2. Three or more stories in height and more than 10,000 square feet (930 m^2) in area per floor; or
3. Four or more stories in height regardless of the area per floor.

1012.2.9 Use Group S: In all buildings or structures or portions thereof of Use Group S, other than public garages which shall conform to Section 1012.2.11, when:

1. Three or more stories in height, of Use Group S-1, and more than 3,000 square feet (279 m^2) in area per floor; or
2. Three or more stories in height, of Use Group S-2, and more than 10,000 square feet (930 m^2) in area per floor; or
3. Four or more stories in height of Use Groups S-1 or S-2 regardless of the area per floor.

Exception: For open parking structures, the required standpipe may be a dry standpipe system without making a connection to the permanent water supply.

1012.2.10 Use Group U: In all buildings or structures or portions thereof of Use Group U when:

1. Three or more stories in height and more than 10,000 square feet (930 m^2) in area per floor; or
2. Four or more stories in height regardless of the area per floor.

1012.2.11 Public garages: In all Group I and II public garages when:

1. More than 10,000 square feet (930 m^2) in area per floor; or
2. More than 7,500 square feet (698 m^2) in area per floor and more than one story in height; or
3. More than 5,000 square feet (465 m^2) in area per floor, and more than two stories in height; or
4. More than three stories in height; or
5. Located in buildings where the upper stories are designed for other uses; or
6. When located in any story that is more than 50 percent below grade.

Note: Open parking structures are not public garages (see Section 607.1).

1012.3 Standpipe system piping sizes: The riser piping, supply piping, and the water service piping shall be sized to maintain a residual pressure of at least 65 psi (448 kPa) at the topmost outlet of each riser while flowing the minimum quantities of water specified in Sections 1012.3.1 and 1012.3.2 of this code.

Exception: The 65 psi (448 kPa) residual pressure is not required to be maintained in buildings less than 75 feet (22860 mm) in height which are equipped throughout with an approved automatic fire suppression system.

1012.3.1 Riser sizing: The vertical water pipe(s) within a building to which fire hose outlets and valves are attached shall be sized for a minimum flow of 500 gpm (0.032 m^3/s).

Exceptions

1. Where only 1½-inch valves are required or are provided, the riser(s) shall be sized to provide a minimum flow of 100 gpm (0.0063 m^3/s). The minimum size shall be 2½ inches.
2. In buildings where limited area sprinkler systems are supplied water from a common standpipe riser, the riser shall be sized to satisfy total demand.
3. In buildings equipped throughout with an approved automatic fire suppression system where both the suppression system and standpipe fire hose outlets are supplied water from a common riser, the minimum riser diameter shall be adequate for the suppression system or the standpipe system, whichever is greater. The minimum riser diameter shall be not less than that based on hydraulic calculations.
4. In buildings which are not equipped throughout with an approved automatic fire suppression system wherein the minimum diameter of the common riser is based on hydraulic calculations, all risers shall have a minimum diameter as described in Table 1012.
5. In buildings of Use Groups B, R-1, R-2, and I equipped throughout with an approved automatic fire suppression system, each vertical standpipe riser shall be sized for a minimum flow of 250 gpm (0.016 m^3/s).
6. Standpipe systems in covered mall buildings as provided in Section 601.10.

Table 1012
BUILDING HEIGHT AND STANDPIPE RISER SIZE

Maximum building height[a]	Minimum riser size
4 stories or 50 feet	2½ inches
6 stories or 75 feet	4 inches
76 feet to 250 feet	6 inches
over 250 feet	8 inches

Note a. 1 foot = 304.8 mm.

1012.3.2 Supply pipe sizing: The supply piping, including the horizontal or common feeder lines within a building and the water service line outside of the building, shall be sized for a minimum flow of 500 gpm (0.032 m^3/s). When more than one standpipe riser is required or provided, all common supply piping shall be sized for a minimum flow of 500 gpm (0.032 m^3/s) for the first riser plus 250 gpm (0.016 m^3/s) for each additional riser, and the total need not exceed 2,500 gpm (0.16 m^3/s).

Exceptions

1. Where only 1½-inch valves are required or are provided, the supply piping shall be sized for a minimum flow of 100 gpm (0.0063 m^3/s) for each riser, and the total need not exceed 500 gpm (0.032 m^3/s). The minimum size shall be 2½ inches.
2. In buildings where limited area sprinkler systems are supplied water from a common standpipe riser, the supply piping shall be sized for a minimum flow of 500 gpm (0.032 m^3/s) plus the sprinkler demand for the first riser, plus 250 gpm (0.016 m^3/s) for each additional riser, and the total need not exceed 2,500 gpm (0.16 m^3/s).
3. In buildings of Use Groups B, I, R-1 and R-2 equipped throughout with an approved automatic fire suppression system, all common supply piping shall be sized for a minimum flow of 250 gpm (0.016 m^3/s) for the first riser plus 250 gpm (0.016 m^3/s) for each additional riser, and the total need not exceed 1,500 gpm (0.095 m^3/s).

1012.4 Number of risers: The number of standpipe risers shall be such that all parts of every floor area can be reached by a 30-foot (9144 mm) hose stream from a nozzle attached to not more than 100 feet (30480 mm) of hose connected to a riser outlet. In those buildings equipped with an interior smokeproof enclosure vestibule, at least one standpipe hose connection shall be located in the vestibule. In covered mall buildings, outlets shall be located in accordance with Section 601.10.

1012.4.1 Combination: Where a standpipe system riser also serves as the water sprinkler system riser in buildings required to have both systems or in buildings having both systems, control valves shall be installed where sprinklers are connected to the riser so that sprinklers are under the control of a separate floor control valve(s) to allow standpipes to remain operational while the sprinkler system is in a closed position. If control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering of such sign shall be of a conspicuous color and shall be at least 4

inches (102 mm) in height and shall read *Standpipe Control Valve* or indicate other types of systems.

1012.5 Outlets: Standpipe system outlets shall comply with the provisions of Sections 1012.5.1 through 1012.5.4.

1012.5.1 Hose connections: At each floor level, and not more than 5 feet (1524 mm) above the floor, there shall be connected to each standpipe a 2½-inch hose connection with valves and threads conforming to the local fire department standards. If deemed necessary by the local fire department, a 1½-inch hose connection shall be provided and equipped with not more than 100 feet (30480 mm) of 1½-inch approved lined fire hose with an approved variable fog nozzle and couplings and hung in an approved rack or cabinet. Hose provided for rack and cabinet use shall be of ozone-resistant material and designed to be folded in a pin rack unit.

> **Exception:** In buildings equipped throughout with an approved automatic fire suppression system, the 1½-inch hose connection, hose and cabinet are not required.

1012.5.2 Roof hydrants: Where standpipes are installed in buildings more than six stories or 75 feet (22860 mm) in height, at least one riser shall extend through the roof and terminate in a two-way, 2½-inch hose connection. The main control valve on a roof hydrant or manifolded hose connection shall be located in an area not subject to freezing, as close to the roof access as practical and plainly marked (see Section 1014.8).

1012.5.3 Pressure reducers: When the residual pressure at any standpipe fire hose outlet exceeds 100 psi (690 kPa), approved pressure reducing devices or discs shall be installed at the outlets to reduce the pressure to 100 psi (690 kPa) while the required quantity of water per minute is flowing. Any standpipe riser over 250 feet (76200 mm) in height shall be equipped with an approved pressure regulating device on each hose outlet, which controls discharge pressures under both flow (residual) and no-flow (static) conditions.

1012.5.4 Test gauges: An approved water pressure gauge shall be attached to the top of each standpipe riser for inspection and test purposes. Shutoff valves, with provisions for bleeding pressure from the gauge, shall be installed between the gauge and the top of the riser. Gauges shall be accessible and located in spaces not subject to freezing.

1012.6 Materials: All standpipes shall be constructed of approved materials. All pipe, fittings and valves shall be of extra heavy pattern when the normal working pressure will exceed 175 psi (1207 kPa).

1012.7 Tests: All standpipe systems shall be flow tested and hydrostatically tested in accordance with the fire prevention code listed in Appendix A.

SECTION 1013.0 STANDPIPES FOR BUILDINGS UNDER CONSTRUCTION OR DEMOLITION

1013.1 General: Standpipes required by this section are to be either temporary or permanent in nature, with or without a water supply, provided, however,

that such standpipes conform to the requirements of Section 1012.0 as to number of risers, capacity, outlets and materials.

1013.2 Where required: Temporary or permanent standpipes shall be installed, as the work of the building progresses, beginning at the 5th story or at 65 feet (19812 mm) in height.

1013.3 Height: The standpipe systems shall be carried up with each floor and shall be installed and ready for use as each floor progresses. Standpipes shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring.

1013.4 Outlets: Hose outlets shall be provided with caps and attachment chains. The 1½-inch hose and nozzle shall not be required during construction.

1013.5 Fire department connections: At the street level there shall be provided for each temporary or permanent standpipe installation one or more two-way fire department inlet connections. Fire department inlet connections shall be prominently marked and readily and easily accessible at all times (see Section 1014.8).

1013.6 Buildings under demolition: Where a building is being demolished and a standpipe is existing within such a building, such standpipe shall be maintained in an operable condition so as to be available for use by the fire department. Such standpipe shall be demolished with the building but shall not be more than one floor below the floor above being demolished.

SECTION 1014.0 FIRE DEPARTMENT CONNECTIONS
(See Section 1013.5 for temporary standpipes)

1014.1 Required: All water sprinkler and standpipe systems shall be provided with at least one two-way fire department connection. Each inlet of the fire department connection shall be at least 2½ inches in diameter. The pipe from the standpipe system and the pipe from the water sprinkler system to the fire department connection shall not be smaller than 4 inches. Single fire department connections shall not be installed unless approved by the department.

Exceptions

1. A fire department connection shall not be required for limited area sprinkler systems (see Section 1005.6.2).
2. On standpipe or sprinkler systems where the supply pipe to the system is less than 4 inches, the pipe from the system to the fire department connection shall not be smaller than 2½ inches.

1014.2 Connections: Fire department connections shall be arranged in such a manner that the use of any one water sprinkler connection will serve all the sprinklers, and the use of any one standpipe connection will serve all the standpipes within the building.

1014.3 Location: Fire department connections shall be located and be visible on a street front or in a location approved by the department. Such connections shall be located so that immediate access can be made by the fire

department. Obstructions such as fences, bushes, trees, walls or any other similar object, shall not be permitted for new or existing installations.

1014.4 Height: Fire department connections shall not be less than 18 inches (457 mm) and not more than 42 inches (1067 mm) in elevation, measured from the ground level to the center line of the inlets.

1014.5 Projection: Where the fire department connection would project beyond the property line or into the public way, a flush-type fire department connection shall be provided.

1014.6 Hose thread: Hose thread in the fire department connection shall be uniform with that used by the local fire department.

1014.7 Fittings: Fire department inlet connections shall be fitted with check valves, ball drip valves and plugs with chains or frangible caps.

1014.8 Signs: A metal sign with raised letters at least 1 inch (25 mm) in height shall be mounted on all fire department connections serving sprinklers or standpipes. Such signs shall read *Automatic Sprinklers* and/or *Standpipe*.

SECTION 1015.0 WATER SUPPLY AND OTHER EXTINGUISHING MEDIA

1015.1 Required: All fire suppression and standpipe systems shall be provided with at least one automatic supply of extinguishing material of adequate pressure, capacity and reliability to perform the function intended, except as provided in Section 1013.0.

1015.2 Combination sprinkler/standpipe water supply: Where both sprinklers and standpipes are installed and have a common fire water service as their combined source of supply, the water supply line shall be adequately sized to meet the flow and pressure demands of the water supplies for the sprinkler system or the standpipe system, whichever is greater.

1015.3 Combination sprinkler/domestic water supply: Where a sprinkler system is connected to the domestic water supply system, the supply system shall be of adequate pressure, capacity and size for the simultaneous operation of the water sprinkler system and domestic water needs. Taps for domestic water from water sprinkler systems are prohibited.

1015.4 Size: The extinguishing material supply for fire suppression systems shall be sized in an approved manner in accordance with this code.

1015.5 Standpipe water service: All standpipe systems shall be connected to a street water main. Water mains shall be adequately sized and have enough pressure and discharge capacity to supply the total water demand for the building. Taps into the main and water service lines from the main to the building shall be at least equal in size to the largest supply line inside the building. Common supply lines from the main, from which standpipes, domestic or sprinkler systems are supplied, shall be sized to satisfy total demand.

1015.6 Standpipe interconnection: The required water supply shall be con-

nected to the base of each standpipe riser. Where more than one standpipe riser is required, all risers shall be interconnected at their base with a common supply line and an approved indicating valve shall be installed at the base of each riser so as to permit individual risers to be taken out of service if damaged or broken without interrupting the water supply to other risers.

1015.7 Standpipes in unheated areas: Standpipes installed so that all or any portion of the system is installed through unheated areas subject to freezing shall be so arranged through the use of approved devices as to admit water to the system automatically by opening a hose valve or through the use of approved remote control devices located at each hose station.

SECTION 1016.0 YARD HYDRANTS

1016.1 Fire hydrants: Fire hydrants installed on private property as a part of a private fire protection system shall be located so as to meet the requirements of NFiPA 24. Yard hydrant installation shall be coordinated with the responsible fire officials who shall not make recommendations which exceed the requirements of NFiPA 24. Hydrants not addressed by NFiPA 24 shall conform to the standards of the administrative authority of the jurisdiction and the fire department. Hydrants shall not be installed on a water main less than 6 inches in diameter.

SECTION 1017.0 FIRE PROTECTIVE SIGNALING SYSTEMS

1017.1 Plans and specifications: Where a fire protective signaling system is required by this code, the plans and specifications shall show the location and number of all sending stations and signals with specifications of the type, construction and operation of the system. Installation of all equipment shall conform to the requirements of this code and NFiPA 72A listed in Appendix A.

1017.2 Approval: The fire protective signaling system shall be approved for the particular application and shall be used for the fire protective signaling purpose only. Alarm boxes shall be painted a distinctive red color.

1017.3 Where required: A fire protective signaling system shall be installed and maintained in full operating condition in the locations described in Sections 1017.3.1 through 1017.3.6.

1017.3.1 Use Groups A-4 and E: In all new and existing buildings of Use Groups A-4 and E.

Exception: Sanctuary and nave areas of churches and similar religious buildings.

1017.3.2 Use Group B: In all buildings of Use Group B when three or more stories in height.

Exception: Buildings equipped throughout with an approved automatic fire suppression system and less than seven stories in height.

1017.3.3 Use Group I: In all buildings of Use Group I.

1017.3.4 Use Group I-3: In all buildings of Use Group I-3. The manual pull boxes shall be permitted to be locked, provided that staff is present within the subject area when occupied.

1017.3.5 Use Group R-1: In all buildings of Use Group R-1.

1017.3.6 Use Group R-2: In all buildings of Use Group R-2 when four or more stories in height.

1017.4 Location: Manual pull stations shall be located in each story, including basements, not more than 5 feet (1524 mm) from each exit. In buildings of Use Group A, where a stage is provided, a manual pull station shall be located adjacent to the lighting control panel.

1017.4.1 Pull station height: The height of the manual pull station boxes shall be a minimum of 42 inches (1067 mm) and a maximum of 54 inches (1372 mm) measured vertically, from the floor level to the activating handle or lever of the pull station.

1017.5 Coding: Systems shall be either coded or noncoded. Coded stations shall be coded in conformance with NFiPA 72A listed in Appendix A.

1017.6 Power supply: The power for the fire protective signaling system shall be provided from an emergency electrical system conforming to Section 2706.0.

1017.7 Requirements: Fire protective signaling systems shall be of the closed circuit type and shall be electrically or mechanically supervised. In addition, such systems shall comply with Sections 1017.7.1 through 1017.7.4.

1017.7.1 Wiring: All wiring or mechanical tubing shall conform to the requirements of NFiPA 72A listed in Appendix A.

1017.7.2 Alarms: Audible alarms of the approved type shall be provided. The operation of any fire alarm device shall cause all audible or visual alarms to operate. Visual and audible alarms shall be provided in occupancies housing the hard of hearing. Alarm sounding devices shall be of approved type, shall provide a distinctive tone and shall not be used for any purpose other than that of a fire alarm. They shall be of such character and so located as to be seen or effectively heard above all other sounds, by all the occupants, in every occupied space within the building.

> **Exception:** Smoke detectors in buildings of Use Group I-3 shall be permitted to alarm at a constantly attended location and are not required to accomplish general alarm indication.

1017.7.3 Presignal system: Presignal systems shall not be installed unless approved by the code official and by the fire department. Where a presignal system is installed, 24-hour personnel supervision shall be provided at a location approved by the fire department, in order that the alarm signal can be actuated in the event of fire or other emergency.

1017.7.4 Zones: Each floor shall be zoned separately. If the floor area exceeds 20,000 square feet (1860 m^2), additional zoning shall be provided. The length

of any zone shall not exceed 300 feet (91440 mm) in any direction. Zoning indicator panels and controls shall be located as approved by the department. Annunciators shall lock in until the system is reset.

1017.8 Acceptance tests: Upon completion of the fire protective signaling system, the installation shall be subjected to a performance test to demonstrate its efficiency of operation. All connections and wiring, with signal devices disconnected, shall develop an insulation resistance of not less than 1 megohm.

SECTION 1018.0 AUTOMATIC FIRE DETECTION SYSTEMS

1018.1 Plans and specifications: Where an automatic fire detection system is required by this code, the plans and specifications 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 requirements of this code and NFiPA 72E listed in Appendix A. The system shall be installed in accordance with this section and shall be part of and subject to the requirements of a fire protective signaling system specified in Section 1017.0.

1018.2 Approval: The automatic fire detection system shall be approved for the particular application and shall only be used for detection and signaling in the event of fire. The automatic detecting devices shall be smoke detectors, except an approved alternative type of detector shall be installed in spaces such as boiler rooms where during normal operation products of combustion are present in sufficient quantity to cause alarm.

1018.3 Where required: An automatic fire detection system shall be installed and maintained in full operating condition in the locations described in Sections 1018.3.1 through 1018.3.5.

1018.3.1 Use Groups I-1 and I-2: In all buildings of Use Group I-1. Buildings of Use Group I-2 shall be equipped with a fire protective signaling system in accordance with this section and Section 610.6.

1018.3.2 Use Group I-3: Automatic smoke detectors shall be installed throughout all resident housing areas.

Exceptions

1. Smoke detectors shall not be required in sleeping rooms with four or less occupants in Use Condition II or III (see Section 307.4),
2. Smoke detectors shall not be required in sleeping rooms with four or less occupants in buildings protected throughout with an approved automatic fire suppression system.

1018.3.3 Use Group R-1: In all buildings of Use Group R-1.

Exception: Motel/hotel units that do not have interior corridors and which have direct access to the outside from the sleeping unit at grade level.

1018.3.4 Use Group B or R-2: In all buildings of Use Group B or R-2 when

such buildings have floors used for human occupancy located more than 75 feet (22860 mm) above the lowest level of fire department vehicle access.

Exception: In buildings of Use Group R-2, smoke detectors are not required within the individual dwelling units except as required by Section 1018.3.5.

1018.3.5 Sleeping areas and dwelling units: In addition to any automatic fire protective signaling system required by Sections 1018.3.1, 1018.3.3 and 1018.3.4, a minimum of one single-station smoke detector shall be installed in each guest room, suite or sleeping area in buildings of Use Groups R-1 and I-1 and in dwelling units in the immediate vicinity of the bedrooms in buildings of Use Group R-2 or R-3. When actuated, the detector shall provide an alarm suitable to warn the occupants within the individual unit. In buildings of Use Groups R-1 and R-2 which have basements an additional smoke detector shall be installed in the basement. In buildings of Use Group R-3, smoke detectors shall be required on every story of the dwelling unit including basements. In dwelling units with split levels, a smoke detector installed on the upper level shall suffice for the adjacent lower level provided the lower level is less than one full story below the upper level. If there is an intervening door between the adjacent levels, a smoke detector shall be installed on both levels. All detectors shall be installed in an approved location. Where more than one detector is required to be installed within an individual dwelling unit, the detectors shall be wired in such a manner that the actuation of one alarm will actuate all the alarms in the individual unit.

1018.4 Sprinklered buildings exception: Buildings or portions thereof equipped throughout with an approved automatic fire suppression system are not required to be equipped with an automatic fire detection system, but are required to be equipped with a manual fire protective signaling system conforming to Section 1017.0. This exception does not apply to buildings of Use Group I-2 or to single-station smoke detectors as required in Section 1018.3.5.

1018.5 Distances: Smoke detectors shall be installed not to exceed the lineal or square footage allowances specified, based on the test standards under which they were tested and approved.

1018.6 Zones: The automatic fire detection system shall be connected to the same zones as those required for the fire protective signaling system in Section 1017.0. Automatic detectors which have separate indication on the annunciator panel from the manual pull stations and the fire suppression systems shall have detection zones which match the pull station zones in size and arrangement.

SECTION 1019.0 SMOKE CONTROL SYSTEMS

1019.1 General: Smoke control systems required by this code shall conform to the provisions of this section.

1019.1.1 Acceptance: Before a certificate of occupancy is issued, the smoke control system shall be tested in an approved manner to show compliance with

the applicable requirements of this section.

1019.1.2 Standby power: All equipment required to provide smoke control shall be equipped with a standby source of power complying with Section 2707.0.

Exceptions

1. Mechanical air-handling equipment designed to accomplish smoke control in systems specified in Sections 1019.2 and 1019.3 when the building is equipped throughout with an approved automatic fire suppression system.
2. Smoke control systems specified in Section 1019.4.

1019.1.3 Inspections: All operating parts of the smoke control systems specified in Sections 1019.5 and 1019.6 (including dampers) shall be tested by the owner every three months and a log of the tests shall be kept for examination by the fire department. At six-month intervals, the system shall be inspected and operated in accordance with the fire prevention code listed in Appendix A.

1019.2 High-rise buildings: Where required by Section 602.7, natural or mechanical ventilation for the removal of products of combustion shall be provided in every story and shall consist of one of the methods described in Sections 1019.2.1 through 1019.2.3.

1019.2.1 Panels or windows: Panels or windows shall be provided in the exterior walls which can be opened remotely from an approved location other than the fire floor. Such venting facilities shall be provided at the rate of 20 square feet per 50 lineal feet (1.85 m^2 per 15240 mm) of exterior wall in each story and shall be distributed around the perimeter at not more than 50 foot (15240 mm) intervals. Such windows or panels and their controls shall be clearly identified.

Exception: Where an approved automatic fire suppression system is installed throughout, remotely operated openable panels and windows are not required when windows or panels manually openable from within the fire floor are installed or approved fixed tempered glass is used. Such windows shall be clearly identified and shall be of the size and spacing indicated above.

1019.2.2 Mechanical system: Where a complete and approved automatic fire suppression system is installed throughout, and the mechanical air handling equipment is designed to accomplish smoke removal, the return and exhaust air shall be moved directly to the outside without recirculation to other sections of the building under fire conditions. The air handling system shall provide a minimum of one exhaust air change each 10 minutes for the area involved.

1019.2.3 Other designs: Any other approved design which will adequately remove smoke from each compartment served in an unsprinklered building is permitted, provided the system is tested and approved by the code official before the building is certified for occupancy.

1019.3 Elevators: When equipped with a mechanical smoke control system that will restrict smoke and hot gases from entering the elevator shaft in the fire floor, hoistway venting specified in Section 2608.3 is not required. In high-rise buildings equipped with this system and equipped throughout with an approved automatic fire suppression system, the 1-hour fireresistance rated elevator lobbies specified in Section 602.8 are not required.

1019.4 Covered mall buildings: Where required by Section 601.11, the mall and adjacent tenant spaces shall be equipped with an approved smoke control system. Smoke control equipment serving the mall shall be sized to provide a minimum of six air changes per hour for malls having a volume of 600,000 cubic feet (16800 m^3) or less, and a minimum of four air changes per hour for malls having a volume of more than 600,000 cubic feet (16800 m^3). The volume shall be measured from the entrance to tenant spaces and to a height of 12 feet (3658 mm) above each pedestrian area. Exhaust inlets for the mall shall be located a minimum of 6 feet (1829 mm) above the walking surface. Necessary outside air to accomplish the required air changes per hour shall be provided.

1019.4.1 Activation: The exhaust system shall be activated by smoke detectors complying with NFiPA 72E listed in Appendix A, by operation of the sprinkler system, and manually. A smoke detector shall be installed in the return air portion of every heating and cooling system ahead of any fresh air intake. The activation system shall be installed in an approved manner.

1019.4.2 Operation: The approved automatic exhaust system shall be a separate system or shall be integrated with an approved air conditioning system. Where a separate system is provided, operation of the fire emergency ventilating system shall automatically shut down the air conditioning system or any other devices which interfere with the effective operation of the fire emergency ventilating system.

1019.4.2.1 Tenant space zones: When a fire occurs within a tenant space zone, that zone shall operate at 100 percent exhaust, and supply air to that zone shall be shut down. Adjoining tenant space zones shall go to normal operations and the mall system shall operate at 100 percent fresh air supply.

1019.4.2.2 Mall system: When a fire occurs within the mall, the mall system shall operate at 100 percent exhaust, and adjoining tenant spaces shall go to normal operation.

1019.5 Atriums: Where required by Section 606.2.1, a smoke control system shall be designed to control the migration of products of combustion in the atrium spaces. A mechanically operated air handling system shall be installed that will exhaust smoke either entering or developed within the atrium. Exhaust openings shall be located in the ceiling or in a smoke trap area immediately adjacent to the ceiling of the atrium. Supply openings sized to provide 50 percent of the exhaust volume shall be located at the lowest level of the atrium. For purposes of this section, the volume of the atrium shall include all spaces not separated from the atrium in accordance with Section 606.2.2.

1019.5.1 Supply air: Where the height of the atrium is 55 feet (16764 mm) or

less, supply air introduced by gravity is permitted provided smoke control is accomplished. When the height of the atrium is more than 55 feet (16764 mm), supply air shall be introduced mechanically from the floor of the atrium and be directed vertically toward the exhaust outlets. In atriums over six stories in height or having open floors above the second story, introduction of supplemental supply air at upper levels is permitted.

1019.5.2 Exhaust: The atrium smoke control system shall exhaust not less than the following quantities of air:

1. For atriums having a volume of not more than 600,000 cubic feet (16800 m^3), including the volume of any levels not physically separated from the atrium, not less than 40,000 cfm (18.88 m^3/s) nor less than six air changes per hour.
2. For atriums having a volume of more than 600,000 cubic feet (16800 m^3), including the volume of any levels not physically separated from the atrium, not less than four air changes per hour.

1019.5.3 Smoke detectors: Smoke detectors shall be installed at the perimeter and on the ceiling of the atrium and on the underside of each floor level that is open to the atrium space. Detectors shall be located in accordance with their listing.

1019.5.4 Smoke control activation: The smoke control system required for the atrium spaces shall be activated by the fire suppression system, by smoke detectors required by Section 1019.5.3, and by manual controls provided for fire department use. The system shall not be activated by a manual fire protective signaling system required by Section 1017.0. Manual controls shall be located in the central control station or other location approved by the fire department. When the smoke control system is activated, other air handling systems which interfere with its function shall shut off automatically.

1019.5.5 Other approved methods: Any other approved design which will achieve the same level of smoke control as described in this section is permitted in lieu of these requirements.

1019.6 Floor openings: The smoke control system required by Section 606.3.1 shall be an automatic exhaust system designed to prevent the passage of smoke to the story above in accordance with Sections 1019.6.1 through 1019.6.3, or any other approved system of smoke control which will accomplish the same purpose.

1019.6.1 Control: The system shall be a separate unit or shall be integrated with an approved air handling system and shall be thermostatically controlled to operate simultaneously with the detection of fire.

1019.6.2 Capacity: The system shall be of adequate capacity to create a controlled draft in the floor opening with sufficient velocity of flow over the entire area of the floor opening under normal conditions of window and door openings in the building.

1019.6.3 Operation: The system shall be so arranged as to automatically stop

the operation of the normal mechanical air handling and ventilating systems, and close the dampers of the return air duct connections, in the event of fire.

SECTION 1020.0 SUPERVISION

1020.1 Fire suppression systems: Fire suppression systems required for buildings of Use Groups A, E, I or R shall be supervised by methods 1, 2, 3 or 4 below. All other fire suppression systems shall be supervised by one of the following methods.

1. Approved central station system in accordance with NFiPA 71 listed in Appendix A.
2. Approved proprietary system in accordance with NFiPA 72D listed in Appendix A.
3. Approved remote station system of the jurisdiction in accordance with NFiPA 72C listed in Appendix A.
4. Approved local alarm service which will cause the sounding of an audible signal at a constantly attended location in accordance with NFiPA 72A listed in Appendix A.
5. Locking valves open.

Exceptions

1. Underground gate valves with roadway boxes.
2. Halogenated extinguishing systems.
3. Carbon dioxide extinguishing systems.
4. Dry chemical extinguishing systems.
5. Limited area sprinkler systems.

1020.2 Fire protection systems: All required fire protection systems, other than fire suppression systems, shall be connected to an approved central station system, proprietary system, or remote station system of the jurisdiction when approved by the fire department. Fire suppression systems shall conform to Section 1020.1.

Exceptions

1. Standpipe systems.
2. Fire alarm systems in buildings of Use Group R when less than five stories in height.
3. Single-station detectors required by Section 1018.3.5.
4. Smoke detectors in buildings of Use Group I-3.

SECTION 1021.0 FIRE EXTINGUISHERS

1021.1 Approval: Portable fire extinguishers shall bear the label of an approved agency and shall be installed in a location visible and accessible to the occupants.

1021.2 Where required: A portable fire extinguisher shall be installed in the following locations in accordance with NFiPA 10 listed in Appendix A.

1. In all buildings of Use Groups A-1, A-2, A-3, E, I-2, R-1 and H.
2. In all areas containing commercial kitchen exhaust hood systems.

3. In all areas where fuel is dispensed.
4. In all areas where a flammable or combustible liquid is used in the operation of spraying, coating or dipping.
5. In all buildings of Use Group I-3 at staff locations. Access to portable extinguishers shall be permitted to be locked.
6. On each completed floor of buildings under construction, other than buildings of Use Group R-3.

ARTICLE 11

STRUCTURAL LOADS

SECTION 1100.0 GENERAL

1100.1 Scope: The provisions of this article shall control the structural design of all buildings and structures or portions thereof hereafter erected.

1100.2 Certificate of compliance: The provisions of this article and Article 12 may be deemed to have been satisfied when certification of an architect or engineer registered in Kentucky to that effect is placed on drawings submitted to the building official.

SECTION 1101.0 PLANS AND SPECIFICATIONS

1101.1 General: Design plans drawn to appropriate scale shall show the size, section and relative locations of all structural members with floor levels, column centers and all offsets fully dimensioned. The design loads shall be clearly indicated for all parts of the building or structure.

SECTION 1102.0 DESIGN SAFE LOAD

1102.1 Safe support required: Buildings or other structures, and all parts thereof, shall be designed and constructed to support safely all loads, including dead loads, without exceeding the allowable stresses (or specified strengths when appropriate load factors are applied) for the materials of construction in the structural members and connections.

1102.2 Progressive collapse: Buildings and structural systems shall provide such structural integrity that the hazards associated with progressive collapse are reduced to a level consistent with good engineering practice. Structures shall be able to sustain local damage or failure with the structure as a whole remaining stable. Compliance with the applicable provisions of ANSI A58.1 listed in Appendix A shall be deemed to meet the requirements of this section.

1102.3 Load tests: The code official is authorized to require a load test, or certified reports of such tests, conducted in an approved manner by approved testing agencies, of any construction whenever there is reason to question its safety for the intended occupancy or use.

SECTION 1103.0 DESIGN LIVE LOAD

1103.1 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 not less than the minimum uniformly distributed unit loads required in Section 1106.0 for specific uses.

1103.2 Loads not specified: The code official shall approve the required live load for any use not specifically provided for in Table 1106.

SECTION 1104.0 DESIGN DEAD LOAD

1104.1 Weights of materials and construction: In estimating dead load for the purposes of structural design, the actual weights of materials and constructions shall be used, but not less than the unit dead loads prescribed in Appendix B and ANSI A58.1 listed in Appendix A. In the absence of definite information, any values assumed by the designers shall be subject to the approval of the code official.

1104.2 Weight of fixed service equipment: In estimating dead loads for purposes of design, the weight of fixed service equipment such as plumbing stacks and risers, electrical feeders, heating, ventilating, air conditioning and sprinkler systems shall be included.

1104.3 Partition load: In offices and other buildings, in which subdividing partitions are 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 20 pounds per square foot (psf) (97.64 kg/m^2) of floor area in addition to the specified uniformly distributed live load. Provision for partition weight shall be made whether or not partitions are shown on the plans, unless the specified live load exceeds 80 psf (390.56 kg/m^2).

SECTION 1105.0 EXISTING BUILDINGS

1105.1 General: In the reconstruction, repair, extension or alteration of existing buildings, the allowable working stresses used in design shall be as indicated in Sections 1105.2 through 1105.5.

1105.2 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.

1105.3 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.

1105.4 Existing live load: When an existing building heretofore approved is altered or repaired in accordance with Section 106.3, the minimum design loads and stresses for the structure shall be the loads and stresses applicable at the time of erection, provided the public safety is not endangered thereby.

1105.5 Posted live load: Any existing building heretofore approved, in which there is not a change in use to a new use group requiring greater floor loads, is permitted to 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 1106.0 UNIFORMLY DISTRIBUTED LIVE LOADS

1106.1 Uniform live load: The minimum uniformly distributed live load in pounds per square foot shall be as provided in Table 1106, and for all concentrated loads wherever they occur as provided in Section 1106.0. The live loads in Table 1106 are the minimum loads to be used for the occupancies listed. Where the buildings will be subjected to greater live loads, such loads shall be used for design.

1106.1.1 Trucks and buses: Minimum live loads for garages having trucks or buses shall be in accordance with lane loads of AASHTO HB-13 listed in Appendix A, but shall not be less than 50 psf.

1106.1.2 Residential attics: A live load shall be applied to joists or to bottom chords of trusses or trussed rafters only in those portions of attic space having a clear height of 42 inches (1067 mm) or more between joist and rafter in conventional rafter construction; and between bottom chord and any other member in trusses or trussed rafter construction. However, joists or the bottom chords of trusses or trussed rafters shall be designed to sustain the imposed dead load or 10 psf (49 kg/m^2), whichever is greater, uniformly distributed over the entire span.

A further ceiling dead load reduction to a minimum of 5 psf (24 kg/m^2) or the actual dead load, whichever is greater, applied to joists in conventional rafter construction or to the bottom chords of trusses or trussed rafters is permitted under either or both of the following conditions:

1. Where the clear height is not over 30 inches (762 mm) between joist and rafter in conventional construction and between the bottom chord and any other member for trusses or trussed rafter construction.
2. Where a clear height of greater than 30 inches (762 mm), as defined in item 1 directly above, does not exist for a horizontal distance of more than 12 inches (305 mm) along the member.

1106.2 Posting of live loads: In every building or other structure or part thereof of Use Groups B, F, M or S, the design loads shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building, or the owner's authorized agent, in a conspicuous place in each space to which they relate. Any plates lost, removed or defaced shall be replaced by the owner or the owner's agent.

Table 1106
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

Occupancy or use	Live load (psf)[a]
Apartments (see Residential)	
Armories and drill rooms	150
Assembly areas:	
Fixed seats	50
Movable seats	100

Table 1106 (cont'd.)
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

Occupancy or use	Live load (psf)[a]
Platforms (assembly)	100
Stage floors	150
Balcony (exterior)	100
One- and two-family dwellings only	60
Bowling alleys, poolrooms and billiard rooms	75
Cornices	60
Corridors, except as otherwise indicated	100
Dwellings (see Residential)	
Fire escapes	100
Single-family residential buildings only	40
Garages:	
Passenger cars	50
Trucks and buses — see Section 1106.1.1	50
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)	
Institutional-residential care (see Residential)	
Libraries:	
Reading rooms	60
Stack rooms	150
Manufacturing:	
Light	100
Heavy	150
Marquees	75
Office buildings:	
Offices	50
Lobbies	100
Corridors, above first floor	80
File and computer rooms require heavier loads based upon anticipated occupancy	
Penal institutions:	
Cell blocks	40
Residential:	
Attics — see Section 1106.1.2	20
Multi-family dwellings:	
Dwelling units	40
Public rooms	100
Corridors	80
One- and two-family dwellings	40
Sleeping rooms	30
Hotels:	
Guest rooms	40
Public rooms	100
Corridors serving public rooms	100
Corridors	80
Reviewing stands, grandstands and bleachers — see Section 1108.5	100

Table 1106 (cont'd.)
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

Occupancy or use	Live load (psf)[a]
Schools:	
Classrooms	40
Corridors	80
Sidewalks, vehicular driveways, subject to trucking	250
Skating rinks	100
Stairs and exits	100
Storage areas:	
Light	125
Heavy	250
Stores:	
Retail	75
Wholesale	100
Yards and terraces, pedestrians	100

Note a. 1 psf = 4.882 kg/m².

SECTION 1107.0 CONCENTRATED LOADS

1107.1 General: Floors of buildings in the locations specified in Table 1107 shall be designed to support the uniformly distributed live loads prescribed in Section 1106.0 or the following minimum concentrated loads in pounds, whichever produces the greater stresses. If the anticipated actual loads are higher, the actual loads shall be used. Unless otherwise specified, the indicated concentration shall be assumed to occupy an area of 2½ feet (762 mm) square and shall be so located as to produce the maximum stress conditions in the structural members.

1107.1.1 Garages: Minimum concentrated loads for garages or portions of buildings used for parking motor vehicles shall be:

1. For passenger cars accommodating not more than nine passengers, 2,000 pounds acting on an area of 20 square inches;
2. Mechanical parking structures without slab, passenger cars only, 1,500 pounds per wheel; and
3. For trucks or buses, on slabs, maximum axle load on an area of 20 square inches.

Table 1107
MINIMUM CONCENTRATED LOADS

Location	Pounds[a]
Elevator machine room grating (on area of 4 sq. in.)	300
Finish light floor plate construction (on area of 1 sq. in.)	200
Garages	See Section 1107.1.1
Greenhouse roof bars, purlins and rafters	100
Hospitals and ward rooms	1,000
Libraries	1,000
Manufacturing and storage buildings	2,000
Mercantile areas	2,000
Office	2,000
Schools	1,000
Scuttles, skylight ribs and accessible ceilings	200
Sidewalks or vehicular driveways subject to trucking	8,000
Stair treads (on area of 4 sq. in. at center of tread)	300

Note a. 1 pound = 4.448 N; 1 square inch = 645.16 square mm.

SECTION 1108.0 IMPACT LOADS

1108.1 General: The live loads specified in Section 1106.0 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.

1108.2 Elevators: All moving elevator loads shall be increased 100 percent for impact, and the structural supports shall be designed within the limits of deflection prescribed by ASME A17.1 listed in Appendix A.

1108.3 Machinery: For the purpose of design, the weight of machinery and moving loads shall be increased as follows to allow for impact:

Elevator machinery	100 percent
Light machinery, shaft- or motor-driven	20 percent
Reciprocating machinery or power-driven units	50 percent
Hangers for floors or balconies	33 percent

These percentages shall be increased when so recommended by the manufacturer.

1108.4 Craneways: The design loads and appropriate impact factors for the design of buildings with bridge, monorail, jib, and single-leg gantry cranes of service classification A through D shall be determined by the provisions of Section 6 of the MBMA *Low Rise Building Systems Manual* listed in Appendix A. For service classification E and F, design loads and appropriate impact factors shall be determined by the provisions of AISE 13 listed in Appendix A. Crane service classifications shall be determined in accordance with CMAA 70 listed in Appendix A.

1108.5 Assembly structures: Grandstands, stadiums and similar assembly structures shall be designed to resist the loads specified in Table 1106. Loads of 120 pounds per lineal foot (180 kg/m) on footboards and seatboards shall be used. Lateral sway bracing loads of 24 pounds per lineal foot (36 kg/m) parallel to and 10 pounds per lineal foot (15 kg/m) perpendicular to seats and footboards shall be used.

SECTION 1109.0 SPECIAL LOADS

1109.1 General: Provisions shall be made for all special loads herein prescribed and all other special loads to which the building or structure is subjected.

1109.2 Retaining walls: Retaining walls shall be designed to resist the lateral pressure of retained material. Walls retaining drained earth shall be designed for a minimum pressure equivalent to that exerted by fluid weighing not less than 30 pounds per cubic foot (21 kg/m^3) and having a depth equal to that of the retained earth. Any surcharge shall be in addition to the equivalent fluid pressure.

1109.3 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.

1109.4 Construction loads and erection stresses: Provision shall be made for temporary construction and wind loads which 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.

1109.5 Partial loading: The full intensity of the appropriately reduced live load applied only to a portion of the length of a structure or member shall be considered if it produces a more unfavorable effect than the same intensity applied over the full length of the structure or member.

1109.6 Interior finish: Finish materials used on interior walls and partitions shall have adequate strength to resist a horizontal load of not less than 5 psf (25 kg/m^2).

1109.7 Guardrails and handrails: All required guardrails and handrails shall be designed and constructed to the structural loading conditions set forth in Sections 1109.7.1 and 1109.7.2 without exceeding the allowable design working stress of the materials, anchorage and connecting devices utilized. The allowable working stresses shall be as defined by the appropriate design standard. Each load shall be applied so as to produce the maximum stress in each of the respective components.

1109.7.1 Handrail design and construction: Handrails shall be designed and constructed for a concentrated load of 200 pounds (91 kg) applied at any point and in any direction. Handrails located in other than dwelling units in buildings of Use Groups R-2 and R-3 shall also be designed and constructed for a uniform load of 50 pounds per foot (74 kg/m) applied in any direction. The concentrated and uniform loading conditions shall not be applied simultaneously.

1109.7.2 Guardrail system design and construction: Guardrails shall be designed and constructed for a concentrated load of 300 pounds (136 kg) applied at any point and in any direction along the top railing member. Guardrail systems located in other than dwelling units in buildings of Use Groups R-2 and R-3 shall also be designed and constructed for a uniform load of 100 pounds per foot (149 kg/m) applied in any direction at the required guardrail height. The concentrated and uniform loading conditions shall not be applied simultaneously.

The infill area of a guardrail system shall be designed and constructed for a horizontal concentrated load of 200 pounds (91 kg) applied on a 1-square-foot (.093 m^2) area at any point in the system, including intermediate rails or other elements serving this purpose.

SECTION 1110.0 ROOF LOADS

1110.1 General: The structural supports of roofs and marquees shall be designed to resist wind (Section 1112.0) and, where applicable, snow (Section 1111.0) and earthquake loads (Section 1113.0) in addition to the dead load of construction and the appropriate live loads as prescribed in this section, or in Table 1106.

1110.2 Minimum roof loads: Ordinary roofs, either flat, pitched, or curved, shall be designed for the live loads as specified in Table 1110 or the snow load, whichever is greater.

1110.3 Overhanging eaves: In other than buildings of Use Group R-3, and except where the overhang framing 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 60 psf (292.92 kg/m^2).

1110.4 Ponding: Roofs shall be designed for the maximum possible depth of water that would pond 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. In determining the maximum possible depth of water, all primary roof drainage means shall be assumed to be blocked.

1110.5 Special purpose roofs: When used for incidental promenade purposes, roofs shall be designed for a minimum live load of 60 psf (292.92 kg/m^2); and 100 psf (488.20 kg/m^2) when designed for roof gardens or assembly or educational uses.

1110.5.1 Landscaped roofs: Where roofs are to be landscaped, the uniform design live load in the landscaped area shall be 20 psf (97.64 kg/m^2). The weight of the landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil.

1110.5.2 Special purpose roofs: Roofs to be used for other special purposes shall be designed for appropriate loads, or as otherwise approved.

Table 1110
MINIMUM ROOF LIVE LOADS
IN POUND-FORCE PER SQUARE FOOT OF HORIZONTAL PROJECTION

Roof slope	Tributary loaded area in square feet[a] for any structural member		
	0 to 200	201 to 600	Over 600
Flat or rise less than 4 inches per foot (1:3) Arch or dome with rise less than 1/8 of span	20	16	12
Rise 4 inches per foot (1:3) to less than 12 inches per foot (1:1) Arch or dome with rise 1/8 of span or less than 3/8 of span	16	14	12
Rise 12 inches per foot (1:1) and greater Arch or dome with rise 3/8 of span or greater	12	12	12

Note a. 1 square foot = 0.093 m^2; 1 psf = 4.882 kg/m^2.

SECTION 1111.0 SNOW LOAD

1111.1 General: Design snow loads shall be determined in accordance with this section, but the design roof load shall not be less than that determined by Section 1110.0.

1111.2 Ground snow loads: Ground snow loads to be used in determining the design snow loads for roofs are given in Figures 1111.2a, 1111.2b and 1111.2c for the contiguous United States.

In some areas the amount of local variation in snow loads is so extreme as to preclude meaningful mapping. Such areas are not zoned in these figures but are shown in black.

In other areas, the snow load zones are meaningful, but the mapped values should not be used for certain geographic settings, such as high country, within these zones. Such areas are shaded in as a warning that the zoned value for those areas applies only to normal settings. Ground snow loads for shaded areas in high country and those areas shown in black shall be determined by the local jurisdiction requirements.

1111.3 Symbols and notation: The following symbols and notations apply to the provisions of this section.

a = roof slope expressed in degrees
C_e = exposure factor (see Table 1111.4a)
C_s = slope factor (see Section 1111.5)
D = density of snow, expressed in pounds per cubic foot (pcf) (see Section 1111.7.1)
h_b = height of balanced snow load on lower roof or deck, expressed in feet
h_d = maximum height of drift surcharge, expressed in feet
h_r = difference in height between the upper and lower roof or deck, expressed in feet
I = importance factor (see Table 1111.4b)
P_f = flat-roof snow load, expressed in pounds-force per square foot
P_g = ground snow load expressed in pounds-force per square foot (see Figures 1111.2a, 1111.2b or 1111.2c)
P_m = maximum intensity of the snow load at the height change, expressed in pounds-force per square foot
P_s = sloped-roof snow load, expressed in pounds-force per square foot
S = horizontal separation between adjacent structures, expressed in feet
W_b = horizontal dimension, in feet, of upper roof normal to the line of change in roof level, but not less than 50 feet (15240 mm)
W_d = width of snow drift, expressed in feet

1111.4 Flat-roof snow loads: The snow load on an unobstructed flat roof shall be calculated in pounds-force per square foot using the following formula:

$$P_f = C_e\, I\, P_g$$

where C_e is determined by Table 1111.4a and I is determined by Table 1111.4b.

Table 1111.4a
SNOW EXPOSURE FACTOR (C_e)

Roofs located in generally open terrain extending one-half mile or more from the structure	0.6
Structure located in densely forested or sheltered areas	0.9
All other structures	0.7

Table 1111.4b
IMPORTANCE FACTOR (I)

All buildings and structures not listed below	1.0
Buildings and structures where the primary occupancy is one in which more than 300 people congregate in one area	1.1
Buildings and structures designated as essential facilities, including but not limited to: 1. Hospital and other medical facilities having surgery or emergency treatment areas 2. Fire or rescue and police stations 3. Primary communication facilities and disaster operation centers 4. Power stations and other utilities required in an emergency 5. Structures having critical national defense capabilities	1.2
Buildings and structures that represent a low hazard to human life in the event of failure, such as agricultural buildings, certain temporary facilities, and minor storage facilities	0.8

1111.5 Sloped-roof snow loads: Snow loads acting on a sloping surface shall be considered to act on the horizontal projection of that surface. The sloped-roof snow load on roofs having a slope greater than 30 degrees (0.52 rad) shall be calculated using the following formula:

$$P_s = C_s P_f$$

where C_s is determined by the following formula:

$$C_s = 1 - \frac{(a - 30)}{40}$$

and a is the slope of the roof expressed in degrees.

1111.5.1 Roof slope factor for curved roofs: Portions of curved roofs having a slope exceeding 70 degrees (1.22 rad) shall be considered free from snow load. The point at which the slope exceeds 70 degrees (1.22 rad) shall be considered the "eave" for such roofs. For curved roofs, the slope factor shall be determined by basing the slope on the vertical angle from the "eave" to the crown.

1111.5.2 Roof slope factor for multiple roofs: For multiple folded-plate, sawtooth and barrel vault roofs with parallel ridge lines, the roof slope factor shall be considered to be equal to 1.0 (C_s = 1.0) regardless of the slope of the roof.

1111.6 Unbalanced snow loads: Winds from all directions shall be considered when determining unbalanced snow loads.

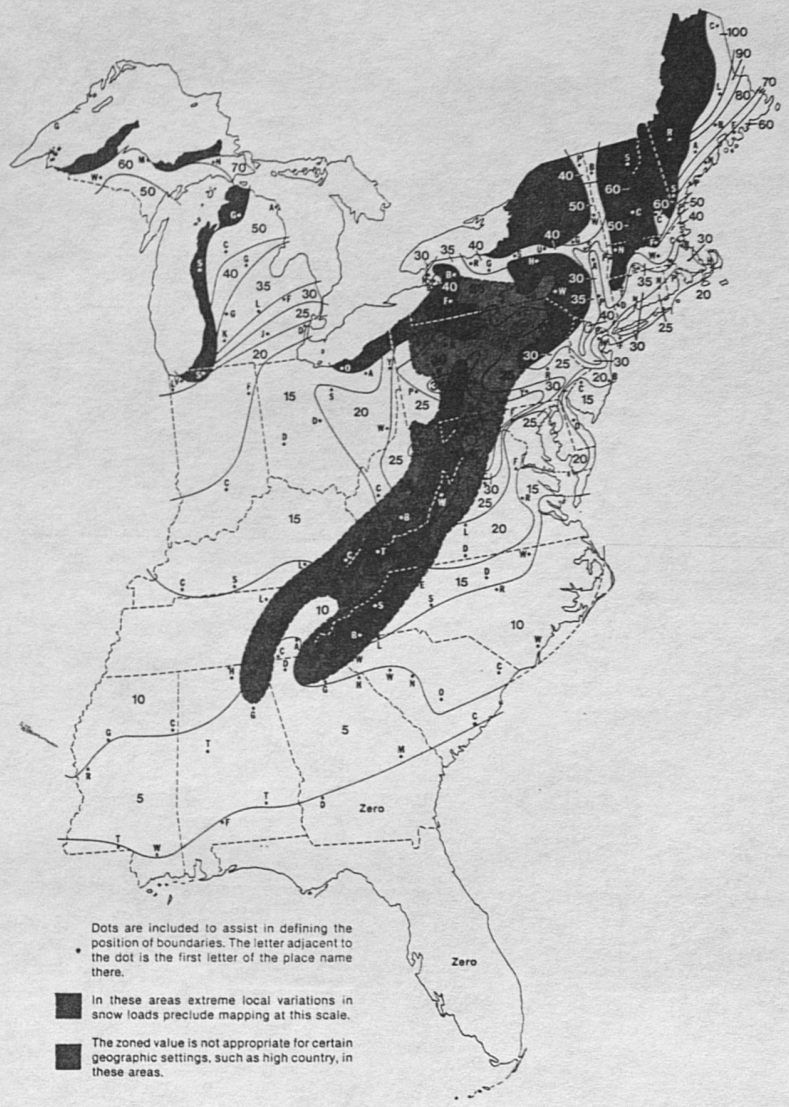


Figure 1111.2a
GROUND SNOW LOADS, P_g, FOR THE EASTERN UNITED STATES
(pounds-force per square foot)

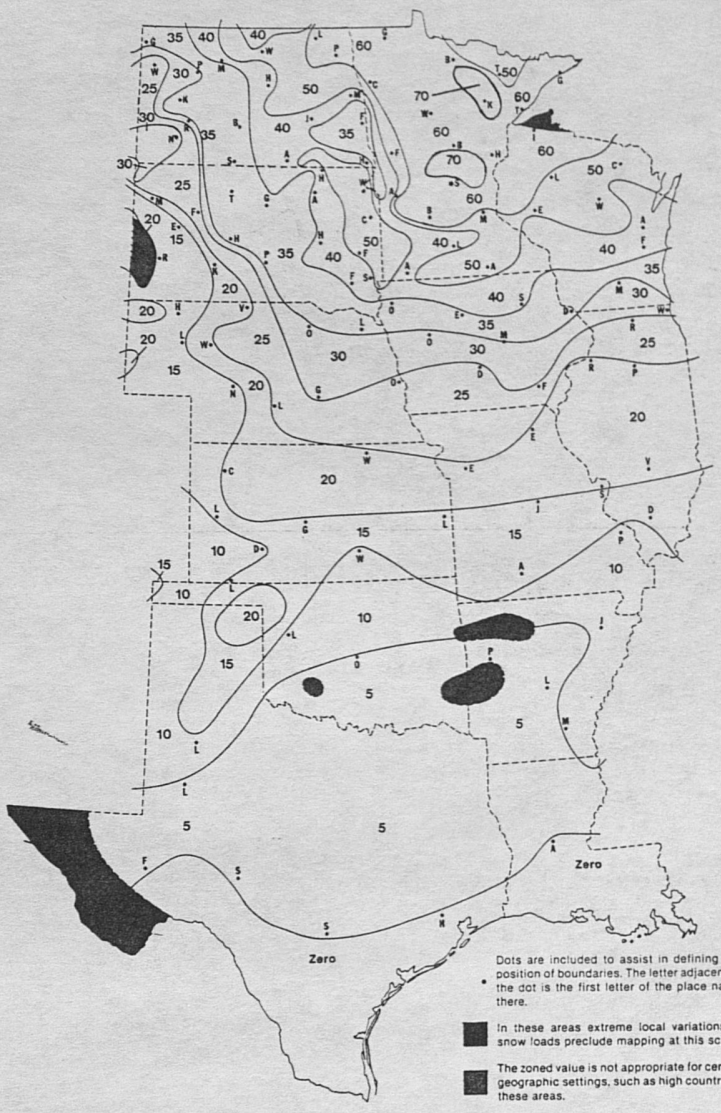


Figure 1111.2b
GROUND SNOW LOADS, P_g, FOR THE CENTRAL UNITED STATES
(pounds-force per square foot)



Figure 1111.2c
GROUND SNOW LOADS, P_g, FOR THE WESTERN UNITED STATES
(pounds-force per square foot)

1111.6.1 Unbalanced snow load for hip and gable roofs: For hip and gable roofs with a slope less than 2.4 degrees, (0.04 rad), or exceeding 70 degrees, (1.22 rad), unbalanced snow loads need not be considered. For slopes of 2.4 degrees (0.04 rad) and up to 20 degrees, (0.35 rad), the roof slope shall be designed to sustain a uniformly distributed load of 0.5 P_f acting on one slope and 1.0 P_f acting on the opposite slope. For slopes between 20 degrees (0.35 rad) and 70 degrees (0.35 rad), the structure shall be designed to sustain an unbalanced uniform snow load on the lee side equal to 1.25 times the sloped roof snow load. In the unbalanced situation, the windward side shall be considered free of snow.

1111.6.2 Unbalanced snow load for curved roofs: Portions of curved roofs having a slope exceeding 70 degrees (1.22 rad) shall be considered free of snow. The equivalent slope of a curved roof is equal to the slope of a line from the eave, or the point at which the slope exceeds 70 degrees (1.22 rad), to the crown. If the equivalent slope is less than 10 degrees (0.17 rad) or greater than 60 degrees (1.05 rad), unbalanced snow loads need not be considered. Unbalanced snow loads shall be determined according to the loading diagrams in Figure 1111.6.2. In all cases, the windward side shall be considered free of snow. If the ground or another roof abuts a Case-II or Case-III (see Figure 1111.6.2) arched roof structure at or within 3 feet (914 mm) of its eave, the snow load shall not be decreased between the 30 degree (0.52 rad) point and the eave but shall remain constant at $2P_s$. This distribution is shown as a dashed line in Figure 1111.6.2.

1111.6.3 Unbalanced snow load for multiple roofs: For multiple folded-plate, sawtooth and barrel vault roofs with parallel ridge lines, the roof snow load shall be increased from one-half the balanced load at the ridge or crown (0.5 P_f) to three times the balanced load at the valley (3.0 P_f). Balanced and unbalanced loading diagrams for a sawtooth roof are presented in Figure 1111.6.3. However, the snow surface above the valley shall not be at an elevation higher than that above the ridge and if this condition limits the unbalanced load to something less than 3.0 P_f, the minimum design unbalanced load shall be the lesser value.

1111.7 Drifts on lower roofs: In areas where the ground snow load is greater than 10 pounds per square foot, (see Figures 1111.2a, 1111.2b and 1111.2c) multi-level roofs, lower roofs and decks of adjacent structures and roofs adjacent to projections shall be designed in accordance with Sections 1111.7.1 through 1111.7.5.

1111.7.1 Design loads for lower roofs: The drift load on lower roofs or decks shall be taken as the triangular loading surcharge superimposed on the uniform roof snow load P_f. The geometry of the drifting shall be in accordance with Figures 1111.7.1 through 1111.7.5. The height of the drift h_d shall be determined by the following formula:

$$h_d = 0.43 \sqrt[3]{W_b} \sqrt[4]{P_g + 10} - 1.5$$

or the value of h_d shall be determined from Figure 1111.7. The value of h_d shall

not exceed $(h_r - h_b)$. For the purpose of evaluating the height of the snow drift, the ground snow and roof snow, the snow density shall be calculated from the formula:

$$D = 0.13\ P_g + 14$$

but not more than 35 pounds per cubic foot (561 kg/m³). The width of the drift W_d in feet shall be taken as the smaller of 4 h_d or 4 $(h_r - h_b)$. Drift loads need only be considered when:

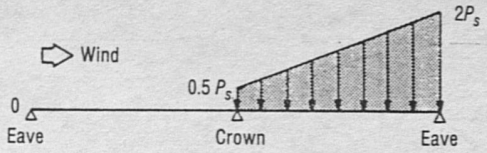
$$\frac{h_r - h_b}{h_b} > 0.2 \quad \text{where } h_b = \frac{P_f}{D}$$

and P_f is evaluated on the basis of the lower roof. The maximum intensity, (P_m), of the snow load at the high point of the drift shall be determined by the formula:

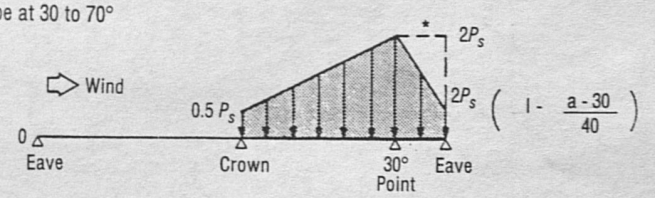
$$P_m = D\,(h_d + h_b)$$

except that P_m shall not exceed Dh_r.

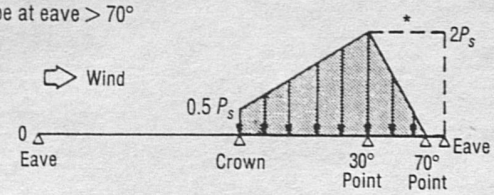
Case I slope at eave < 30°



Case II slope at 30 to 70°



Case III slope at eave > 70°



* Alternate distribution if another roof abuts

Figure 1111.6.2
UNBALANCED LOADING CONDITIONS FOR CURVED ROOFS

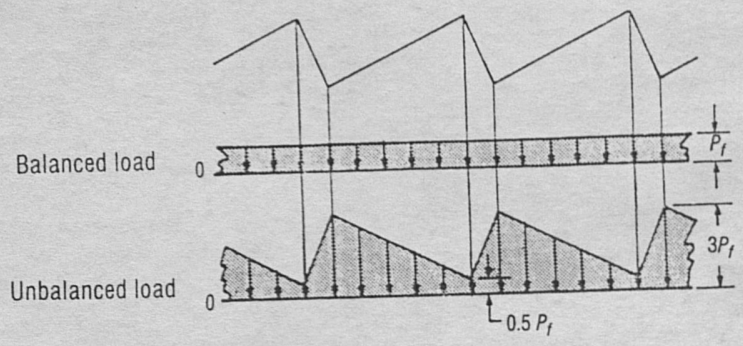


Figure 1111.6.3
BALANCED AND UNBALANCED LOADS FOR A SAWTOOTH ROOF

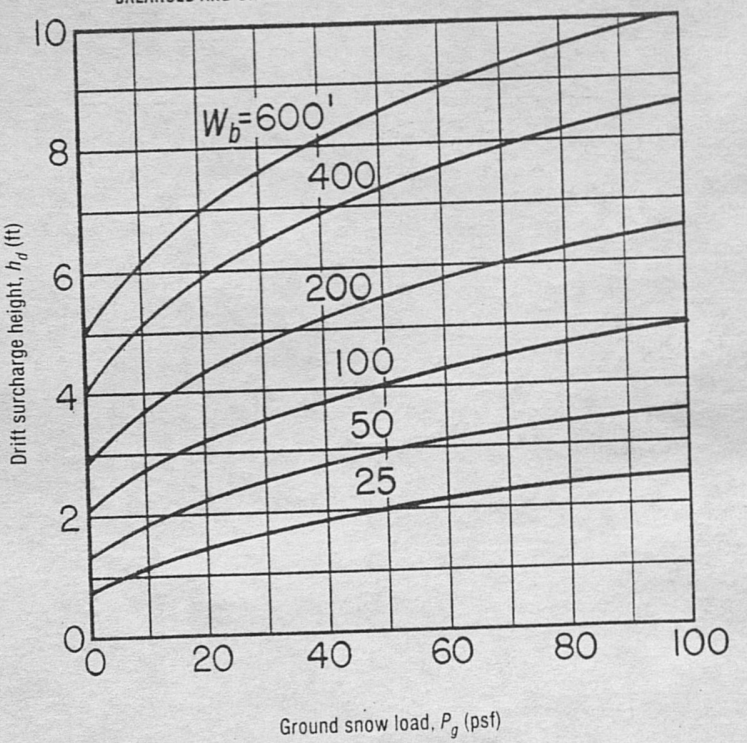


Figure 1111.7
DETERMINATION OF h_d

$$h_d = 0.43 \sqrt[3]{W_b} \sqrt[4]{P_g + 10} - 1.5$$

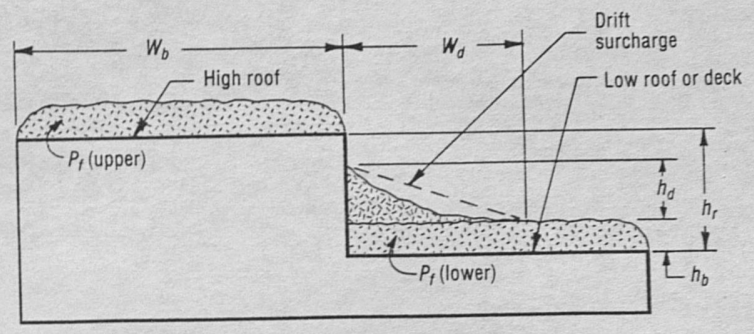


Figure 1111.7.1
DRIFTING SNOW ON LOW ROOFS AND DECKS

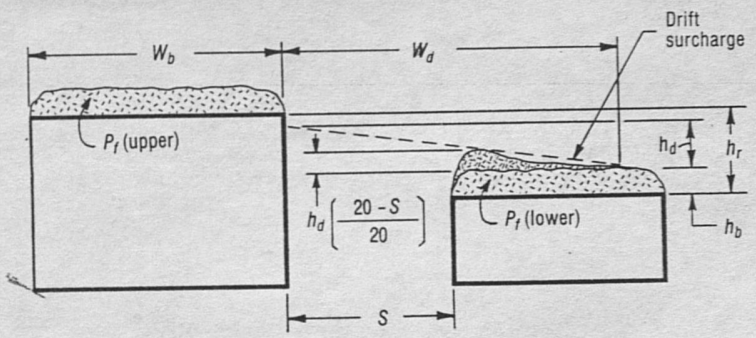


Figure 1111.7.2
DRIFTING SNOW ONTO ADJACENT LOW STRUCTURES

1111.7.2 Roof of adjacent lower structure: A drift surcharge shall be applied to lower roofs or structures sited within 20 feet (6096 mm) of a higher structure as depicted in Figure 1111.7.2. The height of the surcharge on the lower structure shall be taken as h_d multiplied by (1 - S/20) to account for the horizontal separation between structures S in feet.

1111.7.3 Roof projections: Drift loads due to mechanical equipment, penthouses, parapets and other projections above the roof shall be applied as depicted in Figure 1111.7.3. Such drift loads shall be calculated on all sides of projections having horizontal dimensions exceeding 15 feet (4572 mm). The value of W_b shall be taken as the maximum distance from the projection to the edges of the roof, or 50 feet (15240 mm), whichever is less.

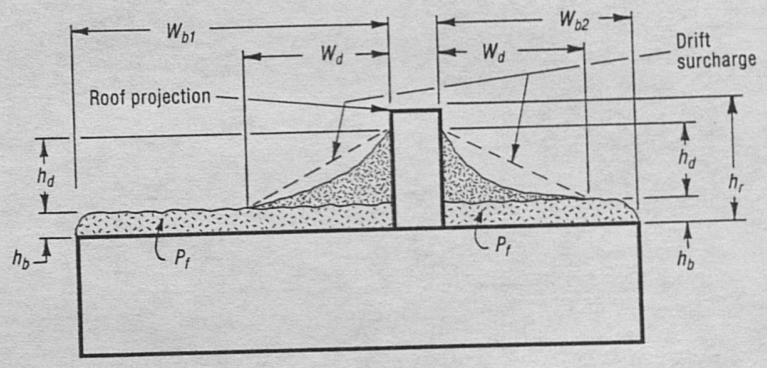


Figure 1111.7.3
SNOW DRIFTING AT ROOF PROJECTIONS

1111.7.4 Intersecting drifts: When one snow drift intersects another at an angle as depicted in Figure 1111.7.4, the maximum unit pressure of the drift shall be taken as the greater of the two individual drifts, but not the sum of the two.

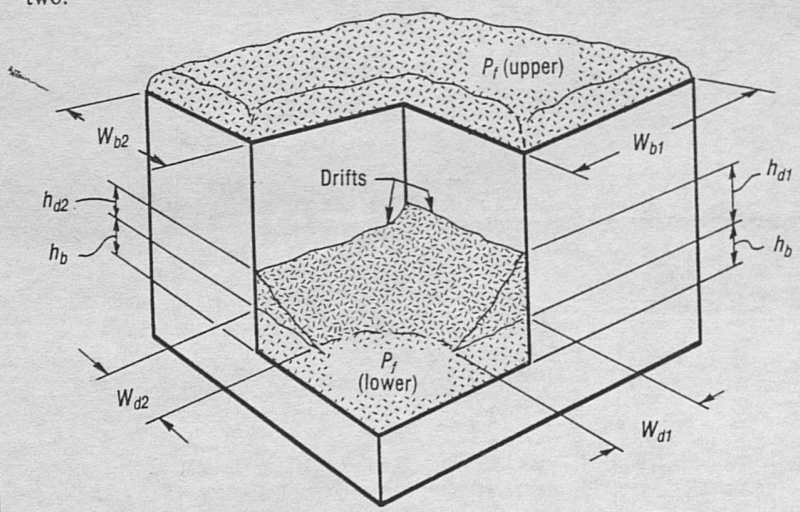


Figure 1111.7.4
INTERSECTING SNOW DRIFTS

1111.8 Sliding snow: Lower roofs which are located below roofs having a slope greater than 20 degrees (0.35 rad) shall be designed for an increase in drift height of 0.4 h_d, that the total drift surcharge (h_d + 0.4 h_d) shall not exceed the height of the roof above the uniform snow depth (h_r - h_b). Sliding snow shall not be considered when the lower roof is separated a distance S greater than h_r or 20 feet (6096 mm). (See Figures 1111.7.2 and 1111.8).

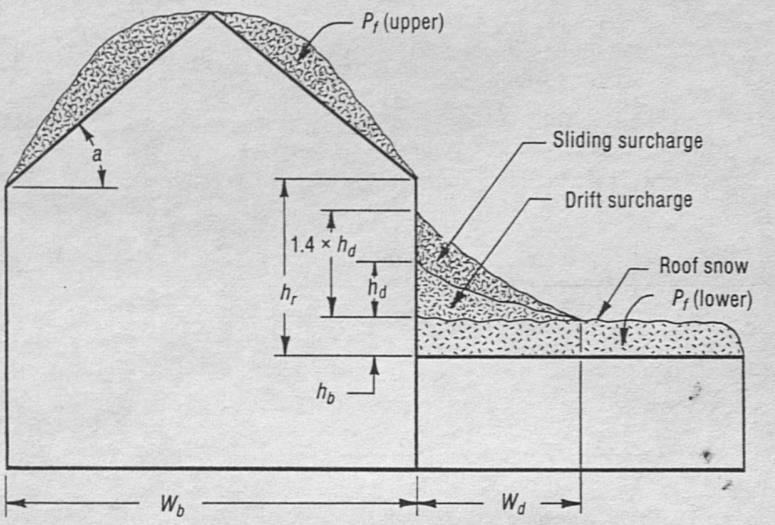


Figure 1111.8
ADDITIONAL SURCHARGE DUE TO SLIDING SNOW

SECTION 1112.0 WIND LOAD

1112.1 General: All exposed structures or structural components, cladding and roof coverings shall be designed to resist the pressures due to wind in any direction as provided herein.

1112.1.1 Wind loads during erection and construction phases: Adequate temporary bracing shall be provided to resist wind loading on structural components and structural assemblages during the erection and construction phases.

1112.1.2 Overturning and sliding: The overturning moment due to wind load shall not exceed two-thirds of the dead load stabilizing moment unless the building or structure is anchored to resist the excess moment. When the total resisting force due to friction is insufficient to prevent sliding, anchorage shall be provided to resist the excess sliding force.

1112.2 Symbols, notations and definitions: The following symbols and notations apply to the provisions of this section.

$P_d = p_z + p_h$ = design pressure to be used in determination of wind loads for the main windforce-resisting system

p_z = windward design pressure evaluated at height z above grade, in pounds per square foot

p_h = leeward or sidewall pressure evaluated at height $z = h$, in pounds per square foot

z = height above grade, in feet

h = the mean roof height of a building, the height of other structures, or the eave height for buildings with roof slope of less than 10 degrees (0.17 rad), in feet

P_e = effective velocity pressure, including gust effect as tabulated in Table 1112.3.3a(1) for exposure B and Table 1112.3.3b for exposure C

I = importance factor of the building or other structure as indicated in Tables 1112.2a(1) and 1112.2b

C_p = external pressure coefficient to be used in determination of wind loads for buildings or for other structures (see Figure 1112.2a and Tables 1112.2c through 1112.2h)

Components and cladding: Structural elements that are either directly loaded by the wind or receive wind loads originating at relatively close locations and that transfer those loads to the main windforce-resisting system.

Main windforce-resisting system: An assemblage of major structural elements designed to provide support for secondary members and cladding. The system primarily receives wind loading from relatively remote locations.

1112.3 Design: The design and wind pressure for the main windforce-resisting system shall be determined as follows:

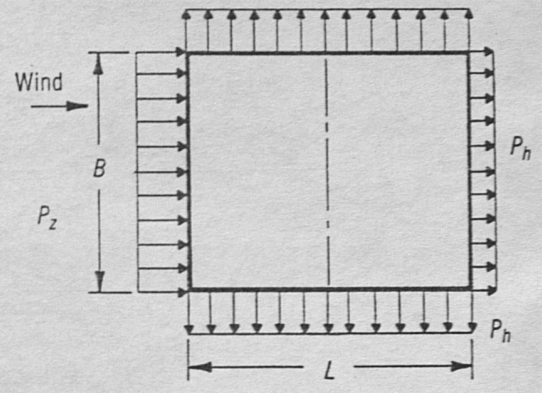
$$P_d = P_e \times I^2 \times C_p$$

1112.3.1 Components and cladding: The design wind pressure for structural components and cladding supporting tributary areas greater than 1,000 square feet (93 m²) shall be designed using the provisions for main windforce-resisting systems. Structural components and cladding supporting tributary areas 1,000 square feet (93 m²) and less shall be designed in accordance with ANSI A58.1 listed in Appendix A.

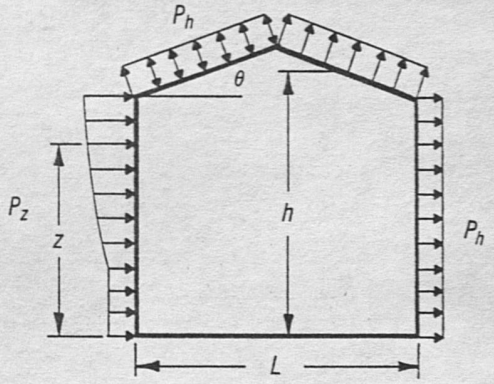
1112.3.2 Basic wind speed: The basic wind speed, in miles per hour, to be used for the location of the building or other structure shall be determined by Figure 1112.3.2. Basic wind speed for special wind regions indicated on Figure 1112.3.2 shall be in accordance with local jurisdiction requirements.

1112.3.3 Exposure classification: The effective velocity pressure, P_e, shall be as specified in Table 1112.3.3a for exposure B and Table 1112.3.3b for exposure C where exposures B and C are defined as follows:

Exposure B: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family



Plan



Elevation

Figure 1112.2a
EXTERNAL PRESSURE COEFFICIENTS, C_p FOR AVERAGE LOADS ON MAIN WINDFORCE-RESISTING SYSTEMS
C_p values used in conjunction with this figure are found in Tables 1112.2a(2) and 1112.2a(3)

dwellings or larger. Use of this exposure category shall be limited to those areas for which terrain representative of Exposure B prevails in the upwind direction for a distance of at least 1,500 feet (457 m) or 10 times the height of the building or structure, whichever is greater.

Exposure C: Open terrain with scattered obstructions having heights generally less than 30 feet (9144 mm). This category includes flat, open country and grasslands.

Table 1112.3.3a
EFFECTIVE VELOCITY PRESSURES P_e (lb/ft²) FOR BUILDINGS AND STRUCTURES (EXPOSURE B)[a]

Height above grade (ft)	Basic wind speed (mph)				
	70	80	90	100	110
0-20	9	12	15	18	22
20-40	10	13	17	21	25
40-60	13	16	21	26	31
60-100	14	18	23	28	34
100-150	16	21	27	33	40
150-200	18	23	29	36	43
200-300	20	26	33	41	50
300-400	23	30	37	46	56
> 400	Per ANSI A58.1 listed in Appendix A.				

Note a. 1 pound per square foot = 47.88 P; 1 mile per hour = 0.447 m/s; 1 foot= 304.8 mm.

Table 1112.3.3b
EFFECTIVE VELOCITY PRESSURES P_e (lb/ft²) FOR BUILDINGS AND STRUCTURES (EXPOSURE C)

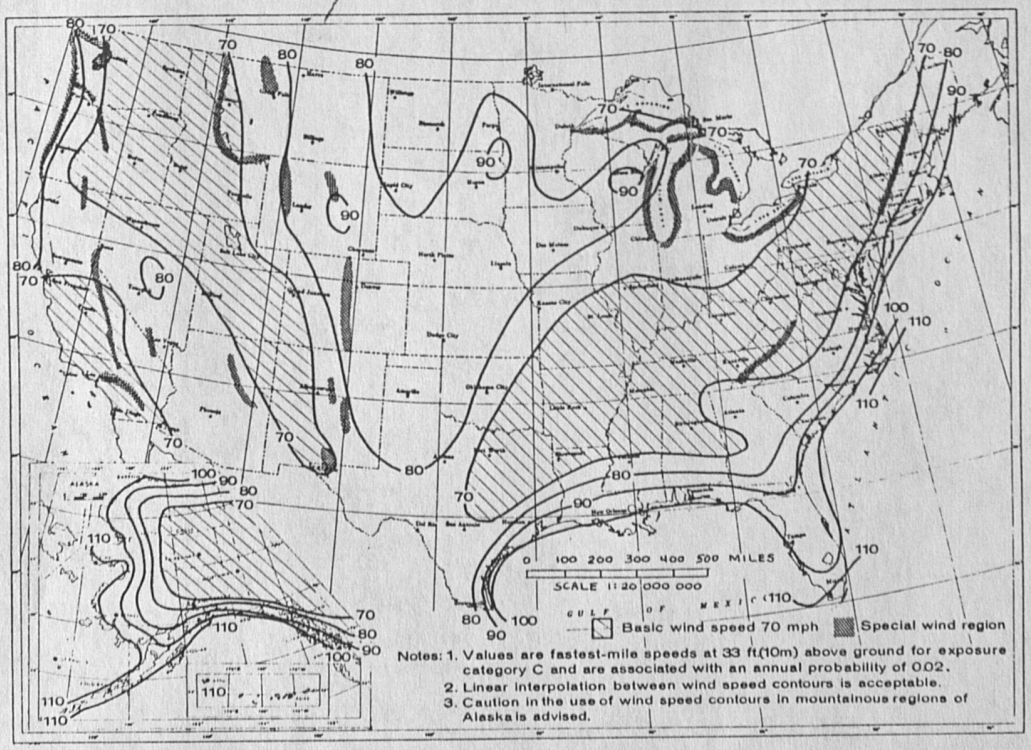
Height above grade (ft)	Basic wind speed (mph)				
	70	80	90	100	110
0-20	15	20	25	31	37
20-40	16	21	27	33	40
40-60	19	25	31	38	47
60-100	20	26	33	41	50
100-150	23	30	37	46	56
150-200	24	31	39	49	59
200-300	25	33	42	51	62
300-400	28	36	46	56	68
> 400	Per ANSI A58.1 listed in Appendix A.				

Note a. 1 pound per square foot = 47.88 P; 1 mile per hour = 0.447 m/s; 1 foot= 304.8 mm.

1112.3.4 Special wind conditions: Special wind conditions shall be provided for in accordance with Sections 1112.3.4.1 and 1112.3.4.2.

1112.3.4.1 Increased loads: For structures located on flat, unobstructed coastal areas directly exposed to wind flowing over large bodies of water, within 1,500 feet (457 m) of the shoreline; the increased wind loads of exposure D shall be used in accordance with ANSI A58.1 listed in Appendix A.

FIGURE 112.3.2
BASIC WIND SPEED (miles per hour)[a]



Note a. 1 mile per hour = 0.447 m/s.

1112.3.4.2 Decreased loads: For structures located in centers of large cities with at least 50 percent of the buildings having a height in excess of 70 feet (21336 mm), the decreased wind loads of exposure A shall be used in accordance with ANSI A58.1 listed in Appendix A.

1112.3.5 Slender buildings and structures: Buildings and other structures having a height exceeding 5 times the least horizontal dimension or having a fundamental natural frequency less than 1 cycle per second shall be designed for wind loads which include a gust response factor which has been determined by a rational analysis that incorporates the dynamic properties of the main windforce-resisting system.

1112.3.6 Wall openings: The main windforce-resisting system for buildings with wall openings where the percentage of total wall area occupied by openings in one wall exceeds that of all other walls by 10 percent or more, and openings in all other walls do not exceed 20 percent of respective wall area, shall be designed for internal pressure in accordance with ANSI A58.1 listed in Appendix A.

Table 1112.2a(1)
IMPORTANCE FACTOR, *I* (WIND LOADS)

Category[a]	Importance factor, *I*[b]	
	100 miles (161 km) from hurricane oceanline, and in other areas	At hurricane oceanline[c]
I	1.00	1.05
II	1.07	1.11
III	1.07	1.11
IV	0.95	1.00

Note a. For building and structure classification categories, see Table 1112.2b.
Note b. For regions between the hurricane oceanline and 100 miles (161 km) inland the importance factor I shall be determined by linear interpolation.
Note c. Hurricane oceanlines are the Atlantic and Gulf of Mexico coastal areas.

Table 1112.2a(2)
WALL PRESSURE COEFFICIENTS, C_p

Surface	*L/B*	C_p	For use with
Windward wall	All values	0.8	p_z
Leeward wall	0 to 1 2 ≥ 4	-0.5 -0.3 -0.2	p_h
Side walls	All values	-0.7	p_h

Table 1112.2a(3)
ROOF PRESSURE COEFFICIENTS, C_p, FOR USE WITH P_h

Wind Direction		Windward							
		Angle, θ (degrees)							
	h/L	0	10-15	20	30	40	50	>60	Leeward
Normal to ridge	≤ 0.3	-0.7	0.2[e] -0.9[e]	0.2	0.3	0.4	0.5	0.01 θ	-0.7 for all values of h/L and θ
	0.5	-0.7	-0.9	-0.75	-0.2	0.3	0.5	0.01 θ	
	1.0	-0.7	-0.9	-0.75	-0.2	0.3	0.5	0.01 θ	
	≥ 1.5	-0.7	-0.9	-0.9	-0.9	-0.35	0.2	0.01 θ	
Parallel to ridge	h/B or h/L <2.5	-0.7							-0.7
	h/B or h/L >2.5	-0.8							-0.8

Note a. Refer to Table 1112.2c for arched roofs.
Note b. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
Note c. Linear interpolation is permitted for values of θ, h/L, and L/B ratios other than shown.
Note d. Notation:
z: Height above ground, in feet
h: Mean roof height, in feet, or the eave height is permitted for $\theta < 10$ degrees
B: Horizontal dimension of building, in feet, measured normal to wind direction
L: Horizontal dimension of building, in feet, measured parallel to wind direction
θ: Roof slope from horizontal, in degrees
Note e. Both values of C_p shall be used in assessing load effects.

Table 1112.2b
CLASSIFICATION OF BUILDINGS AND OTHER STRUCTURES FOR WIND LOADS

Nature of occupancy	Category
All buildings except those listed below	I
Buildings and structures where the primary occupancy is one in which more than 300 people congregate in one area	II
Buildings and structures designated as essential facilities, including, but not limited to: 1. Hospital and other medical facilities having surgery or emergency treatment areas 2. Fire or rescue and police stations 3. Primary communication facilities and disaster operation centers 4. Power stations and other utilities required in an emergency 5. Structures having critical national defense capabilities	III
Buildings and structures that represent a low hazard to human life in the event of failure, such as agricultural buildings, certain temporary facilities, and minor storage facilities	IV

Table 1112.2c
EXTERNAL PRESSURE COEFFICIENTS FOR ARCHED ROOFS, C_p[a]

Condition	Rise-to-span ratio, r	C_p[b]		
		Windward quarter	Center half	Leeward quarter
Roof on elevated structure	$0 < r < 0.2$	-0.9	-0.7-r	-0.5
	$0.2 \leq r < 0.3$[c]	1.5r - 0.3	-0.7-r	-0.5
	$0.3 \leq r \leq 0.6$	2.75r - 0.7	-0.7-r	-0.5
Roof springing from ground level	$0 < r \leq 0.6$	1.4r	-0.7-r	-0.5

Note a. Values listed are for the determination of average loads on main wind-force resisting system.
Note b. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
Note c. When the rise-to-span is $0.2 \leq r \leq 0.3$, alternate coefficients given by 6r - 2.1 shall also be used for the windward quarter.

Table 1112.2d
FORCE COEFFICIENTS FOR CHIMNEYS, TANKS AND SIMILAR STRUCTURES, C_p[a,c]

Shape	C_p for h/D[b] values of:		
	1	7	25
Square (wind normal to a face)	1.3	1.4	2.0
Square (wind along diagonal)	1.0	1.1	1.5
Hexagonal or octagonal ($D\sqrt{P_e} > 2.5$)	1.0	1.2	1.4
Round ($D\sqrt{P_e} > 2.5$)	0.7	0.8	0.9
Round ($D\sqrt{P_e} \leq 2.5$)	0.7	0.8	1.2

Note a. The design wind force shall be calculated based on the area of the structure projected on a plane normal to the wind direction. The force shall be assumed to act parallel to the wind direction.
Note b. Linear interpolation is permitted for h/D values other than shown.
Note c. Notation:
D: Diameter or least horizontal dimension, in feet
h: Height of structure, in feet

Table 1112.2e
FORCE COEFFICIENTS FOR SOLID SIGNS,[a] C_p[c,d]

At ground level[b]		Above ground level	
v	C_p	M/N	C_p
≤ 3	1.2	≤ 6	1.2
5	1.3	10	1.3
8	1.4	16	1.4
10	1.5	20	1.5
20	1.75	40	1.75
30	1.85	60	1.85
≥ 40	2.0	≥ 80	2.0

Note a. Signs with openings comprising less than 30 percent of the gross area shall be considered as solid signs.

Notes to Table 1112.2e (cont'd.)

Note b. Signs for which the distance from the ground to the bottom edge is less than 0.25 times the vertical dimension shall be considered to be at ground level.

Note c. To allow for both normal and oblique wind directions, two cases shall be considered:

1. Resultant force acts normal to sign at geometric center, and
2. Resultant force acts normal to sign at level of geometric center and at a distance from windward edge of 0.3 times the horizontal dimension.

Note d. Notation:

v: Ratio of height to width
M: Larger dimension of sign, in feet
N: Smaller dimension of sign, in feet

Table 1112.2f
FORCE COEFFICIENTS FOR TRUSSED TOWERS,[a] C_p[b,e,f,g]

ϵ_h	C_p	
	Square towers[d]	Triangular towers[c]
< 0.025	4.0	3.6
0.025 to 0.44	4.1 - 5.2 ϵ	3.7 - 4.5 ϵ
0.45 to 0.69	1.8	1.7
0.7 to 1.0	1.3 + 0.7 ϵ	1.0 + ϵ

Note a. Force coefficients are given for towers with structural angles or similar flat-sided members.

Note b. For towers with rounded members, the design wind force shall be determined using the values in the above table multiplied by the following factors:

$\epsilon < 0.29$, factor = 0.67
$0.3 < \epsilon < 0.79$, factor = 0.67 ϵ + 0.47
$0.8 < \epsilon < 1.0$, factor = 1.0

Note c. For triangular section towers, the design wind forces shall be assumed to act normal to a tower face.

Note d. For square section towers, the design wind forces shall be assumed to act normal to a tower face. To allow for the maximum horizontal wind load, which occurs when the wind is oblique to the faces, the wind load acting normal to a tower face shall be multiplied by the factor 1.0 + 0.7 ϵ for $\epsilon \leq 0.5$ and shall be assumed to act along a diagonal.

Note e. Wind forces on tower appurtenances, such as ladders, conduits, lights, elevators, and the like, shall be calculated using appropriate force coefficients for these elements.

Note f. For guyed towers, the cantilever portion of the tower shall be designed for 125 percent of the design force.

Note g. A reduction of 25 percent of the design force in any span between guys shall be made for determination of controlling moments and shears.

Note h. Notation:

ϵ: Ratio of solid area to gross area of tower

Table 1112.2g
FORCE COEFFICIENTS FOR MONOSLOPE ROOFS OVER UNENCLOSED BUILDINGS AND OTHER STRUCTURES, C_p[a,b]

θ (degrees)	C_p for L/B values of:						
	5	3	2	1	½	⅓	⅕
10	0.2	0.25	0.3	0.45	0.55	0.7	0.75
15	0.35	0.45	0.5	0.7	0.85	0.9	0.85
20	0.5	0.6	0.75	0.9	1.0	0.95	0.9
25	0.7	0.8	0.95	1.15	1.1	1.05	0.95
30	0.9	1.0	1.2	1.3	1.2	1.1	1.0

Table 1112.2g (cont'd.)
FORCE COEFFICIENTS FOR MONOSLOPE ROOFS OVER UNENCLOSED BUILDINGS AND OTHER STRUCTURES, C_p[a,b]

θ (degrees)	Location of center of pressure, X/L, for L/B values of:		
	2 to 5	1	1/5 to 1/2
10 to 20	0.35	0.3	0.3
25	0.35	0.35	0.4
30	0.35	0.4	0.45

Note a. Wind forces act normal to the surface and shall be directed inward or outward.
Note b. Notation:
B: Dimension of roof measured normal to wind direction, in feet
L: Dimension of roof measured parallel to wind direction, in feet
X: Distance to center of pressure from windward edge of roof, in feet
θ: Angle of plane of roof from horizontal, in degrees

Table 1112.2h
FORCE COEFFICIENTS FOR OPEN SIGNS[a] AND LATTICE FRAMEWORKS, C_p[b,c]

ϵ	C_p		
	Flat-sided members	Rounded members	
		$D\sqrt{P_e} \leq 2.5$	$D\sqrt{P_e} > 2.5$
< 0.1	2.0	1.2	0.8
0.1 to 0.29	1.8	1.3	0.9
0.3 to 0.7	1.6	1.5	1.1

Note a. Signs with openings comprising 30 percent or more of the gross area are classified as open signs.
Note b. The calculation of the design wind forces shall be based on the area of all exposed members and elements projected on a plane normal to the wind direction. Forces shall be assumed to act parallel to the wind direction.
Note c. Notation:
ϵ: Ratio of solid area to gross area
D: Diameter of a typical round member, in feet

SECTION 1113.0 EARTHQUAKE LOADS

1113.1 General: Every building and structure and portion thereof shall be designed and constructed to resist the earthquake effects determined in accordance with the requirements of this section. Seismic zones shall be determined by location in Figure 1113.1. Where wind load requirements of Section 1112.0 would produce higher stresses, such stresses shall be used in lieu of the stresses resulting from earthquake forces.

Exceptions

1. Buildings or structures in Use Group R-3 located in Seismic Zones 0, 1 or 2 are exempt from the requirements of this section.
2. All buildings or structures in Zone 0 and buildings or structures in Zone 1 having an importance factor I in Table 1113.1 of less than 1.5, shall only be required to comply with Sections 1113.11.1 and 1113.11.2.

3. Buildings and structures that represent a low hazard to human life in the event of failure, such as agricultural buildings, certain temporary facilities, and minor storage facilities are exempt from the requirements of this section.

Except for unreinforced masonry, the determination of forces in this section depends on the ability of a structure to remain stable when members are strained into the inelastic range during a major earthquake. Structural concepts other than those set forth in this section shall be permitted when evidence is submitted showing that equivalent ductility and energy dissipation are provided. While the requirements in this section refer primarily to an equivalent static force method, other procedures used to establish the seismic forces and their distribution shall be permitted if the corresponding internal forces and deformations in the members are determined using a model consistent with the procedure adopted. Principles governing the use of dynamic analysis are given in Section 1113.8.

1113.1.1 Additions: Where applicable, every addition to an existing building or structure shall be designed and constructed to resist the forces provided for herein, and in any case where an existing building or structure is increased in height all portions thereof affected by such increased height shall be reconstructed or modified, if necessary, to resist the forces provided for herein.

Exception: In Zone 1, additions that increase the height of an existing building shall not be required to conform to the provisions of this subsection.

1113.1.2 Alterations: Where applicable, an existing building or structure shall not be altered or reconstructed in such a manner that the seismic force-resisting system is not capable of resisting the forces provided for herein. This provision shall not apply to alterations which are made in accordance with Section 106.3.

1113.1.3 Plans and design data: Where earthquake loads are applicable, a brief statement of the items indicated in Sections 1113.1.3.1 through 1113.1.3.3 shall be included with each set of plans filed.

1113.1.3.1 Dead and live loads: A summation of the dead and, where applicable, live loads of the building, floor by floor, which was used in figuring the shear for which the building is designed.

1113.1.3.2 Bracing: A brief description of the bracing system used, the manner in which the designer expects such system to act and a clear statement of any assumption used. Assumptions as to location of all points of counter-flexure in members shall be stated.

1113.1.3.3 Sample calculations: Sample calculations of a typical bent or equivalent.

1113.1.4 Stress increases: The requirements of this section presume that allowable stresses are increased by one-third for earthquake loadings. However, this increase shall not be permitted in conjunction with any decrease in total load effect taken in accordance with Section 1114.0.

1113.1.5 Combined vertical and horizontal forces: In computing the effect of seismic forces 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. Consideration shall also be given to minimum gravity loads acting in combination with lateral forces.

Table 1113.1
OCCUPANCY IMPORTANCE FACTOR, /

Nature of occupancy	/Factor
All buildings and structures except those listed below	1.0
Buildings and structures of Use Group A with a total occupant load of more than 300.	1.25
Buildings and structures designated as essential facilities, including, but not limited to: 1. I-2 Uses having surgery or emergency treatment areas 2. Fire or rescue and police stations 3. Primary communication facilities and disaster operation centers. 4. Power stations and other utilities required in an emergency. 5. Structures having critical national defense capabilities.	1.5

1113.2 Definitions: The definitions listed below apply only to the provisions of this section.

Base: The level at which the earthquake motions are considered to be imparted to the structure or the level at which the structure as a dynamic vibrator is supported.

Braced frame: A truss system or its equivalent which is provided to resist lateral forces in the frame system and in which the members are subjected primarily to axial stresses.

Diaphragm: A horizontal or nearly horizontal system designed to transmit seismic forces to the vertical elements of the lateral force-resisting system.

Essential facilities: As listed in Table 1113.1.

Lateral force-resisting system: That part of the structural system to which the lateral forces prescribed in Section 1113.4 are assigned.

Shear wall: A wall designed to resist lateral forces parallel to the wall.

Space frame: A three-dimensional structural system without bearing walls, composed of interconnected members, laterally supported so as to function as a complete self-contained unit with or without the aid of horizontal diaphragms or floor bracing systems.

Moment-resisting space frame: A vertical load-carrying space frame in which the members and joints are capable of resisting forces primarily by flexure.

Special moment-resisting space frame: A moment-resisting frame complying with the requirements for a ductile moment-resisting space frame as given in Section 1113.9.3.3.

Semi-ductile moment-resisting space frame: A moment-resisting frame

complying with the requirements for a semi-ductile moment-resisting space frame as given in Section 1113.9.3.4.

Vertical load-carrying space frame: A space frame designed to carry all vertical loads.

1113.3 Symbols and notation: The following symbols and notations apply only to the provisions of this section.

C = Numerical coefficient as defined in Section 1113.4.4

C_p = Numerical coefficient as defined in Section 1113.10 and set forth in Table 1113.10

D = The dimension of the structure, in feet, in a direction parallel to the applied forces (see also Section 1113.5.1)

D_s = The longest dimension of a shear wall or braced frame in the direction parallel to the applied forces, in feet

F_i, F_n, F_x = Lateral forces applied to level i, n, or x respectively

F_p = Lateral force on a part of the structure, and in the direction under consideration

F_{px} = Force on floor diaphragms and collectors

F_t = That portion of V considered concentrated at the top of the structure in addition to F_n

f_i = Distributed portion of a total lateral force at level i for use in the equation in Section 1113.4.5.1

g = Acceleration due to gravity

h_i, h_n, h_x = The height in feet above the base to level i, n, or x respectively

I = Occupancy importance factor (see Table 1113.1)

K = Numerical coefficient as set forth in Table 1113.4.3

k = Numerical coefficient for reduction of the overturning moment in tall buildings

Level i = Level of the structure referred to by the subscript i; $i = 1$ designates the first level above the base

Level n = That level which is uppermost in the main portion of the structure

Level x = That level which is under design consideration; $x = 1$ designates the first level above the base

S = Soil factor (see Table 1113.4.6)

T = Fundamental elastic period of vibration of the building or structure in the direction under consideration, in seconds

V = The total lateral force or shear at the base

W = In buildings and structures of Use Group S, W shall be equal to the total dead load as defined in Section 1104.0, including partition loading, plus 25 percent of the floor live load. Where the ground snow load, as determined by Section 1111.0, is 30 lbf/ft² or less, ground snow load need not be included in the value of W. Where the ground snow load is greater than 30 lbf/ft², the snow load shall be included. However, in areas subject to short duration snow loads, snow load reductions of up to 75 percent shall be permitted. In all buildings and struc-

tures of other than Use Group S, W shall be equal to the total dead load as defined in Section 1104.0, including partition loading

w_i, w_x = That portion of W which is located at or is assigned to level i or x, respectively

w_{px} = The weight of the floor or roof diaphragms and collectors and elements tributary thereto at level x plus 25 percent of the floor live load for buildings or structures of Use Group S

W_p = The weight of a portion of a structure or nonstructural component

Z = Numerical coefficient (see Table 1113.4.1) dependent upon the zone as determined by the maps in Figure 1113.1

σ_i = Deflection at level i relative to the base, due to applied lateral forces, Σf_i, for use in the equation in Section 1113.4.5.1

1113.4 Minimum earthquake forces for structures: Except as provided in Sections 1113.8 and 1113.10, every structure shall be designed and constructed to resist 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:

$$V = ZIKCSW$$

1113.4.1 *Z* Factor: The factor Z shall be as shown in Table 1113.4.1.

Table 1113.4.1
SEISMIC ZONE COEFFICIENT, *Z*

Seismic zone (see Figure 1113.1)	*Z*
4	1
3	3/4
2	3/8
1	3/16
0	1/8

1113.4.2 *I* Factor: The factor I shall be as shown in Table 1113.1.

1113.4.3 *K* Factor: The value of K shall be not less than set forth in Table 1113.4.3.

Table 1113.4.3
HORIZONTAL FORCE FACTOR, *K*, FOR BUILDINGS OR OTHER STRUCTURES

Arrangement of lateral force-resisting elements	Value of *K*
Bearing wall system: A structural system with bearing walls providing support for all, or major portions of, the vertical loads. Seismic force resistance is provided in accordance with Section 1113.9.1, utilizing:	
Unreinforced masonry walls	4.00
Reinforced concrete or reinforced masonry walls or braced frames	1.33
One-, two-, or three-story light wood or metal-frame wall systems	1.00

Table 1113.4.3 (cont'd.)
HORIZONTAL FORCE FACTOR, *K*, FOR BUILDINGS OR OTHER STRUCTURES

Arrangement of lateral force-resisting elements	Value of *K*
Building framing system: A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by shear walls or braced frames in accordance with Section 1113.9.2	1.00
Moment-resisting frame system: A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by a moment-resisting frame system in conformance with:	
Requirements for ordinary concrete frames	1.50
Sections 1113.9.3.1 and 1113.9.3.2 for ordinary steel frames	1.00
Section 1113.9.3.4 for semi-ductile concrete frames	1.00
Sections 1113.9.3.1 and 1113.9.3.3 for special frames	0.67
Dual system: A structural system with an essentially complete space frame providing support for vertical loads. Seismic force resistance is provided by a combination of:	
A special moment-resisting frame system and shear walls or braced frames in accordance with Section 1113.9.4.1	0.80
or, a semi-ductile moment-resisting frame system and shear walls or braced frames in accordance with 1113.9.4.2	1.00
Elevated tanks: Tanks plus full contents, where tanks are supported on four or more cross-braced legs and not supported by a building.	2.50[a]
Structures other than buildings: Structures other than buildings and other than those set forth in Table 1113.10.	2.00

Note a. The minimum value of *KC* shall be 0.12 and the maximum value of *KCS* need not exceed 0.29 or 0.23 for Soil Profile 3 in Seismic Zones 3 and 4. The tower shall be designed for an accidental torsion of 5 percent as specified in Section 1113.5.5. Elevated tanks that are supported by buildings or do not conform to the type or arrangement of supporting elements as described above shall be designed in accordance with Section 1113.10 using $C_p = 0.3$.

1113.4.4 *C* Factor: The value of *C* shall be as indicated in the equation in this subsection. The product *CS* (see Section 1113.4.6 for *S* values) need not exceed 0.14, or, for Soil Profile 3 in Seismic Zones 3 and 4, the product need not exceed 0.11.

The value of *C* shall be determined in accordance with the following formula:

$$C = \frac{1}{15\sqrt{T}}$$

The value of *C* need not exceed 0.12.

1113.4.5 *T* Factor: The value of *T* shall be determined using the methods described in Sections 1113.4.5.1 and 1113.4.5.2.

1113.4.5.1 *T* formula: *T* is the fundamental period which shall be established using the structural properties and deformational characteristics of the resisting elements using the following formula or the appropriate formula in Section 1113.4.5.2:

$$T = 2\pi \sqrt{\left(\sum_{i=1}^{n} w_i \sigma_i^2\right) \div \left(g \sum_{i=1}^{n} f_i \sigma_i\right)}$$

where the values of f_i represent any lateral force distributed approximately in accordance with the principles of the equations in Section 1113.5.1 or any other rational distribution. The elastic deflections σ_i shall be calculated using the applied lateral forces f_i. The value of C when calculated using the period T as determined by the equation in this section shall not be less than 80 percent of the value of C based on the period T estimated using the appropriate equation in Section 1113.4.5.2.

1113.4.5.2 Alternative *T* formulas: In the absence of a determination of the value of T in accordance with Section 1113.4.5.1, the value of T for buildings shall be determined by the following appropriate formula:

1. For shear walls or exterior concrete frames utilizing deep beams or wide piers, or both:

$$T = \frac{0.05\, h_n}{\sqrt{D}}$$

2. For isolated shear walls not interconnected by frames or for braced frames:

$$T = \frac{0.05\, h_n}{\sqrt{D_s}}$$

3. In buildings in which the lateral force-resisting system consists of moment-resisting space frames capable of resisting 100 percent of the required lateral forces and such system is not enclosed by or adjoined by more rigid elements tending to prevent the frame from resisting lateral forces:

$$T = C_T h_n^{3/4}$$

where $C_T = 0.035$ for steel frames and 0.030 for concrete frames.

1113.4.6 *S* Factor: The value of S shall be determined from Table 1113.4.6. The soil profile types are defined as follows:

1. Soil profile type S_1 is a profile with:
   a. Rock of any characteristic, which is either shalelike or crystalline in nature. Such material is characterized by a shear wave velocity greater than 2,500 feet per second (762 m/s); or
   b. Stiff soil conditions where the soil depth is less than 200 feet (60960 mm) and the soil types overlaying rock are stable deposits of sands, gravels, or stiff clays.
2. Soil profile type S_2 is a profile with deep cohesionless deposits or stiff clay conditions, including sites where the soil depth exceeds 200 feet (60960 mm) and the soil types overlying rock are stable deposits of sands, gravels, or stiff clays.

3. Soil profile type S_3 is a profile with soft-to medium-stiff clays and sands, characterized by 30 feet (9144 mm) or more of soft to medium-stiff clays without intervening layers of sand or other cohesionless soils.

In locations where the soil properties are not known in sufficient detail to determine the soil profile type or the profile does not fit any of the three types, soil profile S_2 or soil profile S_3 shall be used, whichever gives the larger value of CS.

Table 1113.4.6
SOIL PROFILE COEFFICIENT, S

Soil profile type	S
S_1	1.0
S_2	1.2
S_3	1.5

1113.5 Distribution of lateral forces: The imposed lateral forces shall be applied in accordance with Sections 1113.5.1 through 1113.5.6.

1113.5.1 Structures having regular shapes or framing systems: The total lateral force V shall be distributed over the height of the structure in accordance with the following formulas:

$$V = F_t + \sum_{i=1}^{n} F_i$$

Where the concentrated force at the top F_t shall be determined according to the formula:

$$F_t = 0.07\ TV$$

The maximum required value of F_t shall be 0.25 V. When T is 0.7 second or less, the minimum required value of F_t shall be zero. The remaining portion of the total base shear V shall be distributed over the height of the structure, including level n, according to the formula:

$$F_x = (V - F_t)w_x h_x \div \sum_{i=1}^{n} w_i h_i$$

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.

1113.5.2 Setbacks: Buildings having setbacks wherein the plan dimension of the tower in each direction is at least 75 percent of the corresponding plan dimension of the lower part shall be considered as uniform buildings without setbacks, provided that other irregularities as defined in this section do not exist.

1113.5.3 Structures having irregular shapes or framing systems: The distribution of the lateral forces in structures that have highly irregular shapes, large differences in lateral resistance or stiffness between adjacent stories, or other unusual structural features shall be determined considering the dynamic

characteristics of the structure.

1113.5.4 Distribution of horizontal shear: 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. Rigid elements incorporated into the building that are not assumed to be part of the lateral force-resisting system shall be permitted if their effect on the action of the system is considered and provided for in the design.

1113.5.5 Horizontal torsional moments: The design shall provide for the torsional moment resulting from the location of the building masses plus the torsional moments caused by assumed displacement of the mass each way from its actual location by a distance equal to 5 percent of the dimension of the building perpendicular to the direction of the applied forces.

1113.5.6 Diaphragms: Floor and roof diaphragms and collectors shall be designed to resist the forces determined in accordance with the formula:

$$F_{px} = \left(\sum_{i=x}^{n} F_i \div \sum_{i=x}^{n} w_i\right) w_{px}$$

The force F_{px} need not exceed $0.30ZIw_{px}$.

When the diaphragm is required to transfer lateral forces from the vertical resisting elements above the diaphragm to other vertical resisting elements below the diaphragm, due either to offsets in the placement of the elements or to changes in stiffness in the vertical elements, these forces shall be added to the value determined for F_{px}. However, the lateral force on the diaphragm shall not be less than $0.14ZIw_{px}$.

Diaphragms providing lateral support to concrete or masonry walls shall have continuous ties between diaphragm chords to distribute into the diaphragm the anchorage forces specified in this section. Chords added to form subdiaphragms to transmit the anchorage forces to the main crossties shall be permitted. Diaphragm deformations shall be considered in the design of the supported walls.

1113.6 Overturning: Every building or structure shall be designed to resist the overturning effects caused by the earthquake forces specified in this section. The overturning moment at each story x shall be calculated as follows:

$$M_x = F_t(h_n - h_x) + \sum_{i=x}^{n} F_i\,(h_i - h_x)$$

The increment of overturning moment at each story shall be distributed to the resisting elements in the same proportion as the distribution of the horizontal shears. In tall buildings, the maximum overturning moment in any element shall be determined by multiplying M_x by a factor k depending on the location of the element, as follows:

k = 1.0 for the top 10 stories.

k = 0.8 for the 20th story from the top and those below.
k = A value between 1.0 and 0.8 determined by straight line interpolation for stories between the 10th and 20th stories below the top.

1113.6.1 Overturning moment distribution: Where other vertical members are provided which are capable of partially resisting the overturning moments, a redistribution to these members shall be permitted 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 a load to the foundation.

1113.7 Drift and building separation: Lateral deflections or drift of a story relative to adjacent stories, including any portions thereof caused by deflection of horizontal resisting elements, shall not exceed 0.005 times the story height (0.0025 in buildings with unreinforced masonry), unless it can be demonstrated that greater deformation can be tolerated. The horizontal displacement calculated from the application of the lateral forces shall be multiplied by $1/K$ to obtain the drift. The ratio $1/K$ shall be not less than 1.0.

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.

1113.8 Alternative determination and distribution of seismic forces: Nothing in Section 1113.0 shall be deemed to prohibit the submission of properly substantiated technical data for establishing the lateral forces and their distribution by elastic or inelastic dynamic analyses. In such analyses, the dynamic characteristics of the structure shall be considered, and the following principles shall be observed:

1. The base shear shall be not less than 90 percent of that computed in Section 1113.4.
2. Values of base shear consistent with K = 0.67 to 2.5 are applicable only if the structure is designed and detailed to be consistent with the requirements in Section 1113.9. Otherwise, the structure shall be designed for a base shear consistent with its ability to dissipate energy by inelastic cyclic straining, which will generally mean a value of K from 2.5 to 4.0 or greater.
3. The requirements of Section 1113.7 shall be satisfied using the forces prescribed in Section 1113.4.
4. The input to the dynamic analyses shall be either a smoothed response spectrum or a suite of ground-motion-time histories that reflect the characteristics of the structure and site and are approved by the code official. In either case, the input shall be scaled in accordance with the above three principles.

1113.9 Structural systems: The design of structural systems shall comply with the applicable provisions of Sections 1113.9.1 through 1113.9.6. Reinforced concrete members shall comply with the applicable provisions of Appendix A of ACI 318 listed in Appendix A as specified in this section and Section 1501.0.

1113.9.1 Bearing wall systems: Bearing wall systems shall use walls or braced frames as vertical elements for resistance to lateral seismic force. Horizontal elements of the seismic force-resisting system shall be diaphragms or trusses. The factor K depends on the type of wall, as shown in Table 1113.4.3. Where the framing systems along two orthogonal axes are different, the factor K for both directions shall be taken as 1.0, 1.33 or 4.0 as appropriate.

1113.9.2 Building-frame systems: Building-frame systems designed using a factor $K = 1.0$ shall have an essentially complete frame conforming to the requirements of the *AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings,* or ACI 318 listed in Appendix A, supporting all gravity loads, and shall have shear walls or vertical bracing trusses to resist the earthquake lateral force.

1113.9.3 Moment-resisting frame systems: Moment-resisting frame systems shall be designed in accordance with the applicable provisions of Sections 1113.9.3.1 through 1113.9.3.4.

1113.9.3.1 Connections in steel frames: Beam-to-column connections in steel moment-resisting frames shall develop the joint capacity determined by the strength of members framing into the joint unless it can be shown that adequate rotation can be obtained by deformations of the connection materials and that the added drift is taken into account.

1113.9.3.2 Ordinary steel frames: Moment-resisting steel frame systems designed using a factor $K = 1.0$ shall have a frame conforming to the requirements of the AISC *Specification for the Design, Fabrication and Erection of Structural Steel for Buildings* listed in Appendix A.

1113.9.3.3 Special frames: Systems designed using a factor $K = 0.67$ shall have special moment-resisting space frames conforming to the requirements of AISC *Specification for the Design, Fabrication and Erection of Structural Steel for Buildings* Part II, Sections 2.7, 2.8, and 2.9, listed in Appendix A, or Sections A.2 through A.8 of ACI 318 listed in Appendix A. Steel members in special moment-resisting frame systems shall be composed of A36, A441, A500 (Grades B and C), A501, A529, A572 (Grades 42 through 55), or A588 structural steel.

1113.9.3.4 Semi-ductile concrete frames: Buildings in Seismic Zone 2, and buildings in Seismic Zone 1 with an importance factor I of 1.5, using a semi-ductile concrete moment-resisting space frame conforming to the requirements of Section A.9 of ACI 318 listed in Appendix A, shall use a K of not less than 1.0.

1113.9.4 Dual systems: Dual systems shall be designed in accordance with the applicable provisions of Sections 1113.9.4.1 and 1113.9.4.2.

1113.9.4.1 Dual systems with special frames: Dual systems designed with special frames using a factor $K = 0.8$ shall have special moment-resisting space frames conforming to Section 1113.9.3.3 that are capable of supporting all gravity loads and resisting at least 25 percent of the prescribed seismic

forces. The total seismic force shall be distributed to the various resisting systems and elements in proportion to their relative rigidities.

1113.9.4.2 Dual systems with semi-ductile concrete frames: In Seismic Zone 2, and for buildings having an importance factor I of 1.5 in Seismic Zone 1, dual systems designed using a factor $K = 1.0$ shall have semi-ductile moment-resisting concrete space frames conforming to the requirements of Section 1113.9.3.4 that are capable of supporting all gravity loads and resisting at least 25 percent of the prescribed seismic forces. The total seismic force shall be distributed to the various resisting systems and elements in proportion to their relative rigidities.

1113.9.5 Braced frames: In Seismic Zones 3 and 4, and for buildings having an importance factor I greater than 1.0 and located in Seismic Zone 2, all members in braced frames shall be designed for 1.25 times the force determined in accordance with Section 1113.4. Steel members in braced frames shall be limited to those grades listed in Section 1113.9.3.3. Reinforced concrete members in braced frames shall be provided with the transverse confinement reinforcement required in Section 1113.9.3.3.

1113.9.6 Substructures: In structures where $K = 0.67$ or 0.80, the special ductility requirements for structural steel or reinforced concrete specified in Section 1113.9.3.3 shall apply to all structural elements at the base level and in the first story below the base which are required to transmit to the foundation the forces resulting from lateral loads.

In structures containing semi-ductile concrete frames where $K = 1.0$, the ductility requirements specified in Section 1113.9.3.4 shall apply to all frame elements at the base level and in the first story below the base which are required to transmit to the foundation the forces resulting from lateral loads.

1113.10 Lateral forces on elements of structures and nonstructural components: Parts or portions of buildings or structures, nonstructural components, and their anchorage to the main structural system shall be designed for lateral forces in accordance with the following formula:

$$F_p = ZIC_pW_p$$

The values of C_p are in Table 1113.10. The value of I shall be as given in Table 1113.1. The value of I for anchorage of machinery and equipment required for life safety systems shall be 1.5 for all buildings.

The distribution of these forces shall be according to the gravity loads pertaining thereto.

Table 1113.10
HORIZONTAL FORCE FACTOR, C_p, FOR ELEMENTS OF STRUCTURES AND NONSTRUCTURAL COMPONENTS

Part or portion of building	Direction of horizontal force	Value of C_p
Exterior bearing and nonbearing walls, interior bearing walls and partitions, interior nonbearing walls and partitions, masonry or concrete fences over 6 feet in height	Normal to flat surface	0.3[a]

Table 1113.10 (cont'd.)
HORIZONTAL FORCE FACTOR, C_p, FOR ELEMENTS
OF STRUCTURES AND NONSTRUCTURAL COMPONENTS

Part or portion of building	Direction of horizontal force	Value of C_p
Cantilever elements:		
Parapets	Normal to flat surface	0.8
Chimneys or stacks	Any direction	0.8
Exterior and interior ornamentations and appendages.	Any direction	0.8
When connected to part of, or housed within, a building:		
Penthouses, anchorage and supports for chimneys, and stacks and tanks, including contents.	Any direction	0.3[b, c]
Storage racks with upper storage level at more than 8 feet in height, plus contents.	Any direction	0.3[b, c]
All equipment or machinery.	Any direction	0.3[b, c, f]
Supports and equipment bracing racks and piping for HPM use facilities	Any direction	0.45
Suspended ceiling framing systems (applies to Seismic Zones 2, 3 and 4 only)	Any direction	0.3[d]
Connections for prefabricated structural elements other than walls, with force applied at center of gravity of assembly.	Any direction	0.3[e]

Note a. C_p required for elements laterally self-supported only at the ground level shall be two-thirds of value shown.

Note b. W_p for storage racks shall be the weight of the racks plus contents. The value of C_p for racks over two storage support levels in height shall be 0.24 for the levels below the top two levels.

Where a number storage rack units are interconnected so that there are a minimum of four vertical elements in each direction on each column line designed to resist horizontal forces, the minimum design coefficients shall be the same as for a building with K values from Table 1113.4.3; CS = 0.2 for use in the formula, $V = ZIKCSW$; and W equal to the total dead load plus 50 percent of the rack-rated capacity.

Note c. For flexible and flexibly-mounted equipment and machinery, the appropriate values of C_p shall be determined with consideration given to both the dynamic properties of the equipment and machinery and to the building or structure in which it is placed but shall be not less than the listed values. The design of the anchorage of the equipment and machinery is an integral part of the design and specification of such equipment and machinery.

For essential facilities described in Table 1113.1 and life safety systems described in Section 602.11, the design and detailing of equipment that must remain in place and be functional following a major earthquake shall consider drifts in accordance with Section 1113.14.

Note d. Ceiling weight shall include all light fixtures and other equipment that is laterally supported by the ceiling. For purposes of determing the lateral force, a ceiling weight of not less than 4 lb/ft^2 shall be used.

Note e. The force shall be resisted by positive anchorage and not by friction.

Note f. Seismic restraints shall not be required for the following installations:

1. Gas piping less than 1-inch inside diameter.
2. Piping in boiler and mechanical rooms less than 1¼-inch inside diameter.
3. All other piping less than 2½-inch inside diameter.
4. All electrical conduit less than 2½-inch inside diameter.
5. All rectangular air-handling ducts less than 6 square feet in cross-sectional area.
6. All round air-handling ducts less than 28 inches in diameter.
7. All piping suspended by individual hangers 12 inches or less in length from the top of the pipe to the bottom of the support for the hanger.
8. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of the support for the hanger.

Note g. 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 pound per square foot = 4.882 kg/m^2; 1 square foot = .093 m^2.

1113.11 Connections: Connections shall comply with the requirements of Sections 1113.11.1 through 1113.11.5.

1113.11.1 Anchorage of concrete or masonry walls: Concrete or masonry walls shall be anchored to all floors and roofs that provide lateral support for the wall. Such anchorage shall provide a positive direct connection capable of resisting the horizontal forces specified in Section 1113.10.

1113.11.2 Load paths: All parts of the building or structure that transmit seismic force shall be connected through a continuous path to the resisting element. At a minimum, the connection and the elements along the path to the resisting element shall be capable of resisting a force equal to $0.15ZI$ or 0.05, whichever is greater, times the weight of the portion being connected.

1113.11.3 Exterior panels: Precast or prefabricated nonbearing, nonshear wall panels or similar elements that are attached to or enclose the exterior shall be designed to resist the forces determined in Section 1113.10, and shall accommodate movements of the structure resulting from lateral forces or temperature changes. The concrete panels or other similar elements shall be supported by means of cast-in-place concrete or mechanical connections and fasteners in accordance with the following provisions:

1. Connections and panel joints shall allow for a relative movement between stories of not less than $3.0/K$ times the calculated elastic story displacement caused by required seismic forces or ½ inch (13 mm), whichever is greater. Connections to permit movement in the plane of the panel for story drift shall be properly designed sliding connections using slotted or oversized holes or connections that permit movement by bending of steel or other connections providing equivalent sliding or ductility capacity, or both.
2. Bodies of connectors shall have sufficient ductility and rotation capacity so as to preclude fracture of the concrete or brittle failures at or near welds.
3. The body of the connector shall be designed for one and one-third times the force determined in Section 1113.10. Fasteners attaching the connector to the panel or the structure, such as bolts, inserts, welds, dowels, and similar fasteners, shall be designed to ensure ductile behavior of the connector or shall be designed for four times the load determined in Section 1113.10.
4. Fasteners embedded in concrete shall be attached to or hooked around reinforcing steel or otherwise terminated so as to effectively transfer forces to the reinforcing steel.
5. The value of the factor I for the entire connector assembly shall be 1.0 when applying the requirements of Section 1113.10.

1113.11.4 Foundation ties: Individual pile caps and caissons of every building or structure in Seismic Zones 2, 3, and 4 shall be interconnected by ties at approximately right angles, unless it can be demonstrated that equivalent restraint can be provided by frictional and passive soil resistance or other approved methods. The design of the piles or ties shall carry the induced lateral forces, with a minimum horizontal force equal to $0.10ZI$ times the vertical loading on the pile cap or caisson.

1113.11.5 Braced frames: In braced frames, connections shall be designed to develop the full capacity of the members or shall be based on the forces specified in Section 1113.9.5 without the one-third increase usually permitted for stresses resulting from earthquake forces.

1113.12 Nonseismic-resisting structural members: In Seismic Zones 3 and 4, and for buildings with an importance factor I greater than 1.0 located in Seismic Zone 2, all framing elements not required by design to be part of the lateral force-resisting system shall be investigated and shown to be adequate for vertical load-carrying capacity and induced moment due to $3/K$ times the distortions resulting from the code-required lateral forces. The rigidity of other elements shall be considered in accordance with Section 1113.5.4.

1113.13 Moment-resisting frames: Where ordinary and special moment-resisting space frames are enclosed by, or adjoined by, more rigid elements that would tend to prevent the space frame from resisting lateral forces, substantiating information shall be submitted to show that the action or failure of the more rigid elements will not impair the vertical and lateral load-resisting ability of the space frame.

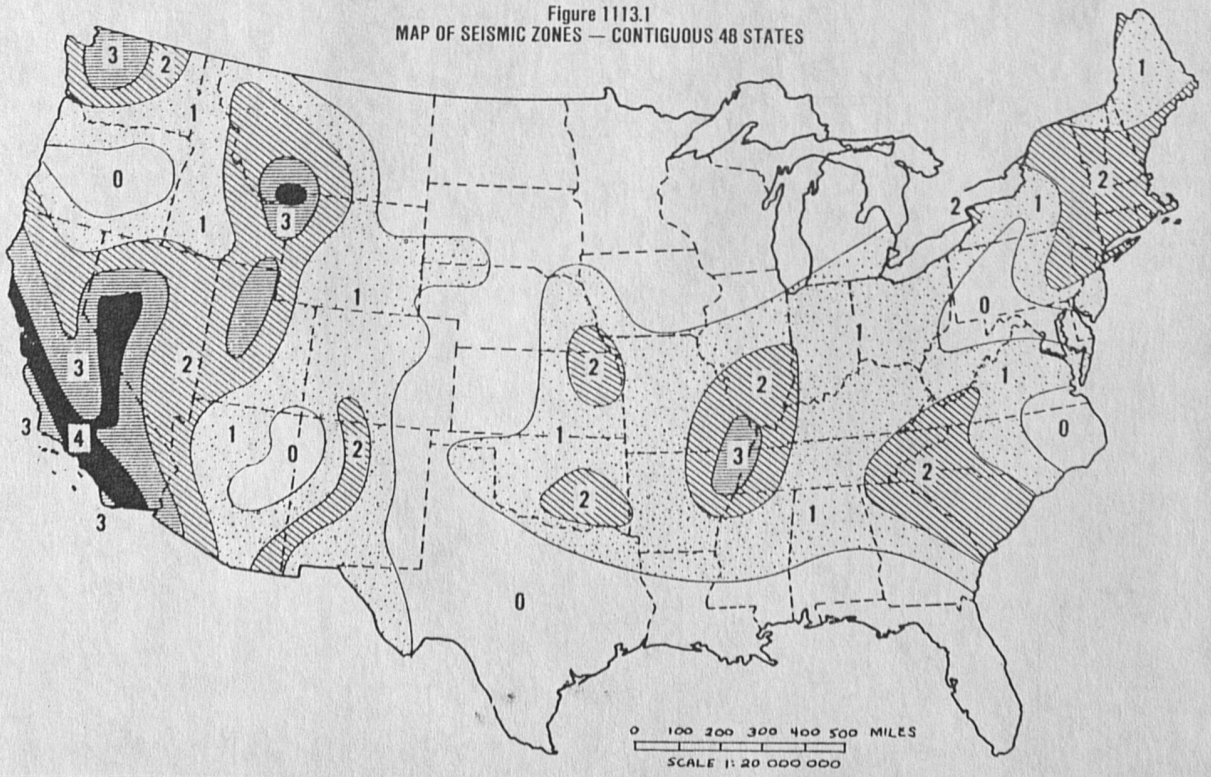
1113.14 Essential facilities: The design and detailing of equipment that must remain in place and be functional following a major earthquake shall be based on the requirements of Section 1113.10 and Table 1113.10. In addition, their design and detailing shall consider effects induced by structure drifts of not less than $2.0/K$ times the story drift caused by required seismic forces. Special consideration shall also be given to relative movements at separation joints.

SECTION 1114.0 COMBINATION OF LOADS

1114.1 General: Combinations of structural loads shall be considered in accordance with this section or in accordance with material design standards listed in Appendix A when such standards permit the strength design method and provide for other load combinations. Loads listed herein shall be considered to act in the following combinations, whichever produce the most unfavorable effects in the building, foundation, or structural member concerned, reduced when appropriate according to Section 1115.0. For combinations 1, 3, and 4 below, crane hook loads are not required to be combined with roof live load nor with more than three-fourths of the snow load or one-half of the wind load.

1. Dead plus floor live plus roof live (or snow).
2. Dead plus floor live plus wind (or seismic).
3. Dead plus floor live plus wind plus ½ snow.
4. Dead plus floor live plus snow plus ½ wind.
5. Dead plus floor live plus snow plus seismic. Snow loads over 30 psf (146 kg/m^2) shall not be reduced by more than 75 percent and all reductions shall be approved. Snow loads 30 psf (146 kg/m^2) or less are not required to be combined with seismic.

Figure 1113.1
MAP OF SEISMIC ZONES — CONTIGUOUS 48 STATES



Notes to Figure 1113.1(a)

Note a. The risk zone assigned herein shall supersede any general area designations as shown upon the face of the map.

Earthquake Risk Zone #1

Adair
Allen
Anderson
Barren
Bath
Bell
Boone
Bourbon
Boyd
Boyle
Bracken
Breathitt
Breckinridge
Bullitt
Butler
Campbell
Carroll
Carter
Casey
Christian
Clark
Clay
Clinton
Cumberland
Daviess
Edmonson
Elliott
Estill
Fayette
Fleming
Floyd
Franklin
Gallatin
Garrard
Grant
Grayson
Green
Greenup
Hancock
Hardin
Harlan
Harrison
Hart
Henry
Jackson
Jefferson
Jessamine
Johnson
Kenton
Knott
Knox
Larue
Laurel
Lawrence
Lee
Leslie
Letcher
Lewis
Lincoln
Logan
Madison
Magoffin
Marion
Martin
Mason
Meade
Menifee
Mercer
Metcalfe
Monroe
Montgomery
Morgan
Muhlenberg
McCreary
McLean
Nelson
Nicholas
Ohio
Oldham
Owen
Owsley
Pendleton
Perry
Pike
Powell
Pulaski
Robertson
Rockcastle
Rowan
Russell
Scott
Shelby
Simpson
Spencer
Taylor
Todd
Trimble
Warren
Washington
Wayne
Whitley
Wolfe
Woodford

Earthquake Risk Zone #2

Caldwell
Calloway
Crittenden
Henderson
Hopkins
Lyon
Trigg
Union
Webster

Earthquake Risk Zone #3

Ballard
Carlisle
Fulton
Graves
Hickman
Livingston
Marshall
McCracken

1114.2 Counteracting load: When the effects of design loads counteract one another in a structural member or joint, special care shall be exercised by the designer to ensure adequate safety for possible stress reversals.

1114.3 Stress increases: All minimum allowable stresses and soil bearing values specified in this code for working stress design shall be increased one-third when considering wind or earthquake forces either acting alone or when combined with vertical loads. An increase will not be allowed for vertical loads acting alone.

SECTION 1115.0 LIVE LOAD REDUCTION

1115.1 Permissible reduction: Except as otherwise indicated in Section 1115.2, the minimum required design live load for members having an influence area of 400 square feet (37.20 m²) or more shall be reduced in accordance with the following equations:

$$L = L_o \left(0.25 + \frac{15}{\sqrt{A_i}}\right) \text{ where;}$$

L = reduced design live load in pounds per square foot,

L_o = unreduced design live load in pounds per square foot from Table 1106,

A_i = influence area in square feet, taken as four times the tributary area for a column, two times the tributary area for a beam, and the panel area for a two-way slab.

1115.2 Limitations: The provisions of Sections 1115.2.1 through 1115.2.3 shall limit the applications of live load reductions permitted by this section.

1115.2.1 Maximum reduction: The reduced design live load permitted by Section 1115.1 shall not be less than 50 percent of the unreduced live load for members supporting one floor and not less than 40 percent of the unreduced live load for members supporting more than one floor.

1115.2.2 Live loads 100 psf or less: For live loads of 100 psf (488.20 kg/m²) or less, reduction shall not be made for buildings or portions thereof of Use Groups A and E, for public garages or open parking structures (except as indicated in Section 1115.2.3), for one-way slabs or for roofs (except as indicated in Section 1110.0).

1115.2.3 Live loads greater than 100 psf: For live loads which exceed 100 psf (488.20 kg/m²) and for Group 2 public garages and open parking structures, minimum design live loads on members supporting more than one floor shall be reduced by 20 percent.

ARTICLE 12

FOUNDATION SYSTEMS AND RETAINING WALLS

SECTION 1200.0 GENERAL

1200.1 Scope: The provisions of this article shall control the foundation design and construction of all buildings and structures 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.

SECTION 1201.0 BEARING VALUE OF SOILS

1201.1 Soil analysis: All applications for permits for the construction of new buildings or structures, and for the alteration of permanent structures which require changes in foundation loads and distribution shall be accompanied by a statement describing the soil in the ultimate bearing strata, including sufficient records and data to establish its character, nature and loadbearing capacity. Such records shall be certified by a licensed professional engineer or a licensed architect.

1201.2 Satisfactory foundation materials: Satisfactory bearing materials for spread footings shall include ledge rock on its natural bed; natural deposits of sand, gravel or firm clay, or a combination of such materials, provided they do not overlie an appreciable amount of peat, organic silt, soft clay or other objectionable materials.

1201.3 Presumptive bearing values: The maximum allowable pressure on supporting soils under spread footings at or near the surface shall not exceed the values specified in Table 1201 or the maximum allowable pressure shall be determined by field loading tests or as otherwise provided herein. Presumptive bearing values shall apply to all materials of similar physical characteristics and disposition. Surface values shall be adjusted for deep footings, and for the bearing strata under piles, as provided in this code. Where foundation piles are driven to penetrate into sound rock, the maximum allowable bearing values in Table 1201 shall be increased as prescribed in Section 1221.0.

1201.4 Lightweight structures: Mud, organic silt, or unprepared fill shall be assumed not to have presumptive bearing capacity unless approved by test, except where the bearing capacity is deemed adequate by the code official for the support of lightweight and temporary structures.

Table 1201
PRESUMPTIVE SURFACE BEARING VALUES OF FOUNDATION MATERIALS

	Class of material	Tons per square foot
1.	Massive crystalline bedrock including granite, diorite, gneiss, trap rock, hard limestone and dolomite	100
2.	Foliated rock including bedded limestone, schist and slate in sound condition	40
3.	Sedimentary rock including hard shales, sandstones, and thoroughly-cemented conglomerates	25
4.	Soft or broken bedrock (excluding shale), and soft limestone	10
5.	Compacted, partially-cemented gravels, and sand and hardpan overlying rock	10
6.	Gravel and sand-gravel mixtures	6
7.	Loose gravel, hard dry clay, compact coarse sand, and soft shales	4
8.	Loose, coarse sand and sand-gravel mixtures and compact fine sand (confined)	3
9.	Loose medium sand (confined), stiff clay	2
10.	Soft broken shale, soft clay	1.5

Note a. 1 ton per square foot = 9765 kg/m².

SECTION 1202.0 FOUNDATION INVESTIGATIONS

1202.1 When required: In the absence of satisfactory data from immediately adjacent areas, the owner or applicant shall make borings, test pits, or other soil investigations at such locations and to sufficient depths of the bearing materials to the satisfaction of the code official. For all buildings which are more than three stories or 40 feet (12192 mm) in height, and whenever it is proposed to use float, mat or any type of deep foundation, there shall be at least one exploratory boring to rock or to an adequate depth below the loadbearing strata for every 2,500 square feet (232.5 m²) of built-over area, and such additional tests that the code official requires. Where the safe sustaining power of the soil is in doubt, or superior bearing value than specified in this code is claimed, the code official shall direct that the necessary borings or tests be made.

1202.2 Soil samples: 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 by the code official. Wash or bucket samples shall not be approved.

1202.3 Varying soil values: When test borings indicate nonuniformity of bearing materials, a sufficient number of additional borings shall be made to establish strata levels of equal bearing capacity.

1202.4 Cost of tests: Costs of soil investigations shall be at the expense of the owner.

SECTION 1203.0 SOIL TEST PROCEDURE

1203.1 Soil test method: The test procedure and testing apparatus shall be

approved by the code official before they are used; and a complete record of the tests, together with a record of the soil profile, shall be filed by the licensed engineer or architect who shall have a fully-qualified representative on the site during all boring and test operations.

1203.2 Loaded areas: For spread footings, the soil shall be loaded at one or more places and at the required level or levels. The loaded area shall be approximately 4 square feet (0.37 m^2) for all bearing materials; except that when the footing overlies wet clay or other soft materials, the test load shall be applied to an area of not less than 10 square feet (0.93 m^2).

1203.3 Recorded settlements: Loads shall be applied in continuous increments of not more than one-fourth of the proposed safe load. When the proposed load has been reached, it shall remain undisturbed and readings shall be recorded to determine the rate of settlement until the settlement in eight consecutive hours is less than 0.01 inches (0.25 mm). A 50 percent excess load shall then be applied and allowed to remain in place until the rate of settlement is less than 0.01 inches (0.25 mm) in 24 hours.

1203.4 Accuracy of loading: Test loads applied by mechanical devices shall be automatically controlled so as to insure not more than 5 percent variation in applied load. Such devices shall be calibrated prior to the test.

1203.5 Test acceptance: The load settlement shall be represented diagramatically, and a test shall not be deemed satisfactory if the net settlement after removal of the test load exceeds 0.01 inches per ton (0.00028 mm/kg) of gross load applied.

SECTION 1204.0 ALLOWABLE FOUNDATION LOADS

1204.1 General: The maximum allowable loads under all types of foundations shall be limited as provided herein.

1204.2 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 10 feet (3048 mm) below the level of the footings to provide assurance of the soundness of the foundation bed and its bearing capacity.

1204.3 Increased rock capacity: The maximum presumptive bearing capacity of Class 1 or Class 2 rock shall be increased when the surface is leveled or benched; provided such increased safe capacity is determined by load tests on an area of not less than 1 square foot (0.093 m^2) in accordance with the provisions of Section 1203.0; but such loads shall not be increased to exceed the unit compressive stress permitted on reinforced concrete footings under the provisions of this code.

SECTION 1205.0 DEPTH OF FOOTINGS

1205.1 Frost protection: Except when erected upon solid rock or otherwise protected from frost, foundation walls, piers and other permanent supports of all buildings and structures larger than 100 square feet (9.30 m^2) in area or 10 feet (3048 mm) in height shall extend below the frost line of the locality or to

a minimum depth of twenty-four (24) inches, whichever is deeper, and spread footings of adequate size shall be provided when necessary to properly distribute the load within the allowable bearing value of the soil. Or, such structures shall be supported on piles or ranging timbers when solid earth to rock is not available. Footings shall not be founded on frozen soils unless such frozen condition is of a permanent character.

1205.2 Isolated footings: Footings on granular soil of Classes 5 to 10 inclusive in Table 1201 shall be so located that the line drawn between the lower edges of adjoining footings shall not have a steeper slope than 30 degrees (0.52 rad.) with the horizontal, unless the material supporting the higher footing is braced or retained or otherwise laterally supported in an approved manner or a greater slope has been properly established by engineering analysis.

1205.3 Floating mat: Floating mat foundations shall be located on permanently undisturbed soil of adequate bearing capacity. The code official shall approve a continuous foundation mat which is located directly on the ground when adequate subsoil drainage and a ratproof apron as specified in Section 2103.0 are provided. Where subject to freezing, the footings shall be designed to resist frost action.

SECTION 1206.0 FOOTING DESIGN

1206.1 Design loads: The full dead load including the weight of foundations, footings, and overlying fill, and the reduced live loads as specified in Section 1114.0, shall be used in designing footings.

1206.2 Pressure due to lateral loads: If the increased pressure on any footing due to wind, earthquake or other lateral loads does not exceed one-third of the dead and live load pressures alone, such loads are not required to be considered in the design. When such increased pressure is more than one-third, the lateral loads shall be considered in the design with a one-third increase in allowable soil pressure under the combined load.

1206.3 Earthquake loads: In localities subject to seismic disturbances, special provision shall be made in the foundation design to comply with the provisions of Section 1113.0.

1206.4 Vibratory loads: Where machinery operation or other vibrations are transmitted through the foundation, consideration shall be given in the footing design to prevent detrimental disturbances of the soil.

1206.5 Varying unit pressures: Footings shall be so designed that the unit soil pressure under the dead load shall be as uniform as possible under all parts of the building or structure. When necessary for stability in the structure due to settlement or varying soil conditions, approved variations are permitted in the unit pressure under different footings.

SECTION 1207.0 TIMBER FOOTINGS AND WOOD FOUNDATIONS

1207.1 Timber footings: Timber footings are permitted for buildings of Type 5

construction and as otherwise approved. Such footings shall be treated in accordance with AWPA C2 or C3 listed in Appendix A. Treated timbers are not required when placed entirely below permanent water level, or when used as capping for wood piles which project above the water level over submerged or marsh lands. The compressive stresses perpendicular to grain in untreated timber footings supported upon piles shall not exceed 70 percent of the allowable stresses for the species and grade of timber as specified in the NFoPA *National Design Specification for Wood Construction* listed in Appendix A.

1207.2 Pole buildings: Pole-type buildings shall be designed and erected in accordance with AWPI *Pole Building Design* listed in Appendix A. The poles shall be treated in accordance with AWPA C2 or C4 listed in Appendix A.

1207.3 Wood foundations: Wood foundation systems shall be designed and installed in accordance with NFoPA TR7 listed in Appendix A. All lumber and plywood shall be treated in accordance with AWPB-FDN listed in Appendix A and shall be identified as to conformance with such standards by an approved agency.

SECTION 1208.0 STEEL GRILLAGES

1208.1 General: All steel grillage beams shall be separated with approved steel spacers and shall be entirely encased in at least 3 inches (76 mm) of concrete and the spaces between the beams shall be completely filled with concrete or cement grout. When used on yielding soils, steel grillages shall rest on approved concrete beds not less than 6 inches (152 mm) thick.

SECTION 1209.0 CONCRETE FOOTINGS

1209.1 Concrete strength: Concrete in footings shall have a specified compressive strength of not less than 2,500 psi (1.76 kg/mm^2) at 28 days.

1209.2 Design: Concrete footings shall comply with Article 15 and ACI 318 listed in Appendix A.

1209.3 Thickness: The thickness of concrete footings shall comply with Sections 1209.3.1 and 1209.3.2.

1209.3.1 Plain concrete: In plain concrete footings, the edge thickness shall be not less than 8 inches (203 mm) for footings on soil; except that for buildings of Use Group R-3 and buildings less than two stories in height of Type 5 construction, the required edge thickness shall be reduced to 6 inches (152 mm) provided the footing does not extend beyond 4 inches (102 mm) on either side of the supported wall.

1209.3.2 Reinforced concrete: In reinforced concrete footings, the thickness above the bottom reinforcement shall be not less than 6 inches (152 mm) for footings on soil, nor less than 12 inches (305 mm) for footings on piles. The clear cover on reinforcement where the concrete is cast against the earth shall not be less than 3 inches (76 mm). Where concrete is exposed to soil after it has

been cast, the clear cover shall be not less than 1½ inches (38 mm) for reinforcement of No. 5 bars or ⅝-inch (16 mm) diameter wire or smaller, nor less than 2 inches (51 mm) for larger reinforcement.

1209.4 Deposition: Concrete footings shall not be poured through water unless otherwise approved. When poured under or in the presence of water, the concrete shall be deposited by approved means which insure minimum segregation of the mix and negligible turbulence of the water.

1209.5 Protection of concrete: Concrete footings shall be protected from freezing during depositing and for a period of not less than 5 days thereafter. Water shall not be allowed to flow through the deposited concrete.

1209.6 Forming of concrete: Concrete footings shall not be cast against the earth where, in the opinion of the code official, soil conditions warrant forming. When forming is required, it shall be in accordance with Chapter 6 of ACI 318 listed in Appendix A.

SECTION 1210.0 MASONRY UNIT FOOTINGS

1210.1 Dimensions: Masonry unit footings shall be laid in Type M or S mortar complying with Section 1409.0, and the depth shall be not less than twice the projection beyond the wall, pier or column. The width shall be not less than 8 inches (203 mm) wider than the wall supported thereon.

1210.2 Offsets: The maximum offset of each course in brick foundation walls stepped up from the footings shall be 1½ inches (38 mm) if laid in single courses, and 3 inches (76 mm) if laid in double courses.

SECTION 1211.0 MAT, RAFT AND FLOAT FOUNDATIONS

1211.1 General: Mat, raft and float foundations shall be used only when the applied loads of the building or structure are so arranged as to result in practically uniformly balanced loading, and the soil immediately below the mat is of uniform bearing capacity. The characteristics of the soil under the mat or raft shall be considered in the analysis of loading on mats and other continuous footings, and due allowance shall be made for possible concentrated soil pressures under heavily loaded columns.

SECTION 1212.0 PIER FOUNDATIONS

1212.1 Lateral dimensions and height: Except for buildings of Use Group R-3 and other light structures, the minimum dimension of isolated piers used as foundations shall be 2 feet (610 mm), and the height shall not exceed 12 times the least horizontal dimension, unless constructed of reinforced concrete or structural steel, or when entirely encased in steel shell at least ¼ inch (6 mm) thick. Approved heights greater than herein specified are permitted when surrounding foundation materials furnish adequate lateral support.

1212.2 Belled bottoms: Where pier foundations are belled at the bottom, the edge thickness of the bell shall be not less than that required for the edge of

footings. If the sides of the bell slope at an angle less than 60 degrees (1.05 rad) from the horizontal, the effects of vertical shear shall be considered.

1212.3 Plain concrete: Where the unsupported height of foundation piers exceeds six times the least dimension, the allowable working stress on piers of unit masonry or plain concrete shall be reduced in accordance with NBS 211 and ACI 318 listed in Appendix A.

1212.4 Reinforced concrete: Where constructed of reinforced concrete, spiral or vertical reinforcement in foundation piers shall conform to ACI 318 listed in Appendix A. When adequate lateral support is furnished by the surrounding materials as defined in Section 1214.0, the requirements for long columns shall be waived.

1212.5 Steel shell: Where concrete piers are entirely encased with a circular steel shell, and the area of the shell steel is considered as reinforcing steel, the steel shall be protected under the conditions specified in Section 1213.0. All horizontal joints in the shell shall be spliced to comply with Section 1213.0.

1212.6 Dewatering: Where piers are carried to depths below water level, the piers shall be constructed by a method which will insure accurate preparation and inspection of the bottom, and the depositing or construction of sound concrete or other masonry in the dry.

SECTION 1213.0 PILE FOUNDATIONS

1213.1 Investigation: Pile foundations shall be designed and installed on the basis of a foundation investigation and report which shall include borings, test pits or other subsurface exploration at locations and depths sufficient to determine the position and adequacy of the bearing soils, except where sufficient data upon which to base the design and installation is available. The investigation and report shall include, but not be limited to, the following:

1. Recommended pile types and installed capacities.
2. Driving criteria.
3. Installation and field inspection procedures.
4. Pile load test requirements.
5. Durability of pile materials.
6. Designation of bearing stratum or strata.

1213.2 Special types of piles: The use of types of piles not specifically mentioned herein is permitted, subject to approval, upon the submission of acceptable test data, calculations and other information relating to the structural properties and load capacity of such piles. The allowable stresses shall not in any case exceed the limitations specified herein.

1213.3 Protection of pile materials: Where boring records or site conditions indicate possible deleterious action on pile materials because of soil constituents, changing water levels or other factors, the pile materials shall be adequately protected by approved materials, methods or processes. Protective materials shall be applied to the piles so as not to be rendered ineffective by driving.

1213.4 Lateral support: Any soil other than fluid soil shall be deemed to afford sufficient lateral support to the pile to prevent buckling and to permit the design of the pile in accordance with the applicable provisions of this code. All piles standing unbraced in air, water or soils not capable of providing lateral support shall be designed as columns in accordance with the provisions of this code.

1213.5 Group action: In cohesive soils, the compressive load capacity of a group of friction piles shall be analyzed by an approved, rational method and, where such analysis indicates, the individual allowable pile load shall be reduced accordingly.

1213.6 Stability: All piles shall be braced to provide lateral stability in all directions. Three or more piles connected by a rigid cap shall be considered as being braced, provided that the piles are located in a radial direction from the centroid of the group, not less than 60 degrees (1.05 rad) apart. A two-pile group in a rigid cap shall be considered to be braced along the axis connecting the two piles. Methods used to brace piles shall be subject to approval.

Piles supporting walls shall be driven alternately in lines at least 1 foot (305 mm) apart and located symmetrically under the center of gravity of the wall load carried, unless effective measures are taken to provide for eccentricity and lateral forces, or the wall piles are adequately braced to provide for lateral stability. Where a single row of piles without lateral bracing is used for buildings of Use Group R-3 or for lightweight construction not exceeding two stories or 35 feet (10668 mm) in height, the centers of the piles shall be located within the width of the foundation wall.

1213.7 Structural integrity: Piles shall be installed in such a manner and sequence as to prevent distortion or damage to piles being installed or already in place, to the extent that such distortion or damage affects the structural integrity of the piles.

1213.8 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-quarters times the diagonal dimension of a rectangular pile. When driven to or penetrating into rock, the spacing shall be not less than 24 inches (610 mm). When receiving principal support from end bearing on materials other than rock, or through friction resistance, the spacing shall be not less than 30 inches (762 mm) except that for piles having enlarged bases formed either by compacting concrete or driving a precast base the minimum center-to-center spacing shall be 4½ feet (1372 mm). The spacing of piles shall be such that the average load on the supporting strata will not exceed the safe bearing value of those strata as determined by test borings or other approved methods.

1213.9 Splices: Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the pile during installation and subsequent thereto and shall be of adequate strength to transmit the vertical and lateral loads and moments occuring at the location of the splice during driving and under service loading. Splices shall develop not less than 50

percent of the least value of the pile in bending. In addition, all pile splices occurring in the upper 10 feet (3048 mm) of the embedded portion of the pile shall be capable of resisting at allowable working stresses the moment and shear that would result from an assumed eccentricity of the pile load of 3 inches (76 mm) or the pile shall be braced in accordance with Section 1213.6 to other piles that do not have splices in the upper 10 feet (3048 mm) of embedment.

1213.10 Pile caps: Pile caps shall be of reinforced concrete. The soil immediately below the pile cap shall not be considered as carrying any vertical load. The tops of all piles shall be embedded not less than 3 inches (76 mm) into pile caps and the caps shall extend at least 4 inches (102 mm) beyond the edges of all piles. The tops of all piles shall be cut back to sound material before capping.

1213.11 Preexcavation: The use of jetting, augering or other methods of preexcavation shall be subject to approval. Where approved, preexcavation shall be carried out in the same manner as used for piles subject to load tests and in such a manner that will not impair the carrying capacity of the piles already in place or damage adjacent structures. Pile tips shall be driven below the preexcavated depth until the required resistance or penetration is obtained.

1213.12 Inspection: An approved, qualified inspector shall be present when pile foundations are being installed or during tests. The inspector shall make and submit to the code official detailed records of the installation of each pile and the results of load tests. Records shall include the cutoff and tip elevation of each pile relative to a permanent reference.

1213.13 Identification: All pile materials shall be identified for conformity to the specified grade with this identification maintained continuously from the point of manufacture to the point of installation or shall be tested by an approved agency to determine conformity to the specified grade and the approved agency shall furnish an affidavit of compliance to the code official.

1213.14 Pile location plan: A plan showing the location and designation of all piles by an identification system shall be filed with the code official prior to installation of such piles. All detailed records for individual piles shall bear an identification corresponding to that shown on the plan.

1213.15 Use of existing piles: Piles left in place where a structure has been demolished shall not be used for the support of new construction unless satisfactory evidence is submitted to the code official indicating that the piles are sound and meet all the requirements of this code. Such piles shall be load tested or redriven to verify their capacities. The design load applied to such piles shall be the lowest allowable load as determined by tests or redriving data.

1213.16 Pile driveability: Pile cross sections shall be of sufficient size and strength to withstand driving stresses without damage to the pile, and to provide sufficient stiffness to transmit the required driving forces.

1213.17 Heaved piles: All piles that have heaved during the driving of adjacent piles shall be redriven as necessary to develop the required capacity and penetration, or the capacity of the pile shall be verified by load tests in accordance with Section 1214.4.

1213.18 Settlement analysis: The settlement of individual piles or groups of piles shall be estimated based upon approved methods of analysis. The predicted settlement shall not cause harmful distortion of, or instability in, the structure; nor shall it lead to any stresses exceeding allowable values.

1213.19 Use of vibratory drivers: Vibratory drivers shall only be used to install piles where the pile load capacity is verified by load tests in accordance with Section 1214.4. The installation of production piles shall be controlled according to power consumption and rate of penetration, or other approved means that assure pile capacities equal or exceeding that of test piles.

1213.20 Installation sequence: Piles shall be installed in such sequence to avoid compacting the surrounding soil to the extent that other piles cannot be installed properly, and to prevent ground movements that could damage adjacent structures.

SECTION 1214.0 ALLOWABLE PILE LOADS

1214.1 Determination of allowable loads: The allowable axial and lateral loads on piles shall be determined by an approved formula, load tests or method of analysis.

1214.2 Piles in subsiding areas: Where piles are driven through subsiding fills or other subsiding strata and derive support from underlying firmer materials, the downward friction forces which are imposed on the piles by the subsiding upper strata shall be included in the design.

1214.3 Driving formula: The allowable compressive load on any pile when determined by the application of an approved driving formula shall not exceed 40 tons (36287 kg). The formula load shall be determined for gravity drop or power-actuated hammers, and the hammer energy used shall be the maximum consistent with the size, strength and weight of the driven piles. The use of a follower shall be permitted only when approved. The introduction of fresh hammer cushion or pile cushion material just prior to final penetration shall not be permitted.

1214.4 Load tests: When greater compressive loads per pile than permitted by Section 1214.3 are desired or when the design load for any pile foundation is in doubt, control test piles shall be tested in accordance with ASTM D1143 listed in Appendix A. At least one pile shall be test loaded in each area of uniform subsoil conditions. When required by the code official, additional piles shall be load tested if necessary to establish the safe design capacity. The resulting allowable loads shall be not more than one-half of that test load which produces a permanent net settlement of not more than 0.01 inch per ton (0.00028 mm/kg) of test load, and not more than ¾ inch (19 mm). In

subsequent driving of the balance of foundation piles, all piles shall be deemed to have a supporting capacity equal to the control pile when such piles are of the same type, size and relative length as the test pile, are installed using the same or comparable methods and equipment as the test pile, are installed in similar subsoil conditions as the test pile, and when the rate of penetration of such piles is equal to or less than that of the test pile through a comparable driving distance.

1214.5 Use of higher allowable stresses: Allowable stresses greater than those specified for each pile type in this article shall be permitted when supporting data justifying such higher stresses are filed with the code official. Such substantiating data shall include a foundation investigation in accordance with Section 1213.1 and pile load tests in accordance with Section 1214.4, regardless of the load supported by the pile. The design and installation of the pile foundation shall be under the direct supervision of a registered professional engineer knowledgeable in the field of soil mechanics and pile foundations, who shall certify to the code official that the piles as installed satisfy the design criteria.

1214.6 Allowable lateral load: When required by the design, the lateral load capacity of a single pile or a pile group shall be determined by an approved method of analysis or by lateral load tests to at least twice the proposed design working load. The resulting allowable load shall be not more than one-half of that test load which produces a gross lateral movement of 1 inch (25 mm) at the ground surface.

1214.7 Uplift capacity: When required by the design, the uplift capacity of a single pile shall be determined in accordance with ASTM D3689 listed in Appendix A or an approved method of analysis based upon a minimum safety factor of three. The maximum allowable uplift load shall be one-half that load which produces an upward movement of the pile but equal to the gross elastic extension of the pile plus 0.1 inch (3 mm). For pile groups subjected to uplift, the allowable working uplift load for the group shall be the lesser of the proposed individual pile uplift working load times the number of piles in the group, or two-thirds of the effective weight of the pile group and the soil contained within a block defined by the perimeter of the group and the length of the pile.

1214.8 Bearing capacity: Individual piles and groups of piles shall develop ultimate load capacities of at least twice the design working loads in the designated bearing layers. Analysis shall show that the soil layer underlying the designated bearing layers does not cause the bearing capacity safety factor to be less than two.

1214.9 Bent piles: The load carrying capacity of piles discovered to have a sharp or sweeping bend shall be determined by an approved method of analysis or by load testing a representative pile.

1214.10 Overloads on piles: The maximum compressive load on any pile due to mislocation shall not exceed 110 percent of the allowable design load.

SECTION 1215.0 STRUCTURAL STEEL PILES

1215.1 Materials: Structural steel piles, steel pipe and fully-welded steel piles fabricated from plates shall conform to ASTM A36, A252, A283, A572 or A588 listed in Appendix A.

1215.2 Allowable stresses: The allowable design compressive stresses shall not exceed 0.35 of the minimum specified yield strength of the steel, except that maximum allowable design stresses shall be 0.50 of the minimum specified yield strength of steel where substantiated by Section 1214.5.

1215.3 Dimensions of H-piles: Sections of H-piles shall comply with the criteria of Sections 1215.3.1 through 1215.3.3.

1215.3.1 Flanges: The flange projections shall not exceed 14 times the minimum thickness of metal in either the flange or the web, and the flange widths shall be not less than 80 percent of the depth of the section.

1215.3.2 Depth: The nominal depth of the direction of the web shall be not less than 8 inches.

1215.3.3 Thickness: Flanges and web shall have a minimum nominal thickness of ⅜ inch.

1215.4 Dimensions of steel pipe piles: Steel pipe piles driven open-ended shall have a nominal outside diameter of not less than 10 inches and a minimum wall thickness of not less than ¼ inch (6 mm) for diameters less than 14 inches (356 mm), and of not less than ⅜ inch (10 mm) for diameters 14 inches (356 mm) and over. Where pipe of less wall thickness is driven open-ended, a suitable cutting shoe shall be provided.

SECTION 1216.0 CONCRETE-FILLED STEEL PIPE AND TUBE PILES

1216.1 Material: Steel pipe and tube piles shall conform to ASTM A252 or A283 listed in Appendix A. Concrete shall conform to Section 1217.1.1. The maximum size coarse aggregate shall be ¾ inch (19 mm).

1216.2 Allowable stresses: The allowable design compressive stresses in the concrete shall not exceed 0.33 of the 28-day specified compressive strength (f'_c). The allowable design compressive stress in the steel shall not exceed 0.35 of the minimum specified yield strength of the steel, except that the maximum allowable design compressive stress shall be 0.50 of the minimum specified yield strength of the steel where substantiated by Section 1214.5.

1216.3 Minimum dimensions: Piles shall have a nominal outside diameter of not less than 8 inches and a minimum wall thickness in accordance with Section 1215.4. For mandrel-driven pipe piles, the minimum wall thickness shall be 1/10 inch (3 mm).

1216.4 Reinforcement: Reinforcement steel shall conform to Section 1217.1.2. Reinforcement shall not be placed within 1 inch (25 mm) of the steel casing.

1216.5 Placing concrete: Placing of concrete shall conform to Section 1217.1.3.

SECTION 1217.0 CAST-IN-PLACE CONCRETE PILES

1217.1 General: The materials, reinforcement and installation of cast-in-place concrete piles shall conform to Sections 1217.1.1 through 1217.1.3.

1217.1.1 Material: All concrete shall have a 28-day specified compressive strength (f'_c) of not less than 2,500 psi (1.76 kg/ mm^2). When concrete is placed through a funnel hopper at the top of the pile, the concrete mix shall be designed and proportioned so as to produce a cohesive workable mix having a slump of not less than 4 inches (102 mm) and not more than 6 inches (152 mm). If concrete is to be pumped, the mix design including slump shall be adjusted to produce a pumpable concrete.

1217.1.2 Reinforcement: Except for steel dowels embedded 5 feet (1524 mm) or less in the pile and as provided in Section 1217.2 reinforcement when required shall be assembled and tied together and shall be placed in the pile as a unit before the reinforced portion of the pile is filled with concrete.

1217.1.3 Installation: Concrete shall be placed in such a manner as to insure the exclusion of any foreign matter and to secure a full-sized shaft. Concrete shall not be placed through water except when tremie methods are approved. When depositing concrete from the top of the pile, the concrete shall not be chuted directly into the pile but shall be poured in a rapid and continuous operation through a funnel hopper centered at the top of the pile.

1217.2 Drilled or augered uncased piles: Drilled or augered uncased piles shall conform to Sections 1217.2.1 through 1217.2.4.

1217.2.1 Allowable stresses: The allowable design stress in the concrete of drilled uncased piles shall not exceed 33 percent of the 28-day specified compressive strength (f'_c). The allowable design stress in the concrete of augered cast in place piles shall not exceed 25 percent of the 28-day specified compressive strength (f'_c).

1217.2.2 Dimensions: The pile length shall not exceed 30 times the average diameter. The minimum diameter shall be 12 inches (305 mm).

1217.2.3 Installation: If pile shafts are formed through unstable soils and concrete is placed in an open drilled hole, a steel liner shall be inserted in the hole prior to placing concrete. If the steel liner is withdrawn during concreting, the level of concrete shall be maintained above the bottom of the liner a sufficient height to offset any hydrostatic or lateral soil pressure.

If concrete is placed by pumping through a hollow-stem auger, the auger shall not be permitted to rotate during withdrawal and shall be withdrawn in a steady continuous motion. Concreting pumping pressures shall be measured and shall be maintained high enough at all times to offset hydrostatic and lateral earth pressures. Concrete volumes shall be measured to insure that the volume of concrete placed in each pile is equal to or greater than the theoretical volume of the hole created by the auger. If the installation process of any pile is interrupted or a loss of concreting pressure occurs, the pile shall be redrilled to original depth and reformed. Augered cast-in-place piles shall not

be installed within six pile diameters center-to-center of a pile filled with concrete less than 24 hours old unless approved. If the concrete level in any completed pile drops, the pile shall be rejected and replaced.

1217.2.4 Reinforcement: For piles installed with a hollow-stem auger, where longitudinal steel reinforcement is placed without lateral ties, the reinforcement shall be placed through ducts in the auger prior to filling the pile with concrete. All pile reinforcement shall have a concrete cover of not less than 2½ inches (64 mm).

1217.3 Driven uncased piles: Driven uncased piles shall conform to Sections 1217.3.1 through 1217.3.4.

1217.3.1 Allowable stress: The allowable design stress in the concrete shall not exceed 25 percent of the 28-day specified compressive strength (f'_c) applied to a cross-sectional area not greater than the inside area of the drive casing or mandrel.

1217.3.2 Dimensions: The pile length shall not exceed 30 times the average diameter. The minimum diameter shall be 12 inches (305 mm).

1217.3.3 Installation: Piles shall not be driven within six pile diameters center-to-center in granular soils or within one-half the pile length in cohesive soils of a pile filled with concrete less than 48 hours old, unless approved. If the concrete surface in any complete pile rises or drops, the pile shall be rejected and replaced. Piles shall not be installed in soils which could cause pile heave.

1217.3.4 Concrete cover: All pile reinforcement shall have a concrete cover of not less than 2½ inches (64 mm), measured from the inside face of the drive casing or mandrel.

1217.4 Enlarged base piles: Enlarged base piles shall conform to Sections 1217.4.1 through 1217.4.5.

1217.4.1 Materials: The maximum size for coarse aggregate for all concrete shall be ¾ inch (19 mm). Compacted concrete shall have a zero slump.

1217.4.2 Allowable stress: The maximum allowable design compressive stress for concrete not placed in a permanent steel casing shall be 25 percent of the 28-day specified compressive strength (f'_c). Where the concrete is placed in a permanent steel casing the maximum allowable concrete stress shall be 33 percent of the 28-day specified compressive strength (f'_c).

1217.4.3 Installation: Enlarged bases formed either by compacting concrete or driving a precast base shall be formed in or driven into granular soils. All piles shall be constructed in the same manner as successful prototype test piles driven for the project. Pile shafts extending through peat or other organic soil shall be encased in a permanent steel casing. If a cased shaft is used, it shall be adequately reinforced to resist column action or the annular space around the pile shaft shall be filled sufficiently to reestablish the lateral support of the soil. If pile heave occurs, the pile shall be rejected unless it can be demonstrated that the pile is undamaged and capable of carrying twice its design load.

1217.4.4 Bearing capacity: Pile bearing capacity shall be verified by load tests in accordance with Section 1214.4.

1217.4.5 Concrete cover: The minimum concrete cover shall be 2½ inches (64 mm) for uncased shafts and 1 inch (25 mm) for cased shafts.

1217.5 Steel cased piles: Steel cased piles shall comply with Sections 1217.5.1 through 1217.5.4.

1217.5.1 Material: Pile shells or casings shall be of steel and shall be sufficiently strong to resist collapse and sufficiently water-tight to exclude any foreign materials during the placing of concrete. Steel shells shall have a sealed tip with a diameter of not less than 8 inches (203 mm).

1217.5.2 Allowable stress: The allowable design compressive stress in the concrete shall not exceed 33 percent of the 28-day specified compressive strength (f'_c). The allowable concrete compressive stress shall be $0.40\,f'_c$ for that portion of the pile meeting the conditions specified in Sections 1217.5.2.1 through 1217.5.2.4.

1217.5.2.1 Thickness: The thickness of the steel shell is not less than No. 14 gage (0.0068 inch) minimum.

1217.5.2.2 Shell type: The shell is seamless or is provided with seams of strength equal to the basic material and is of a configuration which will provide confinement to the cast in place concrete.

1217.5.2.3 Strength: The ratio of steel yield strength (f_y) to design f'_c shall be not less than 6.

1217.5.2.4 Diameter: The nominal pile diameter is not greater than 16 inches.

1217.5.3 Installation: Piles shall have steel shells, mandrel-driven their full length in contact with the surrounding soil, left permanently in place and filled with concrete. A pile shall not be driven within four and one-half average pile diameters of a pile filled with concrete less than 24 hours old unless approved. Concrete shall not be placed in steel shells within heave range of driving.

1217.5.4 Reinforcement: Reinforcement shall not be placed within 1 inch (25 mm) of the steel shell. Reinforcing shall be considered necessary only for unsupported pile lengths or when the pile is designed to resist uplift or unbalanced lateral loads.

SECTION 1218.0 PRECAST CONCRETE PILES

1218.1 Design and manufacture: All piles shall be designed and manufactured in accordance with accepted practice, and to resist all stresses induced by handling, driving and service loads. The minimum lateral dimension shall be 10 inches (254 mm). All corners of square piles shall be chamfered. Longitudinal steel shall be arranged in a symmetrical pattern and shall be laterally tied with steel ties or wire spiral spaced not more than 3 inches (76 mm) apart, center-to-center, for a distance of 2 feet (610 mm) from the ends of the pile; and not more than 6 inches (152 mm) elsewhere except that at the ends of each pile the first five ties or spirals shall be spaced 1 inch (25 mm) center-to-center.

1218.1.1 Installation: All piles shall be handled and driven so as not to cause injury or overstressing which will affect their durability or strength.

1218.2 Reinforced piles: Reinforced precast concrete piles shall conform to Sections 1218.2.1 through 1218.2.5.

1218.2.1 Design: The minimum amount of longitudinal reinforcement shall be 2 percent of the concrete section and shall consist of at least four bars.

1218.2.2 Material: All concrete shall have a 28-day specified compressive strength (f'_c) of not less than 4,000 psi (2.81 kg/mm^2).

1218.2.3 Allowable stress: The allowable compressive stress in the concrete shall not exceed 33 percent of the 28-day specified compressive strength (f'_c) applied to the gross cross-sectional area of the pile.

1218.2.4 Concrete cover: All pile reinforcement shall have a concrete cover of not less than 2 inches (51 mm), except that piles exposed to sea water shall have a minimum protective concrete cover of 3 inches (76 mm).

1218.2.5 Installation: A precast concrete pile shall not be driven before the concrete has attained a compressive strength of at least 3,000 psi (2.11 kg/mm^2), but not less than such strength sufficient to withstand handling and driving forces.

1218.3 Prestressed piles: Prestressed concrete piles shall conform to Sections 1218.3.1 through 1218.3.4.

1218.3.1 Design: The effective prestress in the pile shall be not less than 700 psi (0.49 kg/mm^2).

1218.3.2 Material: Prestressing steel shall conform to ASTM A416 listed in Appendix A. All concrete shall have a 28-day specified compressive strength (f'_c) of not less than 5,000 psi (3.52 kg/mm^2).

1218.3.3 Allowable stress: The maximum allowable design compressive stress (f_c) in concrete shall be determined as follows:

$$f_c = 0.33\, f'_c - 0.27\, f_{pc}$$

where f_{pc} is the effective prestress on the gross area of pipe section.

1218.3.4 Installation: A prestressed pile shall not be driven before the concrete has attained a compressive strength of at least 4,000 psi (2.81 kg/mm^2), but not less than such strength sufficient to withstand handling and driving forces.

SECTION 1219.0 TIMBER PILES

1219.1 Materials: Timber piles shall conform to ASTM D25 listed in Appendix A.

1219.2 Preservative treatment: Timber piles used to support permanent structures shall be treated in accordance with this section unless it is established that the tops of untreated timber piles will be below lowest ground water level assumed to exist during the life of the structure. Preservative and minimum final retention shall be in accordance with AWPA C3 listed in Appendix A.

When timber piles are used in salt water, the treatment shall conform to AWPB MP1, MP2 or MP4 listed in Appendix A. Pile cutoffs shall be treated in accordance with AWPA M4 listed in Appendix A.

1219.3 Allowable stresses: The allowable stresses for treated round timber piles shall not exceed those set forth in Table 1219.3 and as provided for in Sections 1219.3.1 and 1219.3.2.

1219.3.1 Stress increase: The allowable unit stresses in compression parallel to grain for Pacific coast Douglas fir and Southern pine shall be increased 0.2 percent for each foot (305 mm) of length from the tip of the pile to the critical section. The increase shall not exceed 10 percent for any pile. The stress increase is cumulative with increase in section properties due to pile taper.

1219.3.2 Dried or untreated piles: The working stresses in Table 1219.3 have been adjusted to compensate for strength reductions due to conditioning prior to treatment. Where piles are air-dried or kiln-dried prior to pressure treatment, or where untreated piles are to be used, the compression, bending and shear stresses shall be increased by multiplying the tabulated values by the following factors:

Pacific coast Douglas fir, red oak, red pine 1.11
Southern pine 1.18

Table 1219.3
ALLOWABLE UNIT STRESSES[a] FOR TREATED ROUND TIMBER
PILES, NORMAL LOAD DURATION — VALUES AT TIP OF PILE (see Section 1219.3.2)

Species	Compression parallel to grain psi	Bending psi	Shear horiz. psi	Comp. perp. to grain psi	Modulus of elasticity
Pacific coast Douglas fir (see Section 1219.3.1)	1,250	2,450	115	230	1,500,000
Red oak — northern and southern	1,100	2,450	135	350	1,250,000
Red pine (grown in the United States)	900	1,900	85	155	1,280,000
Southern pine — longleaf, slash, loblolly and shortleaf (see Section 1219.3.1)	1,200	2,400	110	250	1,500,000

Note a. 1 psi = 0.000703 kg/mm².

1219.4 End bearing piles: Any sudden decrease in driving resistance of an end bearing timber pile shall be investigated with regard to the possibility of damage. If the sudden decrease in driving resistance cannot be correlated to bearing data, the pile shall be removed for inspection or rejected.

SECTION 1220.0 COMPOSITE PILES

1220.1 Design: Composite piles consisting of two or more approved pile types

shall be designed to meet the conditions of installation.

1220.2 Limitation of load: The maximum allowable load shall be limited by the capacity of the weakest section incorporated in the pile.

1220.3 Splices: Splices between concrete and steel or wood sections shall be designed to prevent separation 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 50 percent of the tension and bending strength of the weaker section.

SECTION 1221.0 CAISSON PILES

1221.1 Construction: Caisson piles shall consist of a shaft section of concrete-filled pipe extending to bedrock with an uncased socket drilled into the bedrock and filled with concrete. The caisson pile shall have a full-length structural steel core or a stub core installed in the rock socket and extending into the pipe portion a distance equal to the socket depth.

1221.2 Design: The depth of the rock socket shall be sufficient to develop the full loadbearing capacity of the caisson pile with a minimum safety factor of two, but the depth shall be not less than the outside diameter of the pipe. The design of the rock socket is permitted to be predicated on the sum of the allowable bearing pressure on the bottom of the socket plus bond along the sides of the socket. The minimum outside diameter of the caisson pile shall be 18 inches (457 mm), and the diameter of the rock socket shall be approximately equal to the inside diameter of the pile.

1221.3 Material: Pipe and steel cores shall conform to the material requirements in Section 1215.0. Pipe shall have a minimum wall thickness of ⅜ inch (10 mm) and shall be fitted with a suitable steel driving shoe welded to the bottom of the pipe. All concrete shall have a 28-day specified compressive strength (f'_c) of not less than 4,000 psi (2.81 kg/mm²). The concrete mix shall be designed and proportioned so as to produce a cohesive workable mix with a slump of from 4 inches (102 mm) to 6 inches (152 mm).

1221.4 Structural core: The gross cross-sectional area of the structural steel core shall not exceed 25 percent of the gross caisson section. The minimum clearance between the structural core and the pipe shall be 2 inches (51 mm). If cores are to be spliced, the ends shall be milled or ground to provide full contact and shall be full-depth welded.

1221.5 Allowable stresses: The allowable design compressive stresses shall not exceed the following: concrete, $0.33f'_c$; steel pipe, $0.35f_y$; structural steel core, $0.50f_y$.

1221.6 Installation: The rock socket and pile shall be thoroughly cleaned of all foreign materials before filling with concrete. Steel cores shall be bedded in cement grout at the base of the rock socket. Concrete shall not be placed through water except when tremie methods are approved.

SECTION 1222.0 FOUNDATION WALLS

1222.1 Design: Foundation walls shall be designed to resist frost action and to support safely all vertical and lateral loads as provided in Article 11. The maximum stresses due to combined loads 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.

1222.2 Minimum thickness: The thickness of foundation walls shall be not less than the thickness of the wall supported, and the minimum thickness shall be limited for the various materials of construction as herein specified. Eight-inch foundation walls shall be permitted under brick veneered frame and under 10-inch cavity walls when the total height of the wall supported, including gables, is not more than 20 feet (6096 mm).

1222.2.1 Reinforced concrete: When reinforced concrete is required to resist all stresses, foundation walls shall be not less than 8 inches thick.

1222.2.2 Hollow and solid unreinforced masonry and plain concrete: The thickness of unreinforced masonry foundation walls shall not be less than shown in Table 1222.2.2 for the type of foundation and superstructure construction used. The maximum depth below grade shall be increased up to that indicated in parentheses in Table 1222.2.2 where such increase is warranted by soil conditions and local experience, and is approved. Where height of unbalanced fill (height of finish grade above basement floor or inside grade) exceeds 7 feet (2134 mm), foundation wall thickness shall be determined by structural analysis as required in Section 1223.2.

Table 1222.2.2
THICKNESS OF FOUNDATION WALLS

Foundation wall construction		Maximum depth below grade (feet)[a] (see Section 1222.2.2) Supported wall construction		
Type	Thickness (inches) (see Section 1222.2.2)	Frame	Masonry veneer	Masonry
Hollow masonry (unreinforced)	8	4 (6)	4.5 (6)	5 (7)
	10	5 (7)	5.5 (7)	6 (7)
	12	7	7	7
Solid masonry (unreinforced)	8	5 (7)	5.5 (7)	6 (7)
	10	6 (7)	6 (7)	6.5 (7)
	12	7	7	7
Plain concrete	8	7	7	7

Note a. 1 foot = 304.8 mm.

1222.2.3 Hollow unit walls: Foundation walls of approved hollow masonry units shall be provided with not less than 4 inches (102 mm) of solid masonry at girder bearings, or shall be strengthened with buttresses.

1222.2.4 Rubble stone: Foundation walls of rough or random rubble stone shall not be less than 16 inches (406 mm) thick.

1222.2.5 Bonding: All foundation walls shall be bonded as required for superstructure walls in Section 1411.0.

1222.3 Increased thickness with depth: When any foundation wall, other than a wall that is designed as a retaining wall, extends more than 12 feet (3658 mm) below the top of the first floor beams, the thickness of the wall shall be increased 4 inches (102 mm) for each additional 12 feet (3658 mm) or fraction thereof in depth.

1222.4 Corbels on 8-inch walls: Where an 8-inch wall is corbeled, the top corbel shall be a full course of headers at least 6 inches in length, extending not higher than the bottom of the floor framing. The maximum projection of one unit shall exceed neither one-half the depth of the unit nor one-third its width at right angles to the face which is offset.

1222.5 Lateral stability: Foundation walls of buildings and structures which serve as retaining walls shall conform to the applicable requirements of Section 1223.0, and shall be strengthened with buttresses or additional wall thickness to resist lateral soil and hydrostatic pressure when subjected thereto.

SECTION 1223.0 RETAINING WALLS

1223.1 General: Walls built to retain or support the lateral pressure of earth or water or other superimposed loads shall be designed and constructed of approved masonry, reinforced concrete, steel sheet piling or other approved materials within the allowable stresses specified in this code (see Section 1712.3.3).

1223.2 Design: Retaining walls shall be designed to resist the pressure of the retained material, including both dead and live load surcharges to which they are subjected, and to insure stability against overturning, sliding, excessive foundation pressure and water uplift.

1223.3 Hydrostatic pressure: Unless drainage is provided, the hydrostatic head of water pressure shall be assumed equal to the height of the wall.

1223.4 Coping: All masonry retaining walls other than reinforced concrete walls shall be protected with an approved coping.

1223.5 Guardrails: When retaining walls with a difference in grade level on either side of the wall in excess of 4 feet (1219 mm) are located closer than 2 feet (610 mm) to a walk, path, parking lot or driveway on the high side, such retaining walls shall be provided with a guard constructed in accordance with Section 827.0 or other approved protective measures.

SECTION 1224.0 WATERPROOFING AND DAMPPROOFING

1224.1 Where required: Walls or portions thereof, retaining earth and enclosing interior spaces and floors below grade shall be waterproofed and dampproofed according to this section except those spaces containing uses other than residential and institutional where such omission is not detrimental to the building or occupancy.

1224.1.1 Story above grade: Where a basement is considered a story above grade and the ground level adjacent to the basement wall is below the floor elevation for not less than 25 percent of the perimeter, the floor and walls shall be dampproofed in accordance with Section 1224.3 and a foundation drain shall be installed in accordance with Section 1224.5.2. The foundation drain shall be installed around the portion of the perimeter where the basement floor is below ground level. The provisions of Sections 1224.2, 1224.4, and 1224.5.1 shall not apply in this case.

1224.1.2 Underfloor space: The finished ground level of an underfloor space such as a crawl space shall not be located below the bottom of the footings. Where there is evidence that the ground water table can rise to within 6 inches (152 mm) of the ground level at the outside building perimeter or where there is evidence that the surface water does not readily drain from the building site, the ground level of the underfloor space shall be as high as the outside finished ground level, unless an approved drainage system is provided. The provisions of Sections 1224.2, 1224.3, 1224.4, 1224.5, and 1224.6 shall not apply in this case.

1224.2 Ground water table investigation: The owner or applicant shall perform a subsurface soil investigation to determine the possibility of the ground water table rising above the proposed elevation of the floor or floors below grade.

Exception: A subsurface soil investigation shall not be required when:

1. Waterproofing is to be provided.
2. Satisfactory data from adjacent areas is available which demonstrates that ground water has not been a problem.
3. Floodproofing is to be provided in accordance with Section 2102.0.

1224.2.1 Ground water control: Where the ground water table is lowered and maintained at an elevation not less than 6 inches (152 mm) below the bottom of the lowest floor, the floor and walls shall be dampproofed in accordance with Section 1224.3. The design of the system to lower the ground water table shall be based upon accepted principles of engineering which shall consider, but not necessarily be limited to: permeability of the soil, rate at which water enters the drainage system, rated capacity of pumps, head against which pumps are to pump and the rated capacity of the disposal area of the system.

1224.3 Dampproofing required: Where hydrostatic pressure will not occur as determined by Section 1224.2, floors and walls for other than wood foundation systems shall be dampproofed in accordance with this section. Wood foundation systems shall be constructed in accordance with NFoPA TR7 listed in Appendix A.

1224.3.1 Floor applications: The required dampproofing materials shall be installed between the floor and the base as provided by Section 1224.5.1, except where a separate floor is provided above a concrete slab.

1224.3.1.1 Floor dampproofing materials: Where installed beneath the slab, dampproofing shall consist of not less than 6-mil (.006 inch; 152 μm) polyethy-

lene with joints lapped not less than 6 inches (152 mm), or other approved methods or materials. Where permitted to be installed on top of the slab, dampproofing shall consist of mopped-on bitumen, not less than 4-mil (.004 inch; 102 μm) polyethylene, or other approved methods or materials. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's recommendations.

1224.3.2 Walls: Dampproofing materials shall be installed on the exterior surface of walls, and shall extend from the top of the footing to above ground level.

1224.3.2.1 Surface preparation of walls: Prior to application of dampproofing materials on concrete walls, all holes and recesses resulting from the removal of form ties shall be sealed with a bituminous material or other approved methods or materials. Unit masonry walls shall be parged on the exterior surface below ground level with not less than ⅜ inch (10 mm) of portland cement mortar. The parging shall be coved at the footing.

Exception: Parging of unit masonry walls is not required where a material is approved for direct application to the masonry.

1224.3.2.2 Wall dampproofing materials: Dampproofing shall consist of a bituminous material, any of the materials permitted for waterproofing by Section 1224.4.2.2, or other approved methods or materials.

1224.4 Waterproofing required: Where the ground water investigation required by Section 1224.2 indicates that a hydrostatic pressure condition exists, walls and floors shall be waterproofed in accordance with this section.

1224.4.1 Floors: Floors required to be waterproofed shall be of concrete, designed and constructed to withstand the hydrostatic pressure to which they will be subjected.

1224.4.1.1 Floor waterproofing materials: Waterproofing shall be accomplished by placing a membrane of rubberized asphalt, butyl rubber, neoprene, or not less than 6-mil (.006 inch; 152 μm) polyvinyl chloride or polyethylene with joints lapped not less than 6 inches (152 mm), or other approved materials under the slab. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's recommendations.

1224.4.2 Walls: Walls required to be waterproofed shall be of concrete or masonry designed and constructed to withstand the hydrostatic pressure and other lateral loads to which they will be subjected.

1224.4.2.1 Surface preparation of walls: Prior to the application of waterproofing materials on concrete or masonry walls, the walls shall be prepared in accordance with Section 1224.3.2.1.

1224.4.2.2 Wall waterproofing materials: Waterproofing shall be applied from the bottom of the wall to not less than 12 inches (305 mm) above the maximum elevation of the ground water table. The remainder of the wall shall be dampproofed in accordance with Section 1224.3.2.2. Waterproofing shall consist of two-ply hot mopped felts, not less than 6-mil (.006 inch; 152 μm)

polyvinyl chloride or other approved methods or materials capable of bridging nonstructural cracks. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's recommendations.

1224.4.3 Joints and penetrations: Joints in walls and floors, and between the wall and floor, and penetrations of the wall and floor, shall be made watertight utilizing approved methods and materials.

1224.5 Subsoil drainage system: Where a hydrostatic pressure condition does not exist, dampproofing shall be provided and a base shall be installed under the floor and a drain installed around the foundation perimeter. A subsoil drainage system designed and constructed in accordance with Section 1224.2.1 shall be deemed adequate for lowering the ground water table.

1224.5.1 Floor base: Floors of basements except as provided in Section 1224.1.1 shall be placed over a base course not less than 4 inches (102 mm) in thickness consisting of gravel or crushed stone containing not more than 10 percent of material that passes a No. 4 sieve.

1224.5.2 Foundation drain: A drain shall be placed around the perimeter of a foundation consisting of gravel or crushed stone containing not more than 10 percent material that passes a No. 4 sieve. The drain shall extend a minimum of 12 inches (102 mm) beyond the outside edge of the footing. The thickness shall be such that the bottom of the drain is not higher than the bottom of the base under the floor, and the top of the drain is not less than 6 inches (152 mm) above the top of the footing. The top of the drain shall be covered with an approved filter membrane material. Where a drain tile or perforated pipe is used, the invert of the pipe or tile shall be not higher than the floor elevation. The top of joints or the top of perforations shall be protected with an approved filter membrane material. The pipe or tile shall be placed on not less than 2 inches (51 mm) of gravel or crushed stone complying with Section 1224.5.1 and covered with not less than 6 inches (152 mm) of the same material.

1224.5.3 Drainage disposal: The floor base and foundation perimeter drain shall discharge by gravity or mechanical means into an approved drainage system complying with the plumbing code listed in Appendix A.

Exception: Where a site is located in well-drained gravel or sand-gravel mixture soils, a dedicated drainage system is not required.

1224.6 Placement of backfill: The excavation outside the foundation shall be backfilled with soil which is free of organic material, construction debris, and large rocks. The backfill shall be placed in lifts and compacted in a manner which does not damage the waterproofing or dampproofing material.

1224.7 Site grading: The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in twelve units horizontal (1:12) for a minimum distance of 8 feet (2438 mm) measured perpendicular to the face of the wall or an approved alternate method of diverting water away from the foundation shall be used. Considera-

tion shall be given to possible additional settlement of the backfill when establishing the final ground level adjacent to the foundation.

1224.8 Erosion protection: Where water impacts the ground from the edge of the roof, downspout, scupper, or other rain water collection or diversion device, provisions shall be made to prevent soil erosion and direct the water away from the foundation.

ARTICLE 13

MATERIALS AND TESTS

SECTION 1300.0 GENERAL

1300.1 Scope: The provisions of this article shall govern the quality, workmanship and requirements for all materials hereafter used in the construction of buildings and structures. All materials of construction and tests shall conform to the applicable standards listed in this code.

1300.2 New materials: All new building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this article and in the approved rules to determine character, quality and limitations of use.

1300.3 Used materials: The use of all second-hand materials which meet the minimum requirements of this code for new materials shall be permitted.

SECTION 1301.0 ALTERNATIVE TEST PROCEDURE

1301.1 General: In the absence of approved rules or other approved standards, the code official shall make or cause to be made the necessary tests and investigations; or the code official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided in Section 110.0. The cost of all tests and other investigations required under the provisions of this code shall be borne by the applicant.

SECTION 1302.0 TEST SAFE LOAD

1302.1 When required: When not capable of design by accepted engineering analysis, any system of construction or structural unit and its connections shall be subjected to the tests prescribed in this article and Articles 14, 15, 16, 17, 18, 19 or 20, or to such other approved tests that simulate the actual loads and conditions of application that occur in normal use; or the code official shall accept certified reports of such tests conducted by an approved testing agency, providing such tests meet the requirements of this code and the approved rules.

1302.2 Test load: When approved by test, every structural assembly shall sustain without failure minimum superimposed loads equal to two and one-half times the required live load; and under the approved working load, the deflection shall not exceed the limits prescribed in Section 1305.0.

SECTION 1303.0 TESTS

1303.1 Test standards: All structural units and assemblies shall be tested in accordance with the standards listed in Appendix A. In the absence of test procedures governing any specific material or method of construction, the code official shall accept authenticated reports from approved agencies which meet the requirements of this code.

1303.2 Strength tests: To determine the safe uniformly distributed working load when not capable of design by approved 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, subassembly or assembled unit and its connections shall be subjected to strength tests prescribed in this code, or to such other approved tests that simulate the loads and conditions of application that the completed structure will be subjected to in normal use.

1303.2.1 Strength test for glass: The working strength of glass for any location in which it is required to withstand wind or impact loads shall be determined according to Section 2202.0 for wind loads and Section 2203.0 for impact loads.

1303.3 Durability and endurance tests: Whenever required by the code official or specified herein or in the approved rules, the material or construction shall be subjected to sustained and repetitive loading to determine its resistance to fatigue, and to test for durability and weather resistance.

1303.4 Maintenance test: In addition to durability and endurance tests, tests of all materials shall be made to assure the maintenance of the standards of approved materials when reasonable doubt exists as to quality and when required by the code official.

1303.5 Performance test: All work shall be conducted and completed in an approved manner, so as to secure the results intended in all sections of this code. Whenever there is reasonable doubt as to the stability or structural safety of a completed building or structure or part thereof for the intended use, the code official is authorized to require a load test of the building unit or portion of the structure in question. The load test shall be conducted in accordance with Section 1303.5.1 or 1303.5.2.

1303.5.1 Load test procedure specified: When a standard listed in Appendix A governing a specific material or method of construction has load test procedures and acceptance criteria, the test procedure and acceptance criteria of the standard shall apply.

1303.5.2 Load test procedure not specified: In the absence of load test proce-

dures and acceptance criteria for a specific material or method of construction, such existing structure shall be subjected to a superimposed load equal to two times the design live load. The test load shall be left in place for a period of 24 hours. If during the test, or upon removal of the test load, the structure shows evidence of failure, the code official shall order such reinforcement or modifications deemed necessary to insure adequacy of the structure for the rated capacity; or in lieu thereof, the code official shall 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 approved 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 75 percent of the maximum deflection within 24 hours after the removal of the test load.

1303.6 Tests of service equipment and devices: Tests of service equipment and accessories shall include proscenium curtain and stage ventilation in accordance with Sections 615.2.6 and 615.2.8; structural load tests in accordance with Section 1302.0; flues, chimneys and boilers in accordance with the mechanical code listed in Appendix A; electric installations in accordance with Section 2702.0; escalators, elevator interlocks and safety devices in accordance with Section 2602.0; refrigerating equipment and other mechanical and plumbing systems and devices as required by the mechanical and plumbing codes listed in Appendix A, and all other service tests required by the approved rules.

1303.7 Fire tests: In the determination of flash points, combustibility, flame-resistance and fireresistance rating of construction materials and methods, all tests shall be conducted in conformity to Sections 902.0, 903.0 and 904.0.

1303.8 Prefabricated construction tests: Prefabricated assemblies or subassemblies not capable of design by approved 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 units in width with two longitudinal joints; and when designed on the assumption of a simple span, such units shall be tested with flat end supports.

1303.9 Test specimens: The selection and construction of all test specimens and the details of test procedures herein required shall conform to the requirements of the specific test standard being followed. All test specimens and constructions shall be truly representative of the materials, workmanship and details to be normally applied in practice. When structural or fireresistance rated properties of the material are dependent upon adequate curing, the age of the specimen shall be not less than that required to reach the specified design strength or other condition regulated by the applicable test standard.

Note: Test procedures. Test requirements constitute fundamental performance standards and therefore come within the scope of this code. The detail test specifications and procedures are formulated and defined in the

approved rules or by reference to test standards of approved testing agencies and organizations. Details of test procedures have been omitted from this code, except for essential basic requirements when deemed necessary.

SECTION 1304.0 DESIGN STRENGTHS OF MATERIALS

1304.1 Conformance to standards: The design strengths and permissible stresses of any structural material that is identified as to manufacture and grade by mill tests, or the strength and stress grade is otherwise confirmed to the satisfaction of the code official, shall conform to the specifications and methods of design of accepted engineering practice or the approved rules in the absence of applicable standards.

1304.2 New materials: For materials which are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests as provided in Sections 1302.0 and 1303.0.

SECTION 1305.0 CONDITIONS OF ACCEPTANCE

1305.1 General: In evaluating the physical properties of materials and methods of construction when not subject to design by approved engineering analysis, the structural requirements shall be based on the criteria established by the following Sections 1305.2 through 1305.7.

1305.2 Test load factor: The test assembly shall sustain without failure superimposed loads equal to two and one-half times the design live load.

1305.3 Working load deflection: Under the approved working load, the deflection of floor and roof assemblies shall not be greater than $^{1}/_{360}$ of the span for plastered construction; $^{1}/_{240}$ of the span for unplastered floor construction; and $^{1}/_{180}$ of the span for unplastered roof construction.

1305.4 Wall and partition assemblies: Bearing wall and partition assemblies shall sustain the load test both with and without window framing.

1305.5 Comparative tests: When not available from existing approved test data, the code official is authorized to require comparative tests of assemblies of standard traditional forms of construction used for similar purposes to assist in determining the adequacy of the new construction.

1305.6 Concentrated load tests: When not capable of design, all floor assemblies in the use classification groups specified in Table 1106 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 1106.

1305.7 Puncture penetration tests: All finish floor assemblies in which light gage metal or other thin materials are used as the structural floor shall withstand the application of a 200-pound (90.8 kg) concentrated load applied to the top surface on an area of 1 square inch (645 mm^2) at any point or points of the assembly designated by the code official.

SECTION 1306.0 APPROVALS

1306.1 Written approval: Any material, appliance, equipment, system or method of construction meeting the requirements of this code shall be approved in writing within a reasonable time after satisfactory completion of all required tests and submission of required test reports.

1306.2 Approved record: Whenever any material, appliance, equipment, system or method of construction shall have been approved, a record of such approval, including all the conditions and limitations of its permitted use, shall be kept on file in the code official's office and shall be open to public inspection during business hours.

1306.3 Labeling: Products and materials required to be labeled shall be labeled in accordance with the procedures set forth in Sections 1306.3.1 through 1306.3.3.

1306.3.1 Testing: An approved agency shall test a representative sample of the product or material being labeled to the relevant standard or standards. The approved agency shall maintain a record of all the tests performed. The records shall provide sufficient detail to verify compliance with the test standard.

1306.3.2 Inspection and identification: The approved agency shall periodically perform an inspection, which shall be in-plant if necessary, of the product or material that is to be labeled. The inspection shall verify that the labeled product or material is representative of the product or material tested.

1306.3.2.1 Independent: The agency to be approved shall be objective and competent. The agency shall also disclose all possible conflicts of interest so that its objectivity can be confirmed.

1306.3.2.2 Equipment: An approved agency shall have adequate equipment to perform all required tests. The equipment shall be periodically calibrated.

1306.3.2.3 Personnel: An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests.

1306.3.3 Label information: The label shall contain the manufacturer's and/or distributor's identification, model number, serial number, or definitive information describing the product or material's performance characteristics and approved agency's identification.

1306.4 Heretofore approved materials: The use of any material already fabricated or of any construction already erected, which conformed to requirements or approvals heretofore in effect, shall be permitted to continue, if not detrimental to life, health or safety of the public.

ARTICLE 14

MASONRY

SECTION 1400.0 GENERAL

1400.1 Scope: The provisons of this article shall govern the materials, design, construction and quality of masonry.

SECTION 1401.0 MASONRY CONSTRUCTION UNITS

1401.1 Nominal dimensions: Dimensions and thicknesses of masonry construction units specified in this code are nominal dimensions. Actual dimensions shall not vary from the prescribed minimum except in accordance with approved tolerances in the building industry.

1401.2 Second-hand units: Brick and other second-hand masonry units which are to be reused, shall be approved as to quality, condition and compliance with the requirements for new masonry units. The unit shall be of 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 1402.0 BRICK UNITS

1402.1 General: Brick of clay, shale and calcium silicate (sand/lime) shall conform to ASTM standards listed in Appendix A as follows: C216 for solid units of face brick; C62 for solid units of building brick; C652 for hollow brick; and C73 for calcium silicate brick. Grade requirements for clay and shale brick units in contact with the ground or subject to water, frost and freezing action shall be governed by the applicable provisions of the ASTM standards listed above.

SECTION 1403.0 STRUCTURAL CLAY TILE UNITS

1403.1 General: Structural clay wall tile shall conform to ASTM standards for structural clay tile units listed in Appendix A as follows: C34 for loadbearing wall tile; C212 for structural clay facing tile; C56 for structural clay nonloadbearing wall tile. Grade requirements for units subjected to the weather or contact with the ground shall be governed by the applicable provisions of the ASTM standards listed above.

1403.2 Fireproofing tile: Structural clay tile for nonstructural use in fireproofing of structural members and in wall furring shall not be required to meet compressive strength specifications. The fireresistance rating shall be determined by standard test procedure to comply with the requirements of Table 401.

SECTION 1404.0 GLAZED MASONRY UNITS

1404.1 General: Glazed masonry building units shall be of a quality equal to that required by ASTM C126 listed in Appendix A.

SECTION 1405.0 CONCRETE UNITS

1405.1 Quality: Cast concrete units shall be of sound, compact structure, uniform in shape and free from cracks, warpage or other defects that would impair their serviceability or strength when laid in the wall.

1405.2 Hollow loadbearing units: Approved hollow loadbearing concrete units for use below grade or unprotected against the weather by stucco, brick or other approved facings or veneers shall have a minimum compressive strength on the gross area of 1,000 pounds per square inch (psi) (0.70 kg/mm^2); and for protected exterior use and general interior construction not less than 700 psi (0.49 kg/mm^2).

1405.3 Hollow nonloadbearing units: Approved hollow nonloadbearing concrete units shall have a minimum compressive strength on the average gross area of 350 psi (0.25 kg/mm^2).

1405.4 Solid loadbearing units: Approved solid loadbearing concrete masonry units, when unprotected against the weather or subject to frost and water action, shall have a minimum compressive strength of 1,800 psi (1.27 kg/mm^2), and for protected exterior or general interior use not less than 1,200 psi (0.84 kg/mm^2).

1405.5 Concrete brick: Approved concrete brick for use when exposed to freezing in the presence of moisture shall have a minimum compressive strength of 2,500 psi (1.76 kg/mm^2); and where used as a backup in exterior walls or for general interior construction, a compressive strength of not less than 1,250 psi (0.88 kg/mm^2).

1405.6 Concrete fireproofing and furring units: Approved concrete block or tile used in fireproofing or furring when not exposed to the weather shall have a minimum compressive strength of 300 psi (0.21 kg/mm^2) of net area tested as laid in practice. Where exposed to the weather, the compressive strength shall be not less than 700 psi (0.49 kg/mm^2) of gross area. All nonbearing units shall be clearly marked to distinguish them from loadbearing units.

1405.6.1 Fireresistance ratings: Fireresistance ratings for concrete masonry walls of various equivalent thicknesses shall be in accordance with Table 1405.6.1. Thicknesses shown are equivalent thicknesses and include the thickness of portland cement plaster, 1.5 times the thickness of gypsum plaster, lath

and gypsum wallboard where mentioned and grout when cells are solidly grouted. Where combustible members are framed into the wall, the wall shall be of such thickness or be so constructed that the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, will be not less than 93 percent of the thickness shown in Table 1405.6.1.

Table 1405.6.1
MINIMUM EQUIVALENT THICKNESS,
INCHES, FOR RATINGS OF (see Section 1405.6.1)

	4 hrs.	3 hrs.	2 hrs.	1½ hrs.	1 hr.	¾ hr.	½ hr.
Calcareous and siliceous gravel	6.2	5.3	4.2	3.6	2.8	2.4	2.0
Expanded clay, shale or slate	5.1	4.4	3.6	3.3	2.6	2.2	1.8
Expanded slag or pumice	4.7	4.0	3.2	2.7	2.1	1.9	1.5
Limestone cinders or slag	5.9	5.0	4.0	3.4	2.7	2.3	1.9

Note a. 1 inch = 25.4 mm.

1405.6.2 Increasing ratings: Walls composed of hollow concrete masonry units having a nominal thickness of 8 inches or greater and having a fireresistance rating of at least 2 hours shall be classified as 4 hours where the hollow spaces are completely filled with insulation, grout or a dry granular material, such as expanded slag, clay, shale or sand.

SECTION 1406.0 ARCHITECTURAL TERRA COTTA

1406.1 General: All approved architectural terra cotta units shall be formed with a strong, homogeneous body of hardburned, weather-resisting clay which gives off a sharp, metallic ring when struck and shall meet the strength and durability requirements of this code. All units shall be formed to engage securely with, and anchor to, the structural frame or masonry wall.

SECTION 1407.0 NATURAL STONE

1407.1 General: Natural stone for masonry shall be sound and free from loose or friable inclusions. It shall meet the strength, fireresistance, durability and impact resistance required for the intended use.

SECTION 1408.0 CAST STONE

1408.1 General: 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 be reinforced where necessary to comply with Article 15.

SECTION 1409.0 MORTAR AND GROUT FOR MASONRY

1409.1 General: Mortar and grout for use in reinforced and nonreinforced

masonry construction shall meet the requirements of this section and ASTM C270 or C476 listed in Appendix A.

1409.2 Mortar and grout types: Mortar and grout for masonry construction shall conform to the requirements of this section.

1409.2.1 Mortar types: Mortar shall conform to the proportion specification of Table 1409.2.1 or the property specification of ASTM C270 listed in Appendix A. Aggregate for use in mortar shall comply with ASTM C144 listed in Appendix A. Mortar conforming to the proportion specification mixed to an initial flow of 100 to 115 percent, shall have a flow after suction of not less than 70 percent.

1409.2.2 Grout types: Grout for reinforced and nonreinforced masonry shall conform to Table 1409.2.2. Aggregate for use in grout shall comply with ASTM C404 listed in Appendix A.

Table 1409.2.1
MORTAR PROPORTION SPECIFICATION REQUIREMENT (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	Not less than 2¼ and not more than 3 times the sum of the volumes of the cements and lime used.
	1	1	—		
S	1	—	¼	½	
	½	1	—		
N	1	—	½	1¼	
	—	1	—	—	
O	—	1	—	—	
	1	—	1¼	2½	

Table 1409.2.2
GROUT PROPORTIONS FOR REINFORCED AND NONREINFORCED MASONRY (PARTS BY VOLUME)

Type	Portland cement or portland blast-furnace slag cement	Hydrated lime or lime putty	Aggregates, measured in a damp loose condition	
			Fine	Coarse
Fine grout	1	0 to 1/10	2¼ to 3 times the sum of the volumes of the cementitious materials	—
Coarse grout	1	0 to 1/10	2¼ to 3 times the sum of the volumes of the cementitious materials	1 to 2 times the sum of of the volumes of the cementitious materials

1409.3 Types of mortar permitted: Unit masonry shall be laid in mortar of the types listed in Table 1409.3.

Table 1409.3
MASONRY AND MORTAR TYPES

Types of masonry	Types of mortar permitted
Fire brick	R fractory air setting mortar
Glass block masonry	S or N
Grouted and filled cell masonry	M or S
Linings of existing masonry, above or below grade	M or S
Masonry above grade or interior masonry	
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
Piers of hollow units	M or S
Piers of solid units	M, S or N
Walls of hollow units	M, S or N
Walls of solid units	M, S, N or O
Masonry in contact with earth	M or S
Masonry other than above	M, S or N
Nonloadbearing partitions and fireproofing	M, S, N, O or gypsum

Note a. 1 psf = 4.882 kg/m^2.

1409.4 Special mortars: The code official shall approve other special masonry mortars in place of the mortar types listed in Table 1409.3, provided they develop the minimum compressive strengths specified for the respective mortars they replace. The strength classification of a special mortar or special mix shall be determined by compressive strength tests with the materials and in the proportions representative of those to be used in actual practice or by other approved methods. The allowable unit working stresses in the masonry shall not be more than one-fourth the average ultimate compressive strength of the assembled test samples.

1409.5 Mortars for ceramic wall and floor tile: Portland cement mortars for installing ceramic wall and floor tile shall be of the compositions indicated in Table 1409.5.

Table 1409.5
CERAMIC TILE MORTAR COMPOSITIONS

Walls:	Scratchcoat	1 cement; 1/5 hydrated lime; 4 dry or 5 damp sand
	Setting bed and leveling coat	1 cement; ½ hydrated lime; 5 damp sand to 1 cement; 1 hydrated lime; 7 damp sand
Floors:	Setting bed	1 cement; 1/10 hydrated lime; 5 dry or 6 damp sand; or 1 cement; 5 dry or 6 damp sand
Ceilings:	Scratchcoat and setting bed	1 cement; ½ hydrated lime; 2½ dry sand or 3 damp sand

1409.5.1 Dry-set portland cement mortars: Premixed, prepared portland cement mortars requiring only the addition of water used in the installation of ceramic tile shall comply with ANSI A118.1 and ANSI A118.2 listed in Appendix A. Dry-set mortars which are for use with a particular type of tile,

such as glazed wall tile, ceramic mosaics, pavers, and quarry tile, shall not be used to set other types of tile for which they are not intended. The shear bond strength for tile set in such mortar shall be as required for the kind of mortar used when tested in accordance with that standard. Mortars which are not restricted to particular types of tile shall pass all of the shear tests listed in the standard. Tile set in dry-set portland cement mortar shall be installed in accordance with ANSI A108.5 and ANSI A108.7 listed in Appendix A.

1409.5.2 Latex portland cement mortars: Latex-modified portland cement thin-set mortar to which latex is added as a replacement for all or part of the gauging water, used in the installation of ceramic tile shall comply with ANSI A118.4 listed in Appendix A. Tile set in latex portland cement mortar shall be installed in accordance with ANSI A108.5 and A108.7 listed in Appendix A.

1409.6 Organic adhesives: Water-resistant organic adhesives used in the installation of ceramic tile shall comply with ANSI A136.1 listed in Appendix A. The shear bond strength shall be not less than 40 psi (0.028 kg/mm^2) for Type I adhesive, and not less than 20 psi (0.014 kg/mm^2) for Type II adhesive, when tested in accordance with ANSI A136.1 listed in Appendix A. Tile set in organic adhesives shall be installed in accordance with ANSI A108.4 listed in Appendix A.

1409.7 Epoxy mortar: Epoxy used in the installation of ceramic tile shall comply with ANSI A118.3 listed in Appendix A. Tile set in epoxy shall be installed in accordance with ANSI A108.6 listed in Appendix A.

SECTION 1410.0 MASONRY WALL CONSTRUCTION

1410.1 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 Table 1410, NBS H74, BIA *Building Code Requirements for Engineered Brick Masonry*, NCMA TR75-B or ACI 531 (with the exception of Section 12.2.2 on fired clay masonry) listed in Appendix A.

1410.1.1 Hollow walls: The allowable compressive stresses for hollow walls are based on the gross cross-sectional area of wall minus area of cavity between wythes. The allowable compressive stresses for cavity walls are based upon the assumption that the floor loads bear upon but one of the two wythes. Where hollow walls are loaded concentrically, the maximum allowable stresses shall be increased by 25 percent.

1410.2 Wetting of brick: Brick (clay or shale) at the time of laying, shall require wetting if the unit's initial rate of water absorption exceeds 30 grams per 30 square inches per minute (30 g per 323 mm^2/s) or 0.035 ounces per square inch (0.0015 g/mm^2), as determined by ASTM C67 listed in Appendix A.

1410.3 Cold weather construction: Masonry laid in temperatures of the outside air below 40 degrees F. (4 degrees C.) shall be protected in accordance

ith the provisions of the IMIAWC *Recommended Practices and Guide pecifications for Cold Weather Masonry* listed in Appendix A. Frozen aterials shall not be used, nor shall frozen masonry be built upon.

Table 1410
ALLOWABLE COMPRESSIVE STRESSES; GROSS CROSS-SECTIONAL AREA, IN PSI [a]
(Except as noted)

Type of masonry and grade of masonry unit (psi gross area)	Type of mortar			
	M	S	N	O
routed masonry of solid masonry units:				
from 4,500 to 8,000 psi	350	275	200	—
from 2,500 to 4,500 psi	275	215	155	—
from 1,500 to 2,500 psi	225	175	125	—
ollow walls (cavity or masonry bonded) — see Section 1410.1.1				
Solid masonry units				
2,500 plus psi	140	130	110	—
from 1,500 to 2,500 psi	100	90	80	—
Hollow masonry units	70	60	55	—
Masonry of hollow units	85	75	70	—
Piers of hollow units, cellular spaces filled	105	95	90	—
Solid masonry of brick and other solid units of clay or shale; sand lime or concrete:				
8,000 plus psi	400	350	300	200
from 4,500 to 8,000 psi	250	225	200	150
from 2,500 to 4,500 psi	175	160	140	110
from 1,500 to 2,500 psi	125	115	100	75
Solid masonry of solid concrete masonry units:				
1,800 plus psi	175	160	140	100
from 1,200 to 1,800 psi	125	115	100	75
Stone ashlar masonry				
Granite	800	720	640	500
Limestone or marble	500	450	400	325
Rubble stone, coursed, rough or random	140	120	100	80
Sandstone or cast stone	400	360	320	250

Note a. 1 psi = 0.000703 kg/mm^2.

1410.4 Incorporation of combustibles: Lumber or other combustible materials, except nailing blocks and ornamental timber to an extent permitted by the chasing restrictions of Section 1413.0 and the provisions of Section 900.3, shall not be incorporated in masonry walls, except as approved for combustible aggregates or component materials after fire tests.

SECTION 1411.0 BONDING OF WALLS

1411.1 General: Walls of solid, composite and hollow masonry and cavity and other hollow walls shall be bonded in accordance with this section, ACI 531, NCMA TR75-B or NBS H74 listed in Appendix A.

1411.2 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 through-bond

stone for each 9 superficial square feet (0.84 m^2) of area.

1411.3 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.

1411.4 Intersecting walls and partitions: Where required by design or Section 1412.0, masonry walls and partitions shall be securely anchored or bonded at points where they intersect by one of the following methods indicated in Sections 1411.4.1 through 1411.4.3.

1411.4.1 True masonry bond or metal ties: Walls shall be bonded by laying at least 50 percent of the units at the intersection in true masonry bond with alternate units having a bearing of not less than 3 inches (76 mm) upon the unit below, or they shall be anchored with not less than 3/16 inch (5 mm) diameter corrosion-resistant metal wire ties or joint reinforcement at vertical intervals not to exceed 2 feet (610 mm), or by other equivalent approved anchorage.

1411.4.2 Offsets and anchors: Where walls are carried up separately, the intersection shall be toothed or blocked with 8-inch (203 mm) maximum offsets and shall be provided with approved metal anchors at vertical intervals of not more than 4 feet (1219 mm) or, when approved, blocking is not required where rigid steel anchors are provided and spaced not more than 2 feet (610 mm) apart vertically.

1411.4.3 Interior nonloadbearing walls: Interior nonloadbearing walls shall be bonded or anchored as required by Sections 1411.4.1 or 1411.4.2 or they shall be anchored at their intersection at vertical intervals of not more than 2 feet (610 mm) with at least 0.034 inch nominal thickness corrosion-resistant corrugated metal ties 7/8 inch (22 mm) in width, or other equivalent approved method of anchorage.

1411.5 Change in thickness: Where hollow walls decrease in thickness, a course of solid masonry or concrete-filled units, or a continuous bearing plate shall be interposed between the thicker and thinner sections.

1411.6 Erecting precautions: A wall shall not be built up more than 25 feet (7620 mm) 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 1412.0 LATERAL BRACING OF WALLS

1412.1 General: All masonry walls shall be laterally supported by horizontal bracing of floor and roof framing, or vertical bracing of columns, buttresses or cross walls at vertical or horizontal intervals as specified in NBS 211, NBS H74, ACI 531, NCMA TR75-B or BIA *Building Code Requirements for Engineered Brick Masonry* listed in Appendix A. Provisions shall be made in the structure to transfer wind pressures and other lateral forces to the foundation.

SECTION 1413.0 CHASES AND RECESSES IN BEARING WALLS

1413.1 Where permitted: Chases and recesses shall be prohibited in any wall less than 12 inches thick and in the required area of piers and buttresses; except that in 8-inch walls, where permitted in residential buildings, and in the apron under window openings, the maximum depth of chases shall be 4 inches (102 mm).

1413.2 Maximum size: The maximum permitted depth of a chase in any wall shall be not more than one-third the wall thickness, and the maximum length of a horizontal chase or the maximum horizontal projection of a diagonal chase shall not exceed 4 feet (1219 mm) except as provided in Section 1413.5; and except further that the maximum length of the apron below window sills in all walls shall not exceed the width of the window opening. Waterproofed chases in such aprons in 8-inch (203 mm) walls shall not exceed 4 inches (102 mm) in depth. The aggregate area of recesses and chases in any wall shall be not more than one-fourth of the area of the face of the wall in any one story.

1413.3 Fireresistive limitations: Chases or recesses shall not reduce the thickness of material below the minimum specified in Article 9 for fire walls, fire separation walls or required fireresistive covering of structural members.

1413.4 Hollow walls: Where chases and recesses are permitted in hollow walls and walls constructed of hollow blocks or tile, they shall be built in with the wall. Chases shall not be cut in hollow walls after erection.

1413.5 Continuous chases: Where horizontal chases for the bearing of reinforced concrete floor and roof slabs are continuous, anchors shall be installed above and below the floor construction to resist the bending and uplifts in the wall due to flexure of the slab.

SECTION 1414.0 WATERPROOFING CHASES

1414.1 Chases: The backs and sides of all chases in exterior walls with less than 8 inches of approved masonry to the exterior surface shall be insulated and waterproofed.

SECTION 1415.0 CORBELED AND PROJECTED MASONRY

1415.1 Limitations: In nonreinforced masonry, the maximum horizontal projection of corbeling from the plane of the wall shall not exceed one-half of the wall thickness of solid walls or one-half of the wythe thickness for cavity walls. The maximum projection of one unit shall not exceed one-half the height of the unit, nor one-third of its bed depth.

1415.2 Hollow walls: Corbeling of hollow masonry or masonry built of hollow units shall be supported on at least one full course of solid masonry.

1415.3 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.

SECTION 1416.0 BEARING ON HOLLOW UNIT WALLS

1416.1 Bearing area: Beam, girder and other concentrated loads shall be provided with a bearing of solid masonry or filled cores of hollow unit masonry at least 4 inches (102 mm) in height, or with a bearing plate of adequate design and dimensions to distribute the load safely on the wall or pier.

1416.2 Closure tile: All open cells in tile or blocks at wall ends and at openings shall be filled solidly with grout for a length of not less than 12 inches (305 mm), or reversed closure tile shall be used.

SECTION 1417.0 ENGINEERED UNREINFORCED MASONRY

1417.1 General: This section shall govern wall thicknesses and lateral support requirements for unreinforced masonry determined by a structural analysis based upon standards referenced in this section.

1417.2 Brick masonry: Walls designed and constructed of brick masonry using solid clay shale units shall conform to the provisions of the BIA *Building Code Requirements for Engineered Brick Masonry* listed in Appendix A.

1417.3 Concrete block masonry: Walls designed and constructed of concrete block masonry units shall conform to the provisions of ACI 531 listed in Appendix A.

SECTION 1418.0 REINFORCED MASONRY

1418.1 General: All reinforced masonry, except for reinforced solid clay brick masonry and reinforced concrete block masonry, shall conform to the provisions of NBS H74 or NCMA TR75-B listed in Appendix A. Reinforced solid clay brick masonry shall conform to the BIA *Building Code Requirements for Engineered Brick Masonry* listed in Appendix A. Reinforced concrete block masonry shall conform to the provisions of NCMA TR75-B or ACI 531 listed in Appendix A.

1418.2 Tests: When required, testing of masonry assemblies designed and constructed under this section for strength, material compatibility, and quality control shall be in accordance with ASTM E72, ASTM E447, ASTM E518 or ASTM E519 listed in Appendix A.

SECTION 1419.0 UNREINFORCED MASONRY

1419.1 General: All unreinforced masonry except for engineered unreinforced masonry shall conform to NBS 211 listed in Appendix A. Engineered unreinforced masonry shall conform to Section 1417.0.

1419.2 Tests: When required, testing of masonry assemblies designed and constructed under this section for strength, material compatibility, and qual-

ity control shall be in accordance with ASTM E72, ASTM E447, ASTM E518, and ASTM E519 listed in Appendix A.

SECTION 1420.0 STRUCTURAL GLASS BLOCK WALLS

1420.1 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 25 feet (7260 mm) in length and 20 feet (6096 mm) in height between structural supports and expansion joints; and the area of each individual panel shall be not more than 250 square feet (23.25 m^2). Intermediate structural supports shall be provided to support the dead load of the wall and all other superimposed loads. Where individual panels are more than 144 square feet (13.39 m^2) in area, a supplementary stiffener shall be provided behind the panels, anchored thereto and to the structural supports.

1420.2 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 ½ inch (13 mm) with nonhardening caulking compound on both faces, or other approved expansion joints shall be provided. Where laid up in joint materials other than mortars herein defined, a single panel shall not be more than 100 square feet (9.30 m^2) in area, nor more than 10 feet (3048 mm) in either length or height.

1420.3 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 1112.0 and 1113.0.

1420.4 Interior wall panels: Solid or hollow approved structural glass blocks shall not be used in fire walls, party walls or fire separation walls, or for loadbearing 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. All mortar-bearing surfaces of the glass block shall be precoated or prepared to insure adhesion between mortar and glass. Wood strip framing shall not be used in partitions which are required to be fireresistance rated.

> **Exception:** Glass block assemblies having a ¾-hour fireresistance rating shall be permitted in accordance with the listing as opening protectives in fire separation walls which have a fireresistance rating of 1 hour or less and do not enclose exit stairways or exit corridors.

SECTION 1421.0 ISOLATED PIERS

1421.1 General: 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 at the top of the pier.

SECTION 1422.0 DRY-STACKED, SURFACE-BONDED MASONRY WALLS

1422.1 General: Dry-stacked, surface-bonded masonry walls shall comply with the requirements of this code for masonry wall construction, except where noted otherwise in this section.

1422.2 Materials: Surface-bonding mortar shall comply with ASTM C887 listed in Appendix A. Concrete masonry units shall comply with ASTM C946 listed in Appendix A.

1422.3 Design: Dry-stacked, surface-bonded masonry walls shall be of adequate strength and proportions to support all superimposed loads without exceeding the allowable stresses of Table 1422.3. Allowable stresses not specified in Table 1422.3 shall comply with the requirements of Table 1410, NCMA TR75-B or ACI 531 listed in Appendix A.

Table 1422.3
ALLOWABLE STRESSES
GROSS CROSS-SECTIONAL AREA (psi)[a]

Description	Maximum allowable stress (psi)
Compression	
Standard block	45
Shear	10
Flexural tension	
Vertical span	18
Horizontal span	30

Note a. 1 psi = 6.895 kPa.

1422.4 Construction: Construction of dry-stacked, surface-bonded masonry walls, including stacking and leveling of units, mixing and application of mortar, curing and protection, shall comply with ASTM C946 listed in Appendix A.

ARTICLE 15

CONCRETE

SECTION 1500.0 CONCRETE DESIGN STANDARDS

1500.1 Reinforced and prestressed concrete: Structural members of reinforced concrete, including prestressed concrete, shall be designed and constructed in accordance with the provisions of this article and ACI 318 listed in Appendix A, hereafter referred to in this article as ACI 318.

1500.2 Plain concrete: Structural members of plain concrete shall be designed and constructed in accordance with the provisions of this article and ACI 318.1 listed in Appendix A. Concrete that is either unreinforced or contains less reinforcement than the minimum specified for reinforced concrete by ACI 318 shall be classified as plain concrete. Plain concrete shall not be used for structural members where special design considerations are required for earthquake or blast forces, unless specifically approved.

SECTION 1501.0 SEISMIC DESIGN PROVISIONS

1501.1 General: Appendix A of ACI 318, which contains special requirements for design and construction of reinforced concrete members of a structure for which the design forces, related to earthquake motions, have been determined on the basis of energy dissipation in the nonlinear range of response, shall be applied as determined in Table 1501.1 and Section 1113.9. In Seismic Zones 0, 1 and 2, the requirements of Chapters 1 through 18 of ACI 318 shall also apply. In Seismic Zones 3 and 4 the requirements of Chapters 1 through 17 of ACI 318 shall also apply.

Table 1501.1
SECTIONS OF APPENDIX A OF ACI 318
TO BE SATISFIED FOR SEISMIC DESIGN

Structural element	Seismic zone (see Figure 1113.1)			
	0	1	2	3, 4
Frame members resisting earthquake effects	None	A.9[a]	A.9	A.2, A.3, A.4, A.6, A.7
Walls, diaphragms and trusses resisting earthquake effects	None	None	None	A.2, A.5, A.6, A.7
Frame members not resisting earthquake effects	None	None	None	A.8

Note a. A.9 for buildings in Seismic Zone 1 with an importance factor, *I*, of 1.5. For other buildings, none.

SECTION 1502.0 MATERIALS

02.1 General: Materials used to produce concrete and admixtures for crete shall comply with the requirements of this section and ACI 318.

02.2 Cements: Cement shall conform to ASTM C150 listed in Appendix A, to such other cements listed in ACI 318.

02.3 Aggregates: Concrete aggregates shall conform to ASTM C33 or to TM C330 listed in Appendix A.

02.3.1 Special tests: Aggregates failing to meet the specifications listed in ction 1502.3 shall not be used unless approved and shown by special test or tual service to produce concrete of adequate strength and durability.

02.3.2 Nominal size: Nominal maximum size of coarse aggregate shall be t larger than:

1. One-fifth the narrowest dimension between sides of forms, nor
2. One-third the depth of slabs, nor
3. Three-fourths the minimum clear spacing between individual reinforcing bars or wires, bundles or bars, or prestressing tendons or ducts.

Exception: These limitations shall not apply when information which shows that the workability and methods of consolidation are such that concrete can be placed without honeycomb or voids is submitted by the engineer and is approved.

502.4 Water: Water used in mixing concrete shall be clean and free from jurious amounts of oils, acids, alkalis, salts, organic materials, or other bstances that are deleterious to concrete or reinforcement.

502.4.1 Chloride ions: Mixing water for prestressed concrete or for concrete at will contain aluminum embedments, including that portion of mixing ater contributed in the form of free moisture on aggregates, shall not contain eleterious amounts of chloride ion (see Section 1503.3.4).

502.4.2 Potability: Nonpotable water shall not be used in concrete unless pecific requirements of ACI 318 allowing the use of nonpotable water are atisfied.

502.5 Metal reinforcement: Reinforcement and welding of reinforcement to e placed in concrete construction shall conform to the requirements of this ection.

502.5.1 Reinforcement type: Reinforcement shall be deformed reinforcement, except for plain reinforcement used for spirals or tendons; and reinforcement consisting of structural steel, steel pipe, or steel tubing as specified n ACI 318. Reinforcement shall conform to the applicable ASTM standards isted in ACI 318.

502.5.2 Welding: Reinforcing bars to be welded shall be indicated on the drawings, and welding procedure to be used shall be specified. ASTM reinforcing bar specifications, except for ASTM A706 listed in Appendix A, shall

be supplemented to require a report of material properties necessary to conform to welding procedures specified in AWS D1.4 listed in Appendix A.

1502.6 Admixtures: Admixtures used in concrete shall comply with Sections 1502.6.1 through 1502.6.3.

1502.6.1 Chloride: Calcium chloride or admixtures containing chloride from other than impurities from admixture ingredients shall not be used in prestressed concrete, in concrete containing embedded aluminum, in concrete cast against stay-in-place galvanized metal forms, or in concrete to be exposed to severe or very severe sulfate-containing solutions as defined in ACI 318 (see Section 1503.3.4).

1502.6.2 Standards: Air-entraining admixtures shall conform to ASTM C260 listed in Appendix A. Water-reducing admixtures, retarding admixtures, accelerating admixtures, water-reducing and retarding admixtures, and water-reducing and accelerating admixtures shall conform to ASTM C494 listed in Appendix A.

1502.6.3 Pozzolans: Fly ash or other pozzolans used as admixtures shall conform to ASTM C618 listed in Appendix A.

1502.7 Tests of materials: Tests of concrete and the materials used in concrete shall be in accordance with ACI 318.

SECTION 1503.0 CONCRETE QUALITY

1503.1 General: Concrete shall be proportioned to provide an average compressive strength as prescribed by ACI 318. Concrete shall be produced to minimize frequency of strengths below f'_c as prescribed in Section 1503.4.2. The specified compressive strength f'_c for concrete designed and constructed in accordance with this article shall be not less than 2,500 psi (17238 kPa).

Unless otherwise specified, f'_c shall be based on 28-day strength. If other than 28 days is used in the design, the length of time to reach f'_c shall be indicated on the design drawings and in the specifications.

1503.2 Selection of concrete proportions: Concrete proportions shall be determined in accordance with ACI 318 and as modified in this section.

1503.2.1 Proportioning by water-cement ratio: If data based on field experience or trial mixture as required by ACI 318 is not available, concrete proportions shall be based on water-cement ratio limits shown in Table 1503.2.1 subject to approval. The specified compressive strengths in Table 1503.2.1 are 28-day strengths for cements meeting strength limits of ASTM C150 listed in ACI 318, Types I, IA, II or IIA and seven-day strengths for Types III and IIIA. For strengths above 3,500 psi (24133 kPa), concrete proportioned by water-cement ratio shall be established by methods in ACI 318.

1503.2.2 Limitation on use: Table 1503.2.1 shall be used only for concrete to be made with cements meeting strength requirements for Types I, IA, II, IIA, III, IIIA, or V of ASTM C150 listed in Appendix A, or Types IS, IS-A,

IS(MS), IS-A(MS), I(SM), I(SM)-A, IP, IP-A, I(PM), I(PM)-A, IP(MS), IP-A(MS), or P of ASTM C595 listed in Appendix A, and shall not be applied to concrete containing lightweight aggregates or admixtures other than those for entraining air.

Table 1503.2.1
MAXIMUM WATER-CEMENT RATIOS AND MINIMUM CEMENT CONTENTS

Specified compressive strength[a] (psi)	Minimum sacks of cement per cubic yard of concrete	Maximum permissible water-cement ratios[a]			
		Nonair-entrained concrete		Air-entrained concrete	
		Absolute ratio by weight	US gal per 94 lb bag of cement	Absolute ratio by weight	US gal per 94 lb bag of cement
2,500	5	0.67	7.6	0.54	6.1
3,000	5½	0.58	6.6	0.46	5.2
3,500	6	0.51	5.8	0.40	4.5

Note a. 1 psi = 6.895 kPa; 1 gal. = .00379 m^3; 1 lb. = 0.454 kg.

1503.2.3 Special exposure: Concrete proportioned by water-cement ratio limits prescribed in Table 1503.2.1 shall also conform to special exposure requirements of Section 1503.3 and to compressive strength test criteria of Section 1503.4.

1503.3 Special exposure requirements: When concrete is exposed to special conditions described in Sections 1503.3.1 through 1503.3.5, the requirements set forth in those sections shall be met.

1503.3.1 Freezing and thawing and deicer chemicals: Normal-weight and lightweight concrete exposed to freezing and thawing or deicer chemicals shall be air-entrained with air content indicated in Table 1503.3.1. Tolerance on air content as delivered shall be ±1.5 percent. For specified compressive strength f'_c greater than 5,000 psi (34475 kPa), the required air content indicated in Table 1503.3.1 shall be reduced 1 percent. When finely divided materials of fly ash or natural pozzolans are used as mineral admixtures (see Section 1502.6.3) in air-entrained portland cement concrete, air content tests shall be made in accordance with ASTM C231 listed in Appendix A, to assure compliance with air content requirements of Table 1503.3.1. The frequency of air-content tests shall be the same as that for strength tests required by Section 1503.4.1.

1503.3.2 Water-cement ratio and strength: Normal-weight aggregate concrete used in buildings or their appurtenances of Use Group R-3 or Use Group R-2 less than four stories in height, and subject to weathering (i.e., freezing and thawing) as determined from Figure 1503.3.2 and/or deicer chemicals, shall comply with the requirements of Table 1503.3.2.2. In all other buildings, concrete that is intended to be water-tight or concrete that will be subject to freezing and thawing in a moist condition shall conform to requirements of Table 1503.3.2.1.

Table 1503.3.1
TOTAL AIR CONTENT FOR FROST-RESISTANT CONCRETE

Nominal maximum aggregate size, in.[b]	Air content, percent	
	Severe[a] exposure	Moderate[a] exposure
3/8	7½	6
½	7	5½
¾	6	5
1	6	4½
1½	5½	4½
2[c]	5	4
3[c]	4½	3½

Note a. The severe and moderate exposures referenced in this table are not based upon the weathering region shown in Figure 1503.3.2. For the purpose of this section, severe and moderate exposures shall be defined as follows:

Severe exposure occurs when concrete will be in almost continuous contact with moisture prior to freezing, or where deicing salts are used. Examples are pavements, bridge decks, sidewalks, parking garages, and water tanks.

Moderate exposure occurs when concrete will be only occasionally exposed to moisture prior to freezing, and where no deicing salts are used. Examples are certain exterior walls, beams, girders, and slabs not in direct contact with soil.

Note b. See ASTM C33 listed in Appendix A for oversize tolerances for various nominal maximum size designations.

Note c. These air contents apply to total mix, as for the preceding aggregate sizes. When testing these concretes, however, aggregate larger than 1½ inch is removed by handpicking or sieving and air content is determined on the minus-1½-inch fraction of mix. (Tolerance on air content as delivered applies to this value.) Air content of total mix is computed from value determined on the minus-1½-inch fraction.

Table 1503.3.2.1
REQUIREMENTS FOR SPECIAL EXPOSURE CONDITIONS

Exposure condition	Maximum water-cement ratio, normal-weight aggregate concrete	Minimum f'_c lightweight aggregate concrete[b] (psi)
Concrete intended to be water-tight:		
a. Concrete exposed to fresh water	0.50	3,750
b. Concrete exposed to brackish water or seawater	0.45	4,250
Concrete exposed to freezing and thawing in a moist condition:		
a. Curbs, gutters, guardrails, or thin sections	0.45	4,250
b. Other elements	0.50	3,750
c. In presence of deicing chemicals	0.45	4,250
For corrosion protection for reinforced concrete exposed to deicing salts, brackish water, seawater or spray from these sources	0.40[a]	4,750[a]

Note a. If minimum concrete cover required by Section 1506.6 is increased by 0.5 in., the maximum water-cement ratio shall be increased to 0.45 for normal weight concrete, or the minimum f'_c reduced to 4250 psi for lightweight concrete.

Note b. 1 psi= 6.895 kPa.

Table 1503.3.2.2
MINIMUM SPECIFIED COMPRESSIVE STRENGTH [f'_c][c]
OF CONCRETE SUBJECT TO WEATHERING[b]
AND/OR DEICER CHEMICALS

Type or location of concrete construction	Minimum specified compressive strength (f'_c at 28 days, psi)		
	Negligible exposure	Moderate exposure	Severe exposure
Basement walls and foundations not exposed to the weather	2,500	2,500	2,500[a]
Basement slabs and interior slabs on grade, except garage floor slabs	2,500	2,500	2,500[a]
Basement walls, foundation walls, exterior walls, and other vertical concrete surfaces exposed to the weather	2,500	3,000[b]	3,000[b]
Driveways, curbs, walks, patios, porches, carport slabs, steps, and other flat-work exposed to the weather, and garage floor slabs	2,500	3,000[b]	3,500[b]

Note a. Concrete in these locations which can be subjected to freezing and thawing during construction shall be air-entrained concrete in accordance with Table 1503.3.1
Note b. Concrete shall be air-entrained in accordance with Table 1503.3.1.
Note c. 1 psi = 6.895 kPa.

1503.3.3 Protection from sulfate: Concrete which will be exposed to sulfate-containing solutions shall conform to requirements for such exposure in ACI 318.

1503.3.4 Corrosion-resistance: The maximum water soluble chloride ion concentrations in concrete shall not exceed the limits established in ACI 318.

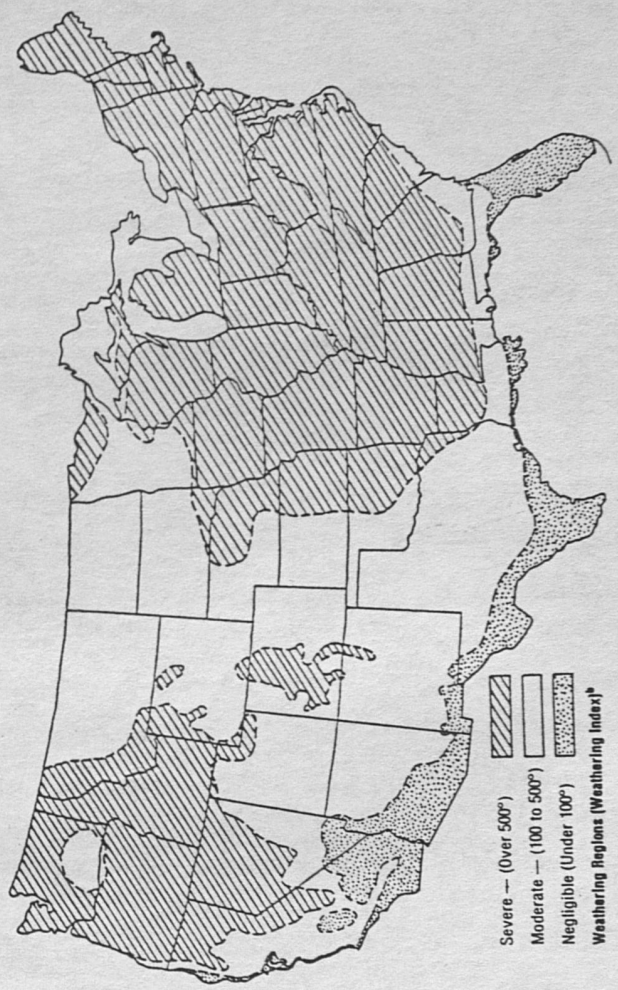
1503.3.5 Protection from salt: When reinforced concrete will be exposed to deicing salts, brackish water, seawater, or spray from these sources, the requirements of Table 1503.3.2.1 for water-cement ratio or concrete strength, and minimum concrete cover requirements of Section 1506.6 shall be satisfied.

1503.4 Evaluation for acceptance of concrete: For evaluation and acceptance of concrete the procedures established in Sections 1503.4.1 through 1503.4.4 shall be followed.

1503.4.1 Frequency of testing: Testing shall be conducted as required by the following:

1. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 150 cubic yards (115 m^3) of concrete, nor less than once for each 5,000 square feet (465 m^2) of surface area for slabs or walls.
2. On a given project, if total volume of concrete is such that frequency of testing required by Section 1503.4.1, item 1, would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five

Figure 1503.3.2
WEATHERING PROBABILITY MAP FOR CONCRETE[a]



Note a. Lines defining areas are approximate only. Local conditions can be more or less severe than indicated by the region classification.

Note b. Data needed to determine the weathering index for any locality can be found or estimated from the *Tables of Local Climatological Data*, published by the National Oceanic & Atmospheric Administration, U.S. Department of Commerce.

batches are used.

3. When total quantity of a given class of concrete is less than 50 cubic yards (38 m^3), strength tests are not required when approved and when evidence of satisfactory strength is provided. Satisfactory evidence shall include, but not be limited to, certification from the concrete supplier that the concrete to be provided will be proportioned to achieve the strength specified based on "field experience" and/or "trial batches" in accordance with ACI 318. In the absence of satisfactory evidence, concrete shall be proportioned in accordance with Table 1503.2.1.
4. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at test age designated for determination of f'_c.

1503.4.2 Laboratory-cured specimens: Laboratory-cured specimens shall conform to the following:

1. Samples for strength tests shall be taken in accordance with ASTM C172 listed in Appendix A.
2. Cylinders for strength tests shall be molded and laboratory-cured in accordance with ASTM C31 listed in Appendix A, and tested in accordance with ASTM C39 listed in Appendix A.
3. Strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
   a. Average of all sets of three consecutive strength tests equal or exceed f'_c.
   b. All individual strength tests (average of two cylinders) shall not fall below f'_c by more than 500 psi (3448 kPa).
4. If either of the requirements of Section 1503.4.2, item 3, is not met, steps shall be taken to increase the average of subsequent strength test results. Requirements of Section 1503.4.4 shall apply if the requirement in Section 1503.4.2, item 3(b), is not met.

1503.4.3 Field-cured specimens: When the code official requires strength tests of cylinders cured under field conditions to check adequacy of curing and protection of concrete in the structure, the field-cured specimens shall conform to the following:

1. Field-cured cylinders shall be cured under field conditions in accordance with Section 7.4 of ASTM C31 listed in Appendix A.
2. Field-cured test cylinders shall be molded at the same time and from the same samples as laboratory-cured test cylinders.
3. Procedures for protecting and curing concrete shall be improved when strength of field-cured cylinders at test age designated for determination of f'_c is less than 85 percent of that of companion laboratory-cured cylinders. The 85 percent is not required when field-cured strength exceeds f'_c by more than 500 psi (3448 kPa).

1503.4.4 Investigation of low strength test results: If the investigation of concrete indicates low strength conditions, the following procedures shall apply:

1. If any strength test (Section 1503.4.1, item 4) of laboratory-cured cylinders falls below specified value of f'_c by more than 500 psi (3448 kPa) (Section 1503.4.2, item 3b) or if tests of field-cured cylinders indicate deficiencies in protection and curing (Section 1503.4.3, item 3) steps shall be taken to assure that load-carrying capacity of the structure is not jeopardized.
2. If the likelihood of low-strength concrete is confirmed and computations indicate that load-carrying capacity would be significantly reduced, tests of cores drilled from the area in question shall be made in accordance with ACI 318.
3. Concrete in an area represented by core tests shall be considered structurally adequate if the average of three cores is not less than 85 percent of f'_c and if a single core is not less than 75 percent of f'_c. When necessary to check testing accuracy, locations represented by erratic core strengths shall be retested.
4. If criteria of Section 1503.4.4, item 3, are not met, and if structural adequacy remains in doubt, load tests shall be ordered at the discretion of the engineer or the code official as outlined in Chapter 20 of ACI 318 for the questionable portion of the structure, or other appropriate action taken.

SECTION 1504.0 MIXING AND PLACING OF CONCRETE

1504.1 General: The preparation, handling and curing of concrete shall be performed in accordance with the requirements of Sections 1504.2 through 1504.8.

1504.2 Preparation of equipment and place of deposit: Preparation before concrete placement shall include the following:

1. All equipment for mixing and transporting concrete shall be clean.
2. All debris and ice shall be removed from spaces to be occupied by concrete.
3. Forms shall be properly coated.
4. Masonry filler units that will be in contact with concrete shall be well drenched.
5. Reinforcement shall be thoroughly clean of ice or other deleterious coating.
6. Water shall be removed from place of deposit before concrete is placed unless a tremie is to be used or unless otherwise permitted by the code official.
7. All laitance and other unsound material shall be removed before additional concrete is placed against hardened concrete.

1504.3 Mixing: All concrete shall be mixed until there is a uniform distribution of materials, and shall be discharged completely before the mixer is recharged.

1504.3.1 Ready-mixed concrete: Ready-mixed concrete shall be mixed and delivered in accordance with requirements of ASTM C94 or ASTM C685 listed in Appendix A.

1504.3.2 Job-mixed concrete: Job-mixed concrete shall be mixed in accordance with ACI 318.

1504.4 Conveying: Concrete shall be conveyed from mixer to place of final deposit by methods that will prevent separation or loss of materials. Conveying equipment shall be capable of providing a supply of concrete at site of placement without separation of ingredients and without interruptions sufficient to permit loss of plasticity between successive increments.

1504.5 Depositing: Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing.

1504.5.1 Placement timing: Concrete shall be carried on at such a rate that concrete is at all times plastic and flows readily into spaces between reinforcement.

1504.5.2 Unacceptable concrete: Concrete that has partially hardened or been contaminated by foreign materials shall not be deposited in the structure.

1504.5.3 Retempering: Retempering concrete or concrete that has been remixed after initial set shall not be used unless approved by the engineer.

1504.5.4 Continuous concreting: After concreting is started, it shall be carried on as a continuous operation until placing of a panel or section, as defined by its boundaries or predetermined joints, is completed except as permitted or prohibited by Section 1505.4.

1504.5.5 Placement in walls: Top surfaces of vertically formed lifts shall be generally level.

1504.5.6 Construction joints: When construction joints are required, joints shall be made in accordance with Section 1505.4.

1504.5.7 Consolidation: All concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.

1504.6 Curing: Concrete (other than high-early-strength) shall be maintained above 50 degrees F. (10 degrees C.) and in a moist condition for at least the first seven days after placement, except when cured in accordance with Section 1504.6.2.

1504.6.1 High-early-strength concrete: High-early-strength concrete shall be maintained above 50 degrees F. (10 degrees C.) and in a moist condition for at least the first three days, except when cured in accordance with Section 1504.6.2.

1504.6.2 Accelerated curing: If curing is to be accelerated, it shall be done in accordance with ACI 318.

1504.7 Cold weather requirements: Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather.

1504.7.1 Frost: All concrete materials and all reinforcement, forms, fillers and

ground with which concrete is to come in contact shall be free from frost.

1504.7.2 Ice: Frozen materials or materials containing ice shall not be used.

1504.8 Hot weather requirements: During hot weather, attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that would impair required strength or serviceability of the member or structure.

SECTION 1505.0 FORMWORK, EMBEDDED PIPES, AND CONSTRUCTION JOINTS

1505.1 Design of formwork: The design, fabrication and erection of forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the design drawings and specifications.

1505.1.1 Form strength: Forms shall be substantial and sufficiently tight to prevent leakage of mortar.

1505.1.2 Form bracing: Forms shall be properly braced or tied together to maintain position and shape.

1505.1.3 Form placement: Forms and their supports shall be designed so as not to damage previously placed structure.

1505.2 Removal of forms and shores: Construction loads shall not be supported on, nor any shoring removed from, any part of the structure under construction except when that portion of the structure, in combination with the remaining forming and shoring system, has sufficient strength to support safely its weight and loads placed thereon.

1505.2.1 Structural analysis: Sufficient strength shall be demonstrated by structural analysis considering proposed loads, strength of forming and shoring system, and concrete strength data. Concrete strength data shall be based on tests of field-cured cylinders or, when approved, on other procedures to evaluate concrete strength. Structural analysis and concrete strength test data shall be furnished to the code official when so required.

1505.2.2 Construction loads: Construction loads exceeding the combination of superimposed dead load plus specified live load shall not be supported on any unshored portion of the structure under construction, unless analysis indicates adequate strength to support such additional loads.

1505.2.3 Safety: Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to be damaged thereby.

1505.2.4 Prestressed members: Form supports for prestressed concrete members shall not be removed unless sufficient prestressing has been applied to enable prestressed members to carry their dead load and anticipated construction loads.

1505.3 Conduits and pipes embedded in concrete: Where conduits, pipes and sleeves of any material not harmful to concrete and within limitations of this section are embedded in concrete with approval of the engineer, they shall not

be considered to replace structurally the displaced concrete, except as provided in Section 1505.3.5.

1505.3.1 Aluminum conduit and pipe: Conduits and pipes of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

1505.3.2 Structural effect: Conduits, pipes, and sleeves passing through a slab, wall, or beam shall not impair significantly the strength of the construction.

1505.3.3 Columns: Conduits and pipes, with their fittings, embedded within a column shall not displace more than 4 percent of the area of cross section on which strength is calculated or which is required for fire protection.

1505.3.4 Slabs, walls or beams: Except when plans for conduits and pipes are approved by the engineer and the code official, conduits and pipes embedded within a slab, wall or beam (other than those merely passing through) shall satisfy the following:

1. They shall not be larger in outside dimension than one-third the overall thickness of slab, wall, or beam in which they are embedded.
2. They shall not be spaced closer than three diameters or widths on center.
3. They shall not impair significantly the strength of the construction.

1505.3.5 Displaced concrete: Conduits, pipes, and sleeves shall not be considered as replacing structurally in compression the displaced concrete unless:

1. They are not exposed to rusting or other deterioration.
2. They are of uncoated or galvanized iron or steel not thinner than standard Schedule 40 steel pipe.
3. They have a nominal inside diameter not over 2 inches and are spaced not less than three diameters on center.

1505.3.6 Additional considerations: In addition to other requirements of Section 1505.3, pipes that will contain liquid, gas or vapor which are embedded in structural concrete shall conform to the following conditions:

1. Pipes and fittings shall be designed to resist effects of the material, pressure, and temperature to which they will be subjected.
2. Temperature of liquid, gas, or vapor shall not exceed 150 degrees F. (66 degrees C.).
3. Maximum pressure to which any piping or fittings shall be subjected shall not exceed 200 psi (1379 kPa) above atmospheric pressure.
4. All piping and fittings shall be tested as a unit for leaks before concrete placement. Testing pressure above atmospheric pressure shall be 50 percent in excess of pressure to which piping and fittings will be subjected, but minimum testing pressure shall not be less than 150 psi (1034 kPa) above atmospheric pressure. Pressure test shall be held for 4 hours without a drop in pressure except that caused by changes in air temperature.

   Exception: Drain pipes and other piping designed for pressures of not more than 1 psi (7 kPa) above atmospheric pressure need not be tested.

5. Pipes carrying liquid, gas, or vapor that is explosive or injurious to health shall again be tested as specified in Section 1505.3.6, item 4, after concrete has hardened.
6. Liquid, gas, or vapor, except water not exceeding 90 degrees F. (32 degrees C.) or 50 psi (345 kPa) pressure, shall not be placed in the pipes until the concrete has attained its design strength.
7. In solid slabs, piping, unless it is for radiant heating or snow melting, shall be placed between top and bottom reinforcement.
8. Concrete cover for pipes and fittings shall not be less than 1½ inches (38 mm) for concrete exposed to earth or weather, or ¾ inches (19 mm) for concrete not exposed to weather or in contact with ground.
9. Reinforcement with an area of not less than 0.002 times area of concrete section shall be provided normal to piping.
10. Piping shall be fabricated and installed so that cutting, bending or displacement of reinforcement from its proper location will not be required.

1505.4 Construction joints: Construction joints shall be created using the procedures set forth in Sections 1505.4.1 through 1505.4.6.

1505.4.1 Surface cleaning: Surface of concrete construction joints shall be cleaned and laitance removed.

1505.4.2 Preparation of joint: Immediately before new concrete is placed, all construction joints shall be wetted, and standing water shall be removed.

1505.4.3 Effect on strength: Construction joints shall be so made and located as not to impair the strength of the structure. Provisions shall be made for transfer of shear and other forces through construction joints.

1505.4.4 Location of joints: Construction joints in floors shall be located within the middle third of spans of slabs, beams, and girders. Joints in girders shall be offset a minimum distance of two times the width of intersecting beams.

1505.4.5 Support conditions: Beams, girders, or slabs supported by columns or walls shall not be cast or erected until concrete in the vertical support members is no longer plastic.

1505.4.6 Monolithic pours: Beams, girders, haunches, drop panels and capitals shall be placed monolithically as part of a slab system, unless otherwise shown in design drawings or specifications.

SECTION 1506.0 DETAILS OF REINFORCEMENT

1506.1 General: Details of reinforcement shall comply with the requirements of this section and ACI 318.

1506.2 Bending reinforcement: All reinforcement shall be bent cold, unless permitted by the engineer and approved. Reinforcement partially embedded in concrete shall not be field bent except as shown on the design drawings or permitted by the engineer and approved.

1506.3 Surface conditions of reinforcement: At the time concrete is placed, metal reinforcement shall be free from mud, oil, or other nonmetallic coatings that adversely affect bonding capability.

1506.3.1 Rust or mill scale: Metal reinforcement, except prestressing tendons, with rust, mill scale, or a combination of both shall be considered satisfactory, provided the minimum dimensions (including height of deformations) and weight of a hand-wire-brushed test specimen are not less than the specification requirements of the applicable ASTM standard referenced by ACI 318.

1506.3.2 Prestressing tendons: Prestressing tendons shall be clean and free of oil, dirt, scale, pitting and excessive rust. A light oxide is permissible.

1506.4 Placing reinforcement: Reinforcement, prestressing tendons and ducts shall be accurately placed and supported before concrete is placed, and shall be secured against displacement within tolerances permitted in Sections 1506.4.1 through 1506.4.3.

Exception: Embedded items (such as dowels or inserts) of precast concrete members that either protrude from concrete or remain exposed for inspection shall not be embedded while the concrete is in a plastic state unless approved by the engineer and the following conditions are met:

1. Embedded items shall not be required to be hooked or tied to reinforcement within plastic concrete.
2. Embedded items shall be maintained in correct position while concrete remains plastic.
3. Embedded items shall be properly anchored to develop required factored loads.

1506.4.1 Reinforcement, prestressing tendons and prestressing ducts: Unless otherwise specified by the engineer, reinforcement, prestressing tendons, and prestressing ducts shall be placed within the following tolerances:

1. Tolerance for depth *d*, and minimum concrete cover in flexural members, walls and compression members shall be as specified in Table 1506.4.1, except that tolerance for the clear distance to formed soffits shall be minus ¼ inch (6 mm) and tolerance for cover shall not exceed minus one-third the minimum concrete cover required in the design drawings or specifications.
2. Tolerance for longitudinal location of bends and ends of reinforcement shall be ± 2 inches (51 mm) except at discontinuous ends of members where tolerance shall be ± ½ inch (13 mm).

Table 1506.4.1[a]
TOLERANCES

Depth *d*	Tolerance on *d*	Tolerance on minimum concrete cover
d less than or equal to 8 in.	± ⅜ in.	-⅜ in.
d greater than 8 in.	± ½ in.	-½ in.

Note a. 1 inch = 25.4 mm.

1506.4.2 Welded wire fabric: Where welded wire fabric (with wire size not greater than W5 or D5) used in slabs not exceeding 10 feet (3048 mm) in span is curved from a point near the top of slab over the support to a point near the bottom of slab at midspan, such reinforcement shall be either continuous over, or securely anchored at the support.

1506.4.3 Welding: Welding of crossing bars shall not be permitted for assembly of reinforcement unless approved by the engineer.

1506.5 Spacing limits for reinforcement: The clear distance between reinforcing bars, bundled bars, prestressing tendons and ducts shall be in accordance with the limitations of ACI 318.

1506.6 Concrete protection for reinforcement: Reinforcement shall be provided with the protection required by Sections 1506.6.1 through 1506.6.5.

1506.6.1 Cast-in-place concrete: In cast-in-place concrete (nonprestressed), the minimum concrete cover for reinforcement shall be as indicated in Table 1506.6.1.

Table 1506.6.1
MINIMUM COVER

Structural element and condition	Minimum cover, in.[a]
1. Concrete cast against and permanently exposed to earth	3
2. Concrete exposed to earth or weather:	
#6 through #18 bars	2
#5 bar, W31 or D31 wire, and smaller	1½
3. Concrete not exposed to weather or in contact with ground	
Slabs, walls, joists:	
#14 and #18 bars	1½
#11 bar and smaller	¾
Beams, columns:	
Primary reinforcement, ties, stirrups, spirals	1½
Shells, folded plate members:	
#6 bar and larger	¾
#5 bar, W31 or D31 wire, and smaller	½

Note a. 1 inch = 25.4 mm.

1506.6.2 Precast concrete: The minimum cover for reinforcement in precast concrete manufactured under plant control conditions, and for prestressed concrete shall be in accordance with ACI 318.

1506.6.3 Corrosive environments: In corrosive environments or other severe conditions, amount of concrete protection shall be suitably increased, and denseness and nonporosity of protection concrete shall be considered, or other protection shall be provided.

1506.6.4 Future extensions: Exposed reinforcement, inserts and plates intended for bonding with future extensions shall be protected from corrosion.

1506.6.5 Fire protection: When this code requires a thickness of cover for fire

protection greater than the minimum concrete cover specified in Section 1506.6.1 or ACI 318, such greater thickness shall be used.

SECTION 1507.0 CONCRETE-FILLED PIPE COLUMNS

1507.1 General: Concrete-filled pipe columns shall be manufactured from standard, extra-strong, or double-extra-strong steel pipe and tubing, filled with concrete so placed and manipulated as to secure maximum density and to insure complete filling of the pipe without voids.

1507.2 Design: The safe supporting capacity of concrete-filled pipe columns shall be computed in accordance with the approved rules or as determined by a test.

1507.3 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.

1507.4 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 of the section, but not nearer than 1 inch (25 mm) to the exterior steel shell. All structural shapes used as reinforcement shall be milled to insure bearing on cap and base plates.

1507.5 Fireresistance rating protection: Pipe columns shall be of such size or so protected as to develop the required fireresistance ratings specified in Table 401. 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. The minimum diameter of pipe columns shall be 4 inches (102 mm) except that in Type 5 structures not exceeding 3 stories or 40 feet (12192 mm) in height, pipe columns used in the basement and as secondary steel members shall have a minimum diameter of 3 inches (76 mm).

1507.6 Approvals: All details of column connections and their splices shall be shop-fabricated by approved methods and shall be approved only after tests in accordance with the approved rules. Shop-fabricated concrete-filled pipe columns shall be inspected by the code official or by an approved representative of the manufacturer at the plant.

SECTION 1508.0 SHOTCRETE

1508.1 General: Except as specified in the following sections, shotcrete shall conform to the requirements for plain concrete or reinforced concrete. Shotcrete is mortar or concrete pneumatically projected at high velocity onto a surface.

1508.2 Proportioning: Shotcrete proportions shall be selected that allow

suitable placement procedures using the delivery equipment selected, and that results in in-place hardened shotcrete meeting the strength requirements of this code.

1508.3 Aggregate: Coarse aggregate, if used, shall not exceed ¾ inch (19 mm) in size.

1508.4 Reinforcement: Reinforcement shall comply with Sections 1508.4.1 through 1508.4.3.

1508.4.1 Size: The maximum size of reinforcement shall be No. 5 bars. The code official shall permit the use of larger bars when it is demonstrated that adequate encasement of the larger bars can be achieved.

1508.4.2 Spacing: The minimum clearance between parallel reinforcing bars shall be 2½ inches (64 mm). Welded wire fabric shall have a minimum wire spacing of 2 inches (51 mm) by 2 inches (51 mm).

1508.4.3 Splices: Lap splices in reinforcing bars shall be by the noncontact lap splice method with at least 2 inches (51 mm) clearance between bars. The code official shall permit the use of contact lap splices where necessary for the support of the reinforcing and when it is demonstrated that adequate encasement of the bars at the splice can be achieved.

1508.5 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 shotcrete. Rebound shall not be reused as aggregate.

1508.6 Joints: Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless all edges are sloped to a thin edge. For structural elements which will be under compression and for construction joints shown on the approved plans, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.

1508.7 Damage: Any in-place shotcrete which exhibits sags or sloughs, segregation, honeycombing, sand pockets or other obvious defects shall be removed and replaced.

1508.8 Curing: During the curing periods specified herein, shotcrete shall be maintained above 40 degrees F. (4 degrees C.) and in a moist condition.

1508.8.1 Initial curing: Shotcrete shall be kept continuously moist for 24 hours after shotcreting is completed or shall be sealed with an approved curing compound.

1508.8.2 Final curing: Final curing shall continue seven days after shotcreting, or for three days if high-early-strength cement is used, or until the specified strength is obtained. Final curing shall consist of either the initial curing process or the shotcrete shall be covered with an approved moisture-retaining cover.

1508.8.3 Natural curing: Natural curing shall not be used in lieu of that specified above unless the relative humidity remains at or above 85 percent,

and is authorized by the design architect/engineer, and approved by the code official.

1508.9 Strength test: Strength test of shotcrete shall be made in accordance with the quality assurance provisions of ACI 506.2 listed in Appendix A.

SECTION 1509.0 MINIMUM SLAB THICKNESS

1509.1 General: The thickness of concrete floor slabs supported directly on the ground shall be not less than 3½ inches (89 mm). An approved vapor barrier with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab.

Exception: A vapor barrier is not required:

1. For detached structures accessory to Use Group R-3, such as garages, utility buildings or other unheated facilities;
2. For buildings of other uses when migration of moisture through the slab from below will not be detrimental to the intended use of the building;
3. For driveways, walks, patios and other flatwork which will not be enclosed at a later date; or
4. Where approved based upon local site conditions.

ARTICLE 16

GYPSUM AND PLASTER

SECTION 1600.0 GENERAL

1600.1 Scope: The provisions of this article shall govern the materials, design, construction and quality of gypsum and plaster.

SECTION 1601.0 INTERIOR LATHING AND GYPSUM PLASTERING

1601.1 General: All lathing and gypsum plaster materials and accessories shall be marked with appropriate standards referenced in this section and stored in such manner as to protect them from the weather.

1601.2 Standards: All interior lathing and gypsum plastering materials shall conform to the standards listed in Table 1601 and Appendix A and, when required for fire protection, shall also conform to the provisions of Article 9.

1601.3 Installation: Installation of these materials shall conform to Section 1604.0.

Table 1601
PLASTER MATERIALS AND ACCESSORIES

Material	Standard
Exterior plaster bonding compounds	ASTM C932
Gypsum base for veneer plasters	ASTM C588
Gypsum casting and molding plaster	ASTM C59
Gypsum Keene's cement	ASTM C61
Gypsum lath	ASTM C37
Gypsum plaster	ASTM C28
Gypsum veneer plaster	ASTM C587
Interior bonding compounds, gypsum	ASTM C631
Lime plasters	ASTM C5; C206
Metal lath	ASTM C847
Plaster aggregates	
Sand	ASTM C35; C897
Perlite	ASTM C35
Vermiculite	ASTM C35
Portland cement	ASTM C150
Steel studs and track	ASTM C645; C955
Steel screws	ASTM C1002; C954
Welded wire lath	ASTM C933

SECTION 1602.0 PORTLAND CEMENT STUCCO LATH AND PLASTER

1602.1 General: All exterior and interior portland cement stucco lathing and plastering shall be done with appropriate materials listed in Table 1601 and Appendix A.

1602.2 Weather protection: All materials shall be stored in such a manner as to protect them from the weather.

1602.3 Installation: Installation of these materials shall be in conformance with ASTM C926 listed in Appendix A and Section 1602.4.

1602.4 Protection after application: At all times during application and for a period of not less than 48 hours after application of each coat, provisions shall be made to keep stucco work above 40 degrees F. (4 degrees C.).

SECTION 1603.0 GYPSUM BOARD MATERIALS

1603.1 General: All gypsum board materials and accessories shall be marked with appropriate standards referenced in this section and stored so as to protect them from the weather.

1603.2 Standards: All gypsum board materials shall conform to the appropriate standards listed in Table 1603 and Appendix A.

1603.3 Installation: Installation of these materials shall conform to Section 1604.0 and, when required for fireresistance, to Article 9.

Table 1603
GYPSUM BOARD MATERIALS AND ACCESSORIES

Material	Standard
Gypsum sheathing	ASTM C79
Gypsum wallboard	ASTM C36
Joint reinforcing tape and compound	ASTM C474; C475
Nails for gypsum boards	ASTM C514
Steel screws	ASTM C1002; C954
Steel studs, nonloadbearing	ASTM C645
Water-resistant gypsum backing board	ASTM C630

1603.4 Water-resistant gypsum backer board: In all areas subjected to repeated damp conditions and moisture accumulation such as bathtub and shower compartments, water-resistant gypsum backer board complying with ASTM C630 listed in Appendix A shall be used as a substratum unless protected with a moisture-proof and vapor-proof covering.

SECTION 1604.0 GYPSUM CONSTRUCTION

1604.1 General: Gypsum board and plaster construction shall be of the materials listed in Table 1603. These materials shall be assembled and

installed in conformance with appropriate standards listed in Table 1604 and Appendix A.

1604.2 Limitations: Gypsum construction shall not be used in any exterior location where it would be directly exposed to the weather.

1604.3 Inspection: The code official shall be notified not less than 24 hours in advance of all plastering work or installation of any gypsum board except gypsum lath. Plaster shall not be applied until after the lathing or other plaster base has been inspected and approved by the code official.

1604.4 Weather protection: When plastering work is in progress, the building or structure shall be enclosed and conditioned to provide proper ventilation and temperatures not less than 40 degrees F. (4 degrees C.) nor more than 80 degrees F. (27 degrees C.) from one week prior to the plastering operation and until one week following or until the plaster is dry.

Table 1604
INSTALLATION OF GYPSUM CONSTRUCTION

Material	Standard
Gypsum plaster	ASTM C842
Gypsum veneer base	ASTM C844
Gypsum veneer plaster	ASTM C843
Gypsum wallboard	GA-216
Interior lathing and furring	ASTM C841
Steel framing for gypsum boards	ASTM C754; C1007

ARTICLE 17

WOOD

SECTION 1700.0 GENERAL

1700.1 Scope: The provisions of this article shall govern the materials, design, construction and quality of wood.

SECTION 1701.0 LUMBER AND TIMBER CONSTRUCTION

1701.1 Design: All structural wood members and connections shall be of sufficient size or capacity to carry all design loads without exceeding the allowable design values specified in the NFoPA *National Design Specification for Wood Construction* listed in Appendix A.

1701.1.1 Identification: All lumber used for load-supporting purposes, including end-jointed or edge-glued lumber, shall be identified by the grade mark of an approved lumber grading or an approved inspection agency. Grading practices and identification shall be in accordance with rules published by an approved agency. 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 an approved inspection agency shall be accepted for precut, remanufactured, or rough-sawn lumber, and for sizes larger than 3-inch nominal thickness.

1701.2 Minimum dimensions: Dimensions of lumber and timber construction shall comply with Sections 1701.2.1 and 1701.2.2.

1701.2.1 Sizes of structural members: All lumber sizes specified in this code are nominal sizes. Nominal sizes or actual sizes shall be shown on the plans. Computations to determine the required size of members shall be based on the net dimensions (actual sizes).

1701.2.2 Structural posts: All isolated structural posts shall have a minimum dimension of 4 inches.

1701.3 Fabrication: Fabrication of lumber and timber construction shall comply with Sections 1701.3.1 through 1701.3.3.

1701.3.1 Connections: All connections shall be fabricated with approved timber connectors, bolts, lag screws, spikes, nails or gluing or other approved connecting devices. Bolted connections shall be snugged up tightly without crushing wood fibers under the washers. All nailed connections shall meet the minimum requirements of Appendix C.

1701.3.2 Cambering: Trusses and long-span girders shall be designed with sufficient camber, or other provision shall be made to counteract any deflection other than that permitted in Section 1305.3.

1701.3.3 Cutting and notching: It shall be unlawful to notch, cut or pierce wood beams, joists, rafters or studs in excess of the limitations herein specified, unless proven safe by structural analysis or suitably reinforced to transmit all calculated loads.

1701.3.3.1 Notches: Notch depth in the top or bottom of the joist, rafters and beams shall not exceed one-sixth the depth of the members and shall not be located in the middle one-third of the span. Notch depth at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of beams, joists and rafters of 4-inch or greater nominal thickness shall not be notched, except at ends of members.

1701.3.3.2 Holes: Holes bored or cut into joists for piping or electrical cables shall not be closer than 2 inches (51 mm) to the top or bottom of the joist and the diameter of the hole shall not exceed one-third 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 ductwork or for other fabricating purposes shall not be cut or bored more than one-third the depth of the stud.

1701.3.3.3 Reinforcement: Where the stud is cut or bored in excess of one-third its depth, the stud shall be reinforced to be equal in load-carrying capacity to a stud notched not more than one-third its depth.

1701.4 Trimmer and header beams: Where determined necessary by stress analysis, trimmer and header beams shall be hung in approved stirrups or hangers, unless supported on a wall, girder or column. All multiple-member beams shall be spiked or bolted together.

1701.5 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 4 inches (102 mm) 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 6 inches (152 mm) and be bolted or spiked together; and when framing end-to-end, the beams shall be secured together by approved ties, straps, dogs, plates or sheathing.

1701.6 Maintenance: All connections in the joints of timber trusses and structural frames shall be inspected periodically. Bolts and other connectors shall be maintained tight.

SECTION 1702.0 HEAVY TIMBER CONSTRUCTION

1702.1 Wood: All structural wood members, sawn or glued-laminated, used in Type 4 construction shall be stress-grade timbers identified as to grade and strength by approved manufacturing, testing or inspection agencies or

bureaus. All structural timber members shall have the minimum dimensions specified in Section 405.0 for Type 4 construction and shall be designed, fabricated and installed in accordance with the NFoPA *National Design Specification for Wood Construction*, AITC 108, AITC 112, AITC 117, AITC 119 and AITC A190.1 listed in Appendix A.

1702.2 Other structural materials: Structural steel or reinforced concrete members shall not be substituted for timber in any part of the structural frame unless protected to develop the required fireresistance rating specified in Table 401, but not less than 1-hour fireresistance rating. Structural members supporting walls shall be protected to afford the same fireresistance rating as the wall supported.

1702.3 Columns: Columns shall be continuous or superimposed throughout all stories by means of reinforced concrete or metal caps with brackets, or shall be connected by properly designed steel or iron caps, with pintles and base plates, or by timber splice plates affixed to the columns by means of metal connectors housed within the contact faces, or by other approved methods. Girders or trusses supporting columns shall have at least 1-hour fireresistance rating.

1702.4 Floors: The planks shall be laid so that a continuous line of joints will not occur except at points of support and so that they are not spiked to supporting girders which are parallel to the lamination of the floor. Flooring shall not extend closer than ½ inch (13 mm) to walls to provide an expansion joint, but the joint shall be covered at top or bottom to avoid flue action.

1702.5 Beams and girders: Beam and girder supports and connections shall comply with Sections 1702.5.1 and 1702.5.2.

1702.5.1 Wall and girder supports: Wall plate boxes of a self-releasing type, or approved hangers, shall be provided where beams and girders enter masonry. An air space of ½ inch (13 mm) 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, the beams 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 shall 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 2 hours or more shall have not less than 4 inches (102 mm) of solid masonry between their ends and the outside face of the wall and between adjacent beams. Approved roof anchorage shall be provided.

1702.5.2 Column connections: Girders and beams shall be closely fitted around columns and adjoining ends shall be cross-tied to each other, or inter-tied by caps or ties, to transfer horizontal loads across the joint. Wood bolsters shall not be placed on tops of columns unless the columns support roof loads only.

SECTION 1703.0 DESIGN AND CONSTRUCTION

1703.1 General: The exterior walls, interior partitions, floors and roofs of wood construction shall be designed and constructed to develop adequate strength to resist all vertical and lateral forces due to both dead and live loads. Standard balloon, braced, platform, and post-and-beam types of construction shall be acceptable framing methods.

1703.2 Beam separation in Types 3A and 3B construction: All wood and other combustible floor, roof and other structural members framing into masonry walls shall be cut to a bevel of 3 inches (76 mm) in the depth and shall project not more than 4 inches (102 mm) into the wall. The distance between embedded ends of adjacent beams or joists entering into the wall from opposite sides shall be not less than 4 inches (102 mm).

1703.3 Framing around flues and chimneys: Combustible framing shall be trimmed not less than 2 inches (51 mm) from all flues, chimneys and fireplaces, and 6 inches (152 mm) away from flue openings.

SECTION 1704.0 WALL CONSTRUCTION

1704.1 Bearing walls: Posts and studs in bearing walls and partitions shall be designed as columns, with due allowance for lateral support furnished by sheathing, intermediate bracing, horizontal bridging, wall coverings and the floor and roof assemblies. The walls shall be fabricated in such a manner as to provide adequate support for the material used to enclose the building and to provide for transfer of all lateral loads to the foundation in accordance with Section 1305.4.

A single top plate shall not be used unless the plate is adequately tied at joints, corners, and intersecting walls by at least the equivalent of 3 inch by 6 inch by 0.036 inch (76 mm by 152 mm by 1 mm) thick galvanized steel that is nailed to each wall or segment of wall by three 8d nails or equivalent, and the rafters, joists, or trusses are centered over the studs with a tolerance of not more than 1 inch (25 mm).

1704.2 Nonbearing walls: Studs in nonbearing walls and partitions shall not be spaced more than 48 inches (1219 mm) on center, and are permitted to be erected with the long dimension parallel to the wall, unless otherwise approved after test as an integrated assembly. A single top plate shall not be used unless it is installed in accordance with Section 1704.1.

1704.3 Bracing: In buildings more than one story in height and where necessary for strength in one-story buildings, the corner posts shall be the equivalent of not less than two pieces of 2-inch by 4-inch studs, braced by not less than one piece of 1-inch by 4-inch continuous diagonal brace let into the studs. Bracing is not required where diagonal wood sheathing, plywood or particle board panels are used, or other sheathing specified in Section 1704.7 is applied vertically in panels of not less than 4 feet by 8 feet with approved fasteners complying with Appendix C. Other sheathing materials shall be permitted

when tested in accordance with ASTM E72 listed in Appendix A and meeting the following criteria.

Dry tests with load increments of 400 pounds (182 kg). Maximum load 5,200 pounds (2362 kg) or 650 pounds per foot (968 kg/m).

1. At load of 1,200 pounds (545 kg), average total deflection of 0.2 inch (5 mm) and residual deflection of 0.1 inch (2 mm).
2. At load of 2,400 pounds (1090 kg), average total deflection of 0.6 inch (15 mm) and residual deflection of 0.3 inch (8 mm).

Wet tests with load increments of 400 pounds (182 kg). Maximum load 4,000 pounds (1816 kg).

1. At load of 1,200 pounds (545 kg), average total deflection of 0.28 inch (7 mm) and residual deflection of 0.14 inch (4 mm).
2. At load of 2,400 pounds (1090 kg), average total deflection of 0.8 inch (20 mm) and residual deflection of 0.4 inch (10 mm).

1704.4 Mortise-and-tenon framing: Where mortise-and-tenon framing is used, the vertical members of the frame shall be not less than 4 inches by 6 inches in size and shall be designed as a column.

1704.5 Multiple stories: Where the frame is more than one 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 0.040 inch nominal thickness steel sheets for 2-inch framing members and not less than 0.052 inch nominal thickness steel sheets for 3-inch structural members. For 4-inch and larger members, column splices and beam and girder supports shall comply with Section 1702.0.

1704.6 Framing over openings: Headers, double joists, trusses or other approved assemblies of adequate size to transfer all superimposed loads to the vertical members shall be provided over all window and door openings in bearing walls and partitions.

1704.7 Wall sheathing: Except as provided in Section 2104.1 for weather boarding or when stucco construction complying with Section 1602.0 is used, all enclosed buildings shall be sheathed with one of the materials of the nominal thickness specified in Table 1704.7 or any other approved material of equal strength and durability.

Table 1704.7
MINIMUM THICKNESS OF WALL SHEATHING

Sheathing type	Minimum thickness
Fiber board	½ inch
Gypsum sheathing	½ inch
Particle board	see Section 1711.5
Plywood	5/16 inch
Reinforced cement mortar	1 inch (see Section 1704.7.1)
Wood sheathing	⅝ inch

1704.7.1 Paper-backed lath sheathing: In buildings of Use Group R-3 and one-story commercial buildings with brick or similar veneers, the sheathing shall conform to Section 1704.7 or shall consist of a layer of paper-backed lath complying with Section 1601.0 and a 1-inch (25 mm) intermediate space which shall be mortar-filled as each course of veneering is applied.

1704.8 Foundation anchorage: Wall sill plates, minimum of 2-inch by 4-inch members, shall be sized and anchored to foundation walls or piers and at intermediate intervals as required to resist wind uplift. Anchor bolts shall be a minimum of ½-inch diameter. The bolts shall be embedded in foundations to a depth of not less than 8 inches (203 mm) of poured in place concrete, and not less than 15 inches (381 mm) in grouted unit masonry. There shall be a minimum of two anchor bolts per section of plate and anchor bolts shall be placed 12 inches (305 mm) from the end of each section of plate with intermediate bolts spaced a maximum of 8 feet (2438 mm) on center.

1704.9 At-grade protection: All exterior wood framework of buildings, whether structural or nonloadbearing, shall be supported on approved foundation walls at least 8 inches (203 mm) above the finished grade, and higher when necessitated by a greater average snowfall. Where climatic conditions or the geographical location require additional control measures to protect buildings and structures against decay and termite attack, the provisions of Section 1712.0 shall apply.

SECTION 1705.0 FLOOR CONSTRUCTION

1705.1 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.

1705.2 Floor spans: Except when otherwise substantiated by approved structural design methods, floor joist spans shall comply with the NFoPA *Span Tables for Joists and Rafters* listed in Appendix A. Design stresses shall be those indicated in the NFoPA *Design Values for Joists and Rafters* listed in Appendix A. Metal plate connected floor trusses shall be designed in accordance with the TPI *Design Specifications for Metal Plate Connected Parallel Chord Wood Trusses* and the NFoPA *National Design Specifications for Wood Construction* listed in Appendix A.

1705.3 Bridging: Except as hereinafter noted, in all floor, attic and roof framing, there shall be not less than one line of bridging for each 8 feet (2438 mm) of span. The bridging shall consist of not less than 1-inch by 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 buildings of Use Groups R-2 and R-3, except when the joist depth exceeds 12 inches nominal or when the minimum uniformly distributed live load exceeds 40 psf (195.28 kg/m^2).

SECTION 1706.0 ROOF CONSTRUCTION

1706.1 Roof spans: Except when otherwise substantiated by approved structural design methods, rafter spans shall comply with the NFoPA *Span Tables for Joists and Rafters* listed in Appendix A. Design stresses shall be those indicated in the NFoPA *Design Values for Joists and Rafters* listed in Appendix A. Metal plate connected roof trusses shall be designed in accordance with the TPI *Design Specifications for Metal Plate Connected Wood Trusses* and the NFoPA *National Design Specifications for Wood Construction* listed in Appendix A and shall be braced to prevent rotation and provide lateral stability.

1706.2 Roof decking and sheathing: Roof deck sheathing shall consist of not less than ⅝-inch boards, plywood of the thickness specified in Section 1710.3, particle board of the grade and thickness specified in Section 1711.4, or other approved materials of equivalent strength and rigidity. When open deck sheathing is used on pitch roofs, it shall consist of not less than 1-inch by 4-inch roofers spaced not more than 6 inches (152 mm) on center, or material of equivalent strength and rigidity.

SECTION 1707.0 STRESS SKIN PANELS

1707.1 Integrated assemblies: Approved panels or other integrated assemblies fabricated of dimension lumber with wood stress coverings glued thereto, or consisting of structural units of metal-covered or molded plywood or other approved plastics formed and molded into prefabricated loadbearing members, shall be permitted for use in floors, roofs, walls, partitions and ceilings when designed in accordance with APA S811, S812, U315C, U813 and U814 listed in Appendix A or meeting the test requirements of Sections 1303.0, 1305.0 and 1306.0.

1707.2 Splices: Splices and connections between panels shall be weather-tight and of sufficient strength to resist two and one-half 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.

1707.3 Molded plywood units: Structural units of plywood or other approved plastics of similar combustible characteristics formed and molded into prefabricated loadbearing members shall conform to the approved rules and shall be identified by the approved label. The design shall be based on approved engineering analysis, confirmed by the tests prescribed in Sections 1303.0 and 1305.0.

SECTION 1708.0 STRUCTURAL GLUED-LAMINATED TIMBER AND BUILT-UP WOOD CONSTRUCTION

1708.1 General: Buildings and structures designed and erected of glued-laminated structural members, or of composite members of plywood and

dimension lumber, or of composite members of wood veneer facings laminated to a flakeboard core shall comply with this section.

1708.2 Exposed structural glued-laminated timber: Those portions of glued-laminated timbers which form the structural supports of a building or other structure and are exposed to weather and not properly protected by a roof, eave overhangs, or similar coverings shall be treated in accordance with AITC 109 listed in Appendix A or be manufactured from approved durable woods.

1708.3 Glued-laminated members and plywood components: Built-up beam and column sections consisting of one or more webs with glued lumber flanges and stiffeners shall be designed in accordance with APA S811, S812, U315C, U813 and U814 listed in Appendix A. Plywood beams consisting of plywood alone bonded together with adhesives shall be designed and fabricated in accordance with APA H815 listed in Appendix A. Other plywood components consisting of plywood alone or plywood in combination with sawn or glued-laminated lumber and bonded together with adhesives shall be designed, fabricated and identified in accordance with APA S811, S812, U315C, U813 and U814 listed in Appendix A.

1708.3.1 Gluing surfaces: In glued-lumber constructions, the surfaces to be glued shall be worked to a smooth, flat surface without sanding and free from wax, grease or oil to insure a complete glue bond over the entire contact. Factory-sanded plywood shall be permitted.

1708.4 Wood veneer and flakeboard core composite framing: Composite framing consisting of wood veneer facings laminated to a flakeboard core shall conform to the SFES standard *Performance and Quality Control Standards for Composite Floor, Wall and Truss Framing* listed in Appendix A.

SECTION 1709.0 FIBER BOARDS

1709.1 General: Insulating boards manufactured with wood or other vegetable fibers used as building boards for sheathing, roof decks, interior wall and ceiling finish, roof insulation or sound deadening, shall be vermin-proof, resistant to rot-producing fungi, water-repellant and shall meet the strength and durability tests specified in ASTM C208, AHA 194.1, ASTM D2277 and C532 listed in Appendix A. Sheathing, when used structurally, shall be so identified by an approved agency. Where required under the provisions of Article 9, the boards shall be protected or treated to develop the required fireresistance rating or flameresistance as determined by test.

1709.2 Jointing: To insure tight-fitting assemblies, edges shall be manufactured square or shiplapped, beveled, tongue-and-groove or U-jointed.

1709.3 Roof insulation: When used as roof insulation in all types of construction, fiber boards shall be protected with an approved roof covering.

1709.4 Wall insulation: Where installed and firestopped to comply with Article 9, fiber boards are permitted as wall insulation in all types of construc-

tion. In fire wall and fire separation wall construction, unless treated to be fire-retardant as provided in Section 904.0 for Class I materials, the boards shall be cemented directly to the masonry or other noncombustible base and shall be protected with an approved noncombustible veneer anchored to the base without intervening air spaces.

1709.5 Drywall construction: Where fireresistance ratings are required, provision shall be made for interlocking, lapping or otherwise protecting the joints between adjacent boards to insure smoke and flame tightness.

1709.6 Insulating roof deck: Where used as roof decking in open beam construction, fiber board insulating roof deck shall have a nominal thickness not less than 1 inch.

1709.7 Siding: Hardboard siding shall comply with AHA A135.6 listed in Appendix A.

SECTION 1710.0 PLYWOOD

1710.1 Quality: All plywood, when used structurally, shall meet the performance standards and all other requirements of DOC PS 1 and HPMA PS 51 listed in Appendix A for the type, grade and span rating or species group of plywood involved and shall be so identified by an approved agency. Working stresses shall conform to APA E30, APA Y510 and HPMA HP-SG listed in Appendix A.

1710.2 Types: Plywood for interior use shall be either of the interior type, moisture-resistant type, or exterior type. Plywood for exterior use shall be of the exterior waterproof type, except that plywood roof sheathing exposed to the outdoors on the underside is permitted to be interior type bonded with exterior glue. Exterior plywood shall not be applied directly to the framing as a siding unless it has a minimum nominal thickness of ⅜ inch. Joints shall occur over framing members, unless wood or plywood sheathing is used or joints are lapped horizontally a minimum of 1½ inches (38 mm) or otherwise made waterproof in an approved manner. Where plywood is used as lapped siding without sheathing, the wall framing to which it is attached shall be diagonally braced.

1710.3 Spans: The maximum spans for plywood sheathing shall be limited by the allowable stresses and deflections for the design live load, but shall not be greater than the spans specified in Tables 1710.3.1, 1710.3.1a, 1710.3.2 and 1710.3.3.

1710.3.1 Floor and roof sheathing: Allowable spans for floor and roof sheathing shall be as specified in Tables 1710.3.1 and 1710.3.1a. The values in Table 1710.3.1 apply to Structural I and II, C-D and C-C grades only and are limited to spans shown because of possible effect of concentrated loads.

1710.3.1.1 Floor sheathing: Edges of plywood floor sheathing shall have approved tongue-and-groove joints or shall be supported with blocking,

unless ¼-inch minimum thickness underlayment or 1½ inches (38 mm) of approved cellular or lightweight concrete is installed, or finish floor is 25/32-inch wood strip. Allowable uniform load based on deflection of 1/360 of the span is 165 pounds per square foot (psf) (806 kg/m²).

1710.3.2 Plywood combination subfloor underlayment: Allowable spans for combination subfloor underlayment shall be as specified in Table 1710.3.2.

Table 1710.3.1
ALLOWABLE SPANS FOR PLYWOOD FLOOR AND ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR TO SUPPORTS[a] (SPAN IN INCHES)[h]

Panel span rating,[b] roof/floor span	Roof					Floor
	Maximum span (inches)			Load (psf)[h]		Maximum span[e] (inches)
	Thickness (inches)	Edges blocked[c]	Edges unblocked	Total load	Live load	
12/0	5/16	12	12	135	130	0
16/0	5/16, 3/8	16	16	80	65	0
20/0	5/16, 3/8	19.2	19.2	70	55	0
24/0	3/8	24	20	60	45	0
24/0	15/32, 1/2	24	24	60	45	0
32/16	15/32, 1/2, 5/8	32	28	50	35	16[f]
40/20	19/32, 5/8, 3/4	40	32	40[d]	35[d]	20[f,g]
48/24	23/32, 3/4, 7/8	48	36	40[d]	35[d]	24

Note a. For limitations on the applicability of this table to grades of plywood, see Section 1710.3.1.
Note b. Span rating appears on all panels in the construction grades listed in Section 1710.3.1.
Note c. Edges shall be blocked with lumber or other approved type of edge support.
Note d. For roof live load of 40 psf or total load of 55 psf, decrease spans by 13 percent or use panel with next greater span rating.
Note e. For requirements for edge support and allowable uniform load, see Section 1710.3.1.1.
Note f. Maximum shall be 24 inches if 25/32-inch wood strip flooring is installed at right angles to joists.
Note g. For joists spaced 24 inches on center, plywood sheathing with span rating numbers 40/20 or greater shall not be used for subfloors except when supporting 1½ inches of lightweight concrete.
Note h. 1 inch = 25.4 mm; 1 psf = 4.882 kg/m².

Table 1710.3.1a
ALLOWABLE LOADS FOR PLYWOOD ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PARALLEL TO SUPPORTS[a] (SPAN IN INCHES)

	Thickness (inches)	No. of plies	Span (inches)	Total load (psf)	Live load (psf)
Structural I	15/32	4	24	30	20
	15/32	5	24	45	35
	1/2	4	24	35	25
	1/2	5	24	55	40
Other grades covered in PS 1	15/32	5	24	25	20
	1/2	5	24	30	25
	19/32	4	24	35	25
	19/32	5	24	50	40
	5/8	4	24	40	30
	5/8	5	24	55	45

Note a. Uniform load deflection limitations: 1/180 of span under live load plus dead load, 1/240 under live load only. Edges shall be blocked with lumber or other approved type of edge supports.
Note b. 1 inch = 25.4 mm; 1 psf = 4.882 kg/m².

1710.3.2.1 Limitations: Table 1710.3.2 is applicable to underlayment grade, C-C (plugged) and all grades of sanded exterior type plywood. For panels with a span rating of other than 48 o.c., the allowable uniform load based on deflection of $^1/_{360}$ of span is 125 psf (610 kg/m^2). Panels with a span rating of 48 o.c. are limited to 65 psf (317 kg/m^2) total load at maximum span. Plywood edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless ¼-inch minimum thickness underlayment is installed, or finish floor is $^{25}/_{32}$-inch wood strip. If wood strips are perpendicular to supports, thicknesses or span ratings shown for 16-inch (406 mm) and 20-inch (508 mm) spans shall be used on 24-inch (610 mm) spans. Spans are limited to values shown in Table 1710.3.2 because of possible effects of concentrated loads.

1710.3.3 Vertical maximum stud spacing: Stud spacing for vertical sheathing shall be as specified in Table 1710.3.3.

1710.4 Stress skin panel: For use in stress skin or other prefabricated construction, plywood design shall be determined by approved engineering analysis or by the tests prescribed for prefabricated assemblies in Section 1303.0.

Table 1710.3.2
ALLOWABLE SPANS FOR PLYWOOD COMBINATION SUBFLOOR—UNDERLAYMENT.[a] PLYWOOD CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR TO SUPPORT (THICKNESS IN INCHES)[d]

Identification	Maximum spacing of joists (inches)			
Species groups[b]	16	20	24	48
1	½	⅝	¾	—
2, 3	⅝	¾	⅞	—
4	¾	⅞	1	—
Span rating[c]	16 o.c.	20 o.c.	24 o.c.	48 o.c.

Note a. For limitations on the use of Table 1710.3.2, see Section 1710.3.2.1.
Note b. Applicable to all grades of sanded exterior type plywood.
Note c. Applicable to underlayment grade and C-C (plugged).
Note d. 1 inch = 25.4 mm; 1 psf = 4.882 kg/m^2.

Table 1710.3.3
ALLOWABLE STUD SPACING FOR PLYWOOD WALL SHEATHING

Panel span rating	Panel thickness (inch) and construction	Maximum stud spacing (inches)[c] Exterior coverings nailed to:[a]	
		Stud	Sheathing
12/0, 16/0, 20/0	5/16	16	16[b]
16/0, 20/0, 24/0, 32/16	3/8, 15/32 and 1/2 (3-ply)	24	16 24[b]
24/0, 32/16	15/32 and 1/2 (4 & 5-ply)	24	24

Note a. Blocking of horizontal joints not required.
Note b. Apply plywood sheathing with face grain perpendicular to studs.
Note c. 1 inch = 25.4 mm.

SECTION 1711.0 PARTICLE BOARD

1711.1 Quality: Particle board shall conform to ANSI A208.1 listed in Appendix A. Particle board shall be identified by the grade mark or certificate of inspection issued by an approved agency.

1711.2 Floor underlayment: Underlayment shall conform to Type 1-M-1 or sanded Type 2-M-W of ANSI A208.1 listed in Appendix A. Underlayment shall not be less than ¼ inch in thickness and shall be installed as recommended by the manufacturer.

1711.3 Subfloor or combination subfloor underlayment: Allowable spans and grades for combination subfloor underlayment shall be as specified in Table 1711.3. All panels shall be continuous over two or more spans and the tongue-and-groove panels shall be installed with the long dimension perpendicular to supports. Uniform deflection limitation shall be 1/360th of the span under 100 psf minimum load. Edges shall have tongue-and-groove joints or shall be supported with blocking unless ¼-inch minimum thickness underlayment is installed, or finish floor is $^{25}/_{32}$-inch wood strip.

Table 1711.3
ALLOWABLE SPANS FOR PARTICLE BOARD SUBFLOOR AND COMBINATION SUBFLOOR UNDERLAYMENT[a]

Grade	Thickness (inches)	Maximum spacing[b] of supports (inches)	
		Subfloor	Combination subfloor underlayment
2-M-W	½	16	—
	⅝	20	16
	¾	24	24
2-M-F	¾	20	20
2-M-3	¾	20	20

Note a. For limitations on the use of Table 1711.3, see Section 1711.3.
Note b. 1 inch = 25.4 mm.

1711.4 Roof sheathing: Allowable loads for roof sheathing shall be in accordance with the spans and grades specified in Table 1711.4. Panels shall be continuous over two or more spans. Uniform load deflection limitations shall be 1/180th of the span under live load plus dead load and 1/240th of the span under live load only. Edges of all ⅜-inch panels and edges of $^{7}/_{16}$-inch panels with 24 o.c. spacing shall be supported with blocking or edge clips.

Table 1711.4
ALLOWABLE LIVE LOADS FOR PARTICLE BOARD ROOF SHEATHING[a,b]

Grade	Thickness (inches)	Maximum on-center spacing of supports (inches)	Live load (pounds per square foot)	Total load (pounds per square foot)
2-M-W	⅜	16	45	65
	$^{7}/_{16}$	16	105	105

Table 1711.4 (cont'd.)
ALLOWABLE LIVE LOADS FOR PARTICLE BOARD ROOF SHEATHING[a,b]

Grade	Thickness (inches)	Maximum on-center spacing of supports (inches)	Live load (pounds per square foot)	Total load (pounds per square foot)
and	7/16	24	30	40
2-M-F	½	16	110	150
	½	24	40	55

Note a. For limitations on the use of Table 1711.4, see Section 1711.4.
Note b. 1 inch = 25.4 mm; 1 pound per square foot = 4.882 kg/m².

1711.5 Siding and sheathing: Allowable spans and grades of particle board siding and sheathing shall be as specified in Tables 1711.5a and 1711.5b.

Table 1711.5a
ALLOWABLE SPANS FOR EXPOSED PARTICLE BOARD PANEL SIDING

Grade	Stud spacing (inches)[a]	Minimum thickness (inches)		
		Siding		Exterior ceilings and soffits
		Direct to studs	Continuous support	Direct to supports
2-M-W and 2-M-F	16	3/8	5/16	5/16
	24	½	5/16	3/8
2-M-1 and 2-M-2	16	5/8	3/8	—
	24	3/4	3/8	—

Note a. 1 inch = 25.4 mm.

Table 1711.5b
ALLOWABLE SPANS FOR PARTICLE BOARD WALL SHEATHING[a]

Grade	Thickness (Inches)	Stud spacing (inches)[b]	
		Siding nailed to studs	Sheathing under coverings parallel or perpendicular to studs
2-M-W and 2-M-F	5/16	16	—
	3/8	24	16
	7/16	24	24
2-M-1 and 2-M-2	3/8	16	—
	½	16	16

Note a. Not exposed to the weather, long dimension of the panel parallel or perpendicular to studs.
Note b. 1 inch = 25.4 mm.

SECTION 1712.0 PROTECTION AGAINST DECAY AND TERMITES

1712.1 General: Wood construction shall conform to provisions of this section in order to prevent decay and termite attack.

1712.2 Protection: Where protection of wood members is required by this section, protection shall be provided by using naturally-durable or pressure-treated wood.

1712.2.1 Naturally-durable wood: The term "naturally-durable wood" refers to the heartwood of the following species with the exception that an occasional piece with corner sapwood is permitted if 90 percent or more of the width of each side on which it occurs is heartwood.

Decay-resistant:	Redwood, cedars, black locust, bald cypress (tidewater red), and black walnut.
Termite-resistant:	Redwood, bald cypress (tidewater red), and Eastern red cedar.

1712.2.2 Pressure-treated wood: The term "pressure-treated wood" refers to wood, including plywood, meeting the retention, penetration and other requirements applicable to the species, product, treatment and conditions of use in AWPA C1, C2, C9, and AWPB LP2, LP22, LP33, LP44, LP55 and LP77 listed in Appendix A. Preservatives shall conform to the AWPA P1, P2, P5, P8, and P9 listed in Appendix A.

1712.2.3 Identification: All lumber and plywood required to be pressure-treated shall bear the quality mark of an approved agency which maintains continuing supervision, testing and inspection over the quality of the product. Quality control inspection agencies for preservative pressure-treated wood shall be certified as to competency and performance by an approved organization. Said mark shall include the following information in a legible format: identification of the inspection agency, the standard to which treated, the identification of the treating plant, and the purpose for which the product has been treated. The mark shall be permanently affixed to each piece unless specifically waived by the code official.

1712.2.4 Moisture content: When wood pressure-treated with a water-borne preservative is used in enclosed locations where drying in service cannot readily occur, such wood shall be at a moisture content of 19 percent or less before being covered with insulation, interior wall finish, floor coverings or other material.

1712.3 Conditions favorable to decay: Where conditions are favorable to decay, wood shall comply with Sections 1712.3.1 through 1712.3.3.

1712.3.1 Wood used above ground: Wood used above ground in the locations specified in Sections 1712.3.1.1 through 1712.3.1.5 shall be naturally-durable or pressure-treated wood using water-borne preservatives and treated in accordance with AWPB LP 2 listed in Appendix A.

1712.3.1.1 Joists and girders: When wood joists or the bottom of a wood structural floor without joists are closer than 18 inches (457 mm), or wood girders are closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation, the floor assembly, including posts, girders, joists and subfloor shall be of approved naturally-durable or pressure-treated wood.

1712.3.1.2 Sills: All sills which rest on concrete or masonry exterior walls and are less than 8 inches (203 mm) from exposed earth shall be of approved naturally-durable or pressure-treated wood.

1712.3.1.3 **Sleepers and sills:** Sleepers and sills on a concrete or masonry slab which is in direct contact with earth shall be of approved naturally-durable or pressure-treated wood.

1712.3.1.4 **Girder ends:** The ends of wood girders entering exterior masonry or concrete walls shall be provided with a ½ inch (13 mm) air space on top, sides and end, unless approved naturally-durable or pressure-treated wood is used.

1712.3.1.5 **Clearance:** Clearance between wood siding and earth on the exterior of a building shall be not less than 6 inches (152 mm) except where siding, sheathing and wall framing are of approved pressure-treated wood.

1712.3.2 **Wood in contact with the ground:** All wood in contact with the ground (exposed earth) and which supports permanent structures intended for human occupancy shall be approved pressure-treated wood using waterborne preservatives and treated in accordance with AWPB LP22 listed in Appendix A when used in the locations specified in Sections 1712.3.2.1 through 1712.3.2.4.

Exception: Untreated wood is permitted where entirely below ground water level or continuously submerged in fresh water.

1712.3.2.1 **Columns embedded in concrete:** Sawn posts and columns supporting permanent structures intended for human occupancy which are embedded in concrete in direct contact with earth or embedded in concrete exposed to the weather shall be of approved pressure-treated wood.

1712.3.2.2 **Other columns:** Posts or columns exposed to the weather or in basements and cellars, and which support permanent structures, shall be supported by concrete piers or metal pedestals projecting at least 1 inch (25 mm) above concrete or masonry floors or decks and 6 inches (152 mm) above exposed earth and separated therefrom by an impervious moisture barrier, except where approved naturally-durable or pressure-treated wood is used.

1712.3.2.3 **Columns in crawl spaces:** Posts or columns supporting permanent structures which are closer than 8 inches (203 mm) to exposed ground in enclosed crawl spaces or unexcavated areas located within the perimeter of the building shall be of approved naturally-durable or pressure-treated wood.

1712.3.2.4 **Wood structural members:** Wood structural members supporting moisture-permeable floors or roofs which are exposed to the weather, such as concrete or masonry slabs, shall be of approved naturally-durable or pressure-treated wood unless separated from such floors or roofs by an impervious moisture barrier.

1712.3.3 **Wood used in retaining walls:** Wood used in retaining or crib walls shall be of approved pressure-treated wood, treated in accordance with AWPB LP22, LP33, LP44, LP55 or LP77 listed in Appendix A, except as indicated in Sections 1712.3.3.1 through 1712.3.3.3.

1712.3.3.1 **Untreated wood:** Where the wall is not more than 2 feet (610 mm) in

height and is separated from the lot line or a permanent building by a minimum distance equal to the height of the wall, the wall is permitted to be of untreated wood.

1712.3.3.2 Naturally-durable wood on the lot line: Where the wall is not more than 2 feet (610 mm) in height and is located on the lot line, approved naturally-durable wood is permitted.

1712.3.3.3 Naturally-durable wood separated: Where the wall is not more than 4 feet (1219 mm) in height and is separated from the lot line or a permanent building by a minimum distance equal to the height of the wall, approved naturally-durable wood is permitted.

1712.4 Geographical areas: In geographical areas where experience has demonstrated a specific need, approved naturally-durable or pressure-treated wood shall be used for those portions of wood members which form the structural supports of buildings, balconies, porches or similar permanent building appurtenances when such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members. Depending on local experience, such members include, but are not limited to, the following:

1. Horizontal members such as girders, joists and decking;
2. Vertical members such as posts, poles and columns; or
3. Both horizontal and vertical members.

ARTICLE 18

STEEL

SECTION 1800.0 GENERAL

1800.1 Scope: The provisions of this article shall govern the materials, design, construction and quality of steel structural members.

SECTION 1801.0 STRUCTURAL STEEL CONSTRUCTION

1801.1 General: 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. All structural steel shall be designed and constructed in accordance with either the AISC *Specification for the Design, Fabrication and Erection of Structural Steel for Buildings* or the AISC *Load and Resistance Factor Design Specification for Structural Steel Buildings* listed in Appendix A. *

1801.2 Temporary and special stresses: Due provision shall be made in the design for temporary stresses occurring during erection, and for the influence of special loads producing impact or vibrations as provided in Section 1108.4. Stresses caused by eccentric loading shall be fully provided for and eccentric details shall be shown on the design and shop drawings.

1801.3 Shop drawings: Complete shop drawings shall be prepared in conformance with the best modern practice in advance of the actual fabrication. Such drawings shall clearly distinguish between shop and field rivets, bolts and welds in all connections and details.

1801.4 Painting and special protection: All painting shall comply with the requirements contained in either of the AISC design specifications referenced in Section 1801.1. When exposed to highly corrosive fumes or vapors, or subject to destruction from other highly hazardous industrial processes, all structural steelwork shall be protected by an approved method.

SECTION 1802.0 FORMED STEEL CONSTRUCTION

1802.1 Design: The design of all cold-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 accordance with the AISI *Specification*

for Design of Cold-Formed Steel Structural Members and AISI *Specification for Design of Cold-Formed Stainless Steel Structural Members* listed in Appendix A. Metal building systems shall conform to the provisions of this code and the MBMA *Low Rise Building Systems Manual* listed in Appendix A.

1802.2 Secondary structural systems: Formed steel floor, wall and roof systems are permitted to 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. Where concrete topping or other approved decking is installed and strength of the composite member is included in the calculations, the concrete topping or decking shall be installed in a manner that insures composite action of the assembly.

1802.3 Protection: Formed steel shall be protected in accordance with Sections 1802.3.1 through 1802.3.4.

1802.3.1 Shop coat: All individual structural members and assembled panels of light gage and formed steel construction, except where fabricated of approved corrosion-resistive metallic steel or of steel having a corrosion-resistive or other approved coating, shall be protected against corrosion with an approved shop coat of paint, enamel, or other approved protection.

1802.3.2 Field coat: After erection where directly exposed to the weather, except when encased in concrete made of noncorrosive aggregates, or where fabricated of approved corrosion-resistive steel, or of galvanized or otherwise adequately-protected steel, individual structural members and assembled panels of light gage and formed steel construction shall be given an additional coat of approved protection.

1802.3.3 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 not less than 8 inches (203 mm).

1802.3.4 Protection at exterior walls: Floor or roof construction which extends into an exterior wall shall be adequately waterproofed and protected from the weather to prevent corrosion.

1802.4 Tests: When not capable of design by approved engineering analysis, the code official shall require tests of the individual or assembled structural units and their connections as prescribed in Sections 1303.0 and 1305.0. At least three 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 10 percent from the mean value shall cause rejection of the series.

1802.5 Identification: Each structural member, siding panel and roof panel of

a metal building system, other than hardware items such as bolts, nuts, washers, shims and rivets, shall be identified by the manufacturer. The identification shall include manufacturer's name or logo, and part number or part name consistent with assembly instructions.

SECTION 1803.0 OPEN WEB STEEL JOIST CONSTRUCTION

1803.1 General: Steel joists and joist girders used as structural members in floor and roof construction shall be designed and constructed in accordance with SJI *Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders* listed in Appendix A. *

1803.2 Partitions: The joists shall be designed to support the dead load of partitions, wherever they occur, in addition to all other imposed dead and live loads.

1803.3 Protection: Painting of steel joists shall be in accordance with the requirements of Section 1802.3 for formed steel construction. *

1803.4 Tests: Where not subject to approved engineering analysis as regulated by Section 1803.1, the assembly shall meet the load test requirements specified in Sections 1303.0 and 1305.0.

SECTION 1804.0 REINFORCING STEEL

1804.1 General: Metal reinforcement for reinforced gypsum concrete, and reinforced masonry shall comply with ACI 531, NBS H74, NCMA TR75-B or BIA *Requirements for Engineered Brick Masonry* listed in Appendix A.

1804.2 Tests: Where unidentified reinforcement is approved for use, not less than three tension and three 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 1805.0 CAST STEEL CONSTRUCTION

1805.1 Materials: Carbon steel casting for building construction shall be cast from steel conforming to the AISC specifications listed in Section 1801.1. All castings shall be free from injurious blow holes or other defects which would impair the structural strength.

1805.2 Higher strength cast steel: Higher strength cast steel shall not be used unless approved.

1805.3 Welding cast steel: Cast steel designed for use in welding shall be of weldable grade.

SECTION 1806.0 CAST IRON CONSTRUCTION

1806.1 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, and conforming to ASTM A48 and ASTM A256 listed in Appendix A for medium gray iron castings.

1806.2 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. The maximum stresses for cast iron shall be as indicated in Table 1806.

Table 1806
CAST IRON STRESSES

Type of stress	Maximum stress in pounds per square inch
Extreme compression (fiber stress in bending)	16,000
Extreme tension (fiber stress in bending)	3,000
Column compression	9,000 minus 40 *l/r*
Shear	3,000
Tension	3,000
Ratio *l/r* not to exceed 70	

Note a. 1 psi = 6.895 kPa.

1806.3 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 6 inches (152 mm).

1806.4 Thickness of metal: The minimum thickness of cast iron shall be not less than specified in Sections 1806.4.1 through 1806.4.3.

1806.4.1 Columns: In columns, the metal shall be not less than one-twelfth the smallest dimension of the cross-section and not less than ¾ inch (19 mm).

1806.4.2 Bases and brackets: In bases and flanges, the metal shall be not less than 1 inch (25 mm) thick reinforced with fillets and brackets.

1806.4.3 Lintels: In lintels, the metal shall be not less than ¾ inch (19 mm) thick and shall be limited to use on spans of not more than 6 feet (1829 mm).

1806.5 Inspection: A cast iron column shall not be erected in place before it has been inspected and approved. The use of any cast iron column in which blow holes or imperfections reduce the effective area of the cross-section more than 10 percent shall be prohibited. Where required by the code official, ⅜-inch (10 mm) round inspection holes shall be drilled in the section to expose the thickness of metal for inspection purposes.

SECTION 1807.0 SPECIAL STEEL AND STEEL CABLE STRUCTURAL SYSTEMS

1807.1 Special steels: Alloy, high-carbon or other special high-strength steels not covered in this article, where used in the design and construction of buildings and structures, shall conform to Section 1304.0.

1807.2 Structural steel cable systems: The design, fabrication and erection of steel cables used as load-carrying members in buildings and structures shall be in accordance with the AISI *Criteria for Structural Applications of Steel Cables for Buildings* listed in Appendix A.

SECTION 1808.0 EXTERIOR STEEL FRAME CORROSION PROTECTION UNDER MASONRY

1808.1 Required: Exterior steel columns and girders, before embedment in masonry of the required fireresistance rating specified in Table 401, shall be protected from moisture by approved waterproofing material, a parging coat of cement mortar or by a minimum of 8 inches of weather-tight masonry.

ARTICLE 19

LIGHTWEIGHT METAL ALLOYS

SECTION 1900.0 GENERAL

1900.1 Scope: The provisions of this article shall govern the materials, design, construction and quality of aluminum and other lightweight metal alloys.

SECTION 1901.0 MATERIALS

1901.1 General: Aluminum used for structural purposes in buildings and structures shall comply with AA-SAS 30 and AA-ASM 35 listed in Appendix A. Other lightweight metals and alloys used for structural purposes in buildings and structures shall be of approved materials.

ARTICLE 20

PLASTIC

SECTION 2000.0 GENERAL

2000.1 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 922.0. In the application of this article, foam plastics shall only be subject to the provisions of Section 2002.0.

2000.2 Approved materials: The use of all plastics which meet the strength, durability, sanitary and fireresistive requirements of this code, ASTM D635, ASTM D1929, ASTM D2843 and ASTM E84 listed in Appendix A shall be permitted subject to the limitations of this article.

2000.3 Application for approval: Applicants for approval of a plastic material shall furnish, in accordance with Section 1306.0, all necessary technical data required by the code official. The data shall include, if necessary, the chemical composition; pertinent physical, mechanical and thermal properties such as fireresistance, flammability, and flame spread; weather resistance; electrical properties; products of combustion and coefficients of expansion.

2000.4 Identification: All plastic materials approved for use under this code shall be identified by the trade formula number or name or other acceptable identification. Each unit or package shall bear the approval number or other identification mark of the approving authority.

2000.5 Use: Section 2001.0 shall apply to plastics used in light-transmitting applications such as glazing, skylights, lighting lenses, luminous ceilings, signs and similar purposes. Section 2002.0 shall apply to foam plastics.

SECTION 2001.0 LIGHT-TRANSMITTING PLASTICS

2001.1 Approved light-transmitting plastics: An approved light-transmitting plastic shall be any thermoplastic, thermosetting, or reinforced thermosetting plastic material which has a self-ignition temperature of 650 degrees F. (343.33 degrees C.) or greater when tested in accordance with ASTM D1929 listed in Appendix A, a smoke density rating not greater than 450 when tested in the manner intended for use by ASTM E84 listed in Appendix A or not greater than 75 when tested in the thickness intended for use according to ASTM D2843 listed in Appendix A, and which meets one of the following combustibility classifications:

Class C 1: Plastic materials which have a burning extent of 1 inch (25 mm) or less when tested in nominal .060 inch thickness, or in the thickness

intended for use, by ASTM D635 listed in Appendix A; or

Class C 2: Plastic materials which have a burning rate of 2.5 inches per minute (1.06 mm/s) or less when tested in nominal .060 inch thickness, or in the thickness intended for use, by ASTM D635 listed in Appendix A.

2001.2 Structural requirements: All plastic materials and their assemblies shall be of adequate strength and durability to withstand the loads and forces specified in Articles 11 and 12 for their approved use.

2001.3 Connections and supports: All fastenings, connections and supports shall be proportioned to safely transmit two and one-half times the design live load. Adequate allowance shall be made in the fastenings and supports for differential expansion and contraction of the connected materials.

2001.4 Other applicable requirements: Light-transmitting plastics used in glazing applications and skylight assemblies shall conform to Section 2204.0. Light-transmitting plastics used as exterior wall panels shall conform to Section 2105.2. Light-transmitting plastics used as roof panels shall conform to Section 2306.0.

2001.5 Light-diffusing systems: Light-diffusing systems shall not be installed in buildings of Use Groups H, I-2 or I-3, nor in exits unless the building is protected throughout by an approved automatic fire suppression system. 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 Steel Wire Gage (0.106 inch) galvanized wire or equivalent.

2001.5.1 Installation: Approved light-transmitting plastic diffusers shall comply with Section 922.0 unless the plastic panels will fall from their mountings before igniting and at an ambient temperature of at least 200 degrees F. (93 degrees C.) below their ignition temperature. The panels shall remain in place at an ambient room temperature of 175 degrees F. (79 degrees C.) for a period of not less than 15 minutes.

2001.5.2 Size limitations: Individual panels or units shall not exceed 10 feet (3048 mm) in length nor 30 square feet (2.79 m^2) in area.

2001.5.3 Fire suppression system: In buildings having an approved automatic fire suppression system throughout, plastic light-diffusing systems shall be protected both above and below unless the system has been specifically approved for installation only above the system. Areas of light-diffusing systems shall not be limited when protected in accordance with this section.

2001.5.4 Electrical lighting fixtures: Plastic light-transmitting panels and light diffuser panels installed in approved electrical lighting fixtures shall comply with Section 922.0 unless the plastic panels meet the requirements of Section 2001.5.1. The area of approved plastic materials when used in required exits or corridors shall not exceed 30 percent of the aggregate area of the ceiling in which they are installed, unless the building is equipped throughout with an approved automatic fire suppression system.

2001.6 Partitions: Approved light-transmitting plastics used in or as parti-

tions shall comply with the requirements of Sections 922.0 and 905.3.

2001.7 Bathroom accessories: Approved plastics shall be permitted as glazing in shower stalls, shower doors, bathtub enclosures and similar accessory units (see Section 2203.0).

2001.8 Awnings and similar structures: Approved light-transmitting plastics used on awnings and similar structures shall comply with the general performance provisions of other sections of the code.

SECTION 2002.0 FOAM PLASTICS

2002.1 General: The provisions of this section shall govern the requirements and uses of foam plastic in buildings or structures.

2002.1.1 Surface burning characteristics: Unless otherwise indicated in this section, all foam plastics and foam plastic cores of manufactured assemblies shall have a flame spread rating of not more than 75 and shall have a smoke developed rating of not more than 450 when tested in the maximum thickness intended for use in accordance with ASTM E84 listed in Appendix A.

2002.1.2 Labeling: Foam plastics or their packages, and containers of foam-in-place plastic system ingredients shall be labeled in conformance with Section 1306.3.

2002.2 Thermal barrier: Unless otherwise indicated in this section, all foam plastic shall be separated from the interior of a building by an approved thermal barrier of ½ inch gypsum wallboard or equivalent thermal barrier material which will limit the average temperature rise of the unexposed surface to not more than 250 degrees F. (121 degrees C.) after 15 minutes of fire exposure complying with the standard time-temperature curve of ASTM E119 listed in Appendix A. The thermal barrier shall be installed in a manner that assures it will stay in place for a minimum of 15 minutes under the same test conditions.

2002.3 Prescriptive installations: The requirements of Sections 2002.3.1 through 2002.3.10.7 shall apply to all uses or foam plastics unless specifically approved according to Section 2002.4.

2002.3.1 Masonry or concrete construction: The thermal barrier described in Section 2002.2 is not required when the foam plastic is protected by a minimum 1-inch (25 mm) thickness of masonry or concrete.

2002.3.2 Cold storage construction: Where foam plastic is tested in a thickness of 4 inches (102 mm) and is used in a thickness up to 10 inches (254 mm), the building shall be equipped throughout with an approved automatic fire suppression system.

2002.3.3 Walk-in coolers: When foam plastic is used in a maximum thickness of 4 inches (102 mm) in freestanding walk-in coolers or freezer units less than 400 square feet (37.2 m^2) in floor area without a thermal barrier and without an automatic fire suppression system, the foam plastic shall be covered by a metal facing not less than 0.032 inch thick aluminum or corrosion-resistant

steel having a minimum base metal thickness of 0.016 inches. The maximum thickness shall be 10 inches (254 mm) when the foam plastic is protected by a thermal barrier.

2002.3.4 Roofing: Foam plastic used in a roof covering assembly without the thermal barrier shall have the foam separated from the interior of the building by plywood sheathing not less than 15/32 inch in thickness bonded with exterior glue, with edges supported by blocking, tongue-and-groove joints or other approved type of edge support, or an equivalent material. The requirements of Sections 2002.1.1 and 2002.2 are not applicable to foam plastic roof insulation which complies with FM 4450 or UL 1256 listed in Appendix A.

For all roof applications, the smoke developed rating shall not be applicable.

2002.3.5 Attics and crawl spaces: Within an attic or crawl space where entry is made only for service of utilities, foam plastics shall be protected against ignition by 1½ inch (38 mm) thick mineral fiber insulation, ¼ inch thick plywood, particle board or hardboard or ⅜-inch gypsum wallboard, corrosion-resistant steel having a base metal thickness of 0.016 inch, or other approved material installed in such a manner that the foam plastic is not exposed. The protective covering shall be consistent with the requirements for the type of construction.

2002.3.6 Doors: Where doors are permitted without a fireresistance rating and foam plastic is used as a core material, the door facing shall be of metal having a minimum thickness of 0.032-inch aluminum or 0.016-inch steel. The thermal barrier requirement of Section 2002.2 shall not apply.

> **Exception:** In buildings of Use Group R-3, foam-filled exterior entrance doors not requiring a fireresistance rating shall be faced with wood or other approved materials.

2002.3.7 Siding backer board: Foam plastic to be used as siding backer board shall have a maximum thickness of ½ inch (13 mm) and be separated from the interior of the building by not less than 2 inches (51 mm) of mineral fiber insulation or equivalent in lieu of the thermal barrier or when applied as insulation with residing over existing exterior wall construction.

2002.3.8 Interior trim: Foam plastic used as interior trim shall comply with Sections 2002.3.8.1 through 2002.3.8.4.

2002.3.8.1 Density: The minimum density is 20 pounds per cubic foot (320 kg/m^3).

2002.3.8.2 Thickness: The maximum thickness of the trim is ½ inch (13 mm) and the maximum width is 4 inches (102 mm).

2002.3.8.3 Area limitation: The trim constitutes not more than 10 percent of the aggregate wall and ceiling area of any room or space.

2002.3.8.4 Flame spread: The flame spread rating does not exceed 75 when tested according to ASTM E84 listed in Appendix A. The smoke developed rating is not limited.

2002.3.9 One-story buildings: Foam plastic insulation, having a flame spread rating of not more than 25 used without a thermal barrier in or on exterior walls of one-story buildings, shall not have a thickness more than 4 inches (102 mm) and the foam plastic shall be covered by a thickness of not less than 0.032-inch aluminum or corrosion-resistant steel having a base metal thickness of 0.016 inch and the building area shall be equipped throughout with an automatic fire suppression system.

2002.3.10 Exterior walls: Foam plastics used in or on the exterior side of exterior walls in Types 1, 2, 3 or 4 construction shall comply with the requirements of Sections 2002.3.10.1 through 2002.3.10.7.

2002.3.10.1 Use: Foam plastics are permitted within exterior walls provided the wall assembly affords the required fireresistance rating.

2002.3.10.2 Thickness: The foam plastic shall be limited to a maximum thickness of 4 inches (102 mm).

2002.3.10.3 Flame spread: The foam plastic core, coatings and facings, each when tested individually, shall have a flame spread rating of 25 or less when tested in accordance with ASTM E84 listed in Appendix A.

2002.3.10.4 Fastening: Facing, coating and core materials shall be fastened to each other, and the overall assembly shall be fastened to the building frame to prohibit failure in bond as a result of temperatures which occur in a building fire, from wind load or other conditions.

2002.3.10.5 Full-scale tests: Results of full-scale fire tests reflecting an end-use configuration shall be submitted to the code official demonstrating that the assembly in its final form does not show any tendency to propagate flame over the surface or through the core when exposed on the exterior face to a fire source. Such testing shall be performed on the finished manufactured foam plastic assemblies and on the maximum thickness intended for use.

2002.3.10.6 Thermal barrier: Any foam plastic insulation shall be separated from the building interior by a thermal barrier unless specific approval is obtained on the basis of Section 2002.4.

2002.3.10.7 Identification: The edge or face of each piece of foam plastic insulation shall be labeled in accordance with Section 1306.3.

2002.4 Diversified tests: Foam plastic is not required to comply with Sections 2002.2 and 2002.3 when specifically approved based on diversified tests such as FM Procedure 4880, UL Subject 1040 or UL Subject 1715 listed in Appendix A. Such approvals shall also be based on tests conducted in accordance with ASTM E84 and ASTM D1929 listed in Appendix A. Such testing shall be performed on the finished manufactured foam plastic assemblies and on the maximum thickness intended for use. Foam plastics which are used as interior finish on the basis of diversified tests shall also meet the flame spread requirements of Section 922.0.

ARTICLE 21

EXTERIOR WALLS

SECTION 2100.0 GENERAL

2100.1 Scope: The provision of this article shall govern the minimum specifications for exterior walls and wall thickness hereafter used in the construction of buildings and structures. All materials and methods of construction shall conform to the applicable standards listed in this code.

SECTION 2101.0 GENERAL CONSTRUCTION REQUIREMENTS

2101.1 General: All buildings, except as provided in Section 906.1.1, shall be enclosed on all sides with independent or party walls of approved construction. Such walls shall be constructed to afford the fireresistance rating specified in Table 401 and as required in this code for location, use and type of construction.

2101.2 Projections: Exterior enclosure walls shall be constructed entirely within lot lines or building lines when established by law, except for authorized projections beyond the street lot line in accordance with Section 506.0.

2101.3 Fireresistance rated openings: Openings in exterior walls, when required to be fireresistance rated, shall comply with the provisions of Article 9.

2101.4 Structural strength against wind forces: In all buildings required to resist wind pressure under the provisions of Article 11, exterior window openings shall be designed to resist the specified wind load when such protectives are more than 100 square feet (9.30m²) in area in the first story or more than 50 square feet (4.65m²) in the upper stories.

2101.5 Structural strength of 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 11, acting both inwardly and outwardly.

SECTION 2102.0 FLOOD-RESISTANT CONSTRUCTION

2102.1 General: All buildings and structures erected in areas prone to flooding shall be constructed and elevated as required by the provisions of this section.

> **Exception:** Plans showing compliance with Subsection 2102.1 through 2102.10.3 shall be submitted to the Kentucky Division of Water pursuant to KRS 151.250 and 260. Approval of plans by or through that agency together with their final approval of construction shall constitute compliance with these sections.

2102.2 Base flood elevation: The base flood elevation shall be used to define areas prone to flooding, and shall describe, at a minimum, the depth or peak elevation of flooding (including wave height) which has a one percent (100-year flood) or greater chance of occurring in any given year.

2102.2.1 Elevation data sources: In identifying areas prone to flooding, the governing body having jurisdiction shall utilize the most current published flood elevation data available and such areas shall be identified accordingly on an

official flood hazard map.

Note: The most recent Flood Insurance Rate Map published by the Federal Emergency Management Agency shall be considered in establishing the official flood hazard map.

2102.3 Hazard zones: Areas which have been determined to be prone to flooding shall be classified as either flood hazard zones (A Zones) or high hazard zones (V Zones) in accordance with Sections 2102.4 and 2102.5.

2102.4 Flood hazard zones (A Zones): All areas which have been determined as prone to flooding but not subject to high velocity waters and/or wave action shall be designated as Flood Hazard Zones. All buildings and structures erected in Flood Hazard Zones shall be designed and constructed in accordance with Sections 2102.4 through 2102.4.4.

2102.4.1 Elevations: All buildings or structures erected within a flood hazard zone shall be elevated so that the lowest portion of all horizontal structural members supporting floors, excluding footings, pile caps, piling, non-structural slabs, girders and grade beams, are located at or above the base flood elevation. All basement floor surfaces shall be located at or above the base flood elevations.

Exceptions

1. Floors usable for human occupancy below the base flood elevation in buildings or structures of all use groups except Use Group R shall conform to Section 2102.4.4.
2. Floors of buildings or structures of any use group which are used solely for structure egress, incidental storage garages, and parking and which are located below the base flood elevation shall conform to Section 2102.4.3.

2102.4.2 Anchorage: The structural systems of all buildings or structures shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses from flooding equal to the base flood elevation.

2102.4.3 Enclosures below base flood elevation: Enclosed spaces below the base flood elevation shall not be used for human occupancy with the exception of structure egress, entrance foyers, stairways, and incidental storage. Fully-enclosed spaces shall be provided with vents, valves, or other openings which will automotically equalize the lateral pressure of flood waters acting on the exterior wall surfaces. The bottom of the openings shall be not lower than 12 inches (305 mm) and not higher than 24 inches (610 mm) above finished grade. A minimum of two openings per building, or one opening for each understructure space, whichever is greater, shall be required.

2102.4.4 Water-resistant construction: Buildings or structures of any use groups except Use Group R shall, in lieu of meeting the elevation provisions of Section 2102.4.1, be erected with floors usable for human occupancy below the base flood elevation provided that the following conditions are met:

1. All space below the base flood elevation shall be constructed with walls and floors that are substantially impermeable to the passage of water.
2. All structural components subject to hydrostatic and hydrodynamic

loads and stresses during the occurrence of flooding to the base flood elevation shall be capable of resisting such forces, including the effects of buoyancy.

3. All openings below the base flood elevation shall be provided with water-tight closures and shall have adequate structural capacity to support all flood loads acting upon the closure surfaces.
4. All floor and wall penetrations for plumbing, mechanical and electrical systems shall be made water-tight to prevent flood water seepage through spaces between the penetration and wall construction materials. Sanitary sewer and storm drainage systems that have openings below the base flood elevation shall be provided with shutoff valves or closure devices to prevent back-water flow during conditions of flooding.

2102.5 High hazard zones (V Zones): Areas of tidal influence which have been determined to be subject to wave heights in excess of three feet (914 mm) or subject to high velocity wave runup or wave induced erosion shall be classified as high hazard zones. All buildings or structures erected in a high hazard zone shall be designed and constructed in accordance with Sections 2102.5.1 through 2102.5.3.

Note: Areas shown as V Zones on the most recent Flood Insurance Rate Map published by the Federal Emergency Management Agency shall be considered in establishing high hazard zones.

2102.5.1 Elevation: All buildings or structures erected within a high hazard zone shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, piling, pile caps, columns, grade beams, and bracing, is located at or above the base flood elevation.

2102.5.2 Enclosures below base flood elevation: All spaces below the base flood elevation in a high hazard zone shall be free of obstruction except as permitted herein:

1. Mat or raft foundations, piling, pile caps, bracing, grade beams and columns that provide structural support for the building.
2. Entrances and/or exits which are necessary for required ingress and egress.
3. Incidental storage of portable or mobile items readily moved in the event of a storm.
4. Walls and partitions are permitted to enclose all or part of the space provided they are not part of the structural support of the building and are designed so as to break away under abnormally high tides or wave action, without causing damage to the structural integrity of the building of which they are a part.

2102.5.3 Foundations: All buildings or structures erected in high hazard zones shall be supported on pilings or columns and adequately anchored to such pilings or columns. The piling shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift) to which they are likely to be subjected during a flood to the base flood elevation. Pile embedment shall include consideration of decreased resistance capacity caused by scour of

soil strata surrounding the piling. Pile system design and installation shall also be made in accordance with the provisions of Section 1213.0 and 1214.0. Mat or raft foundations supporting columns shall not be permitted where soil investigations required in accordance with Section 1202.1 indicate that soil material under the mat or raft is subject to scour or erosion from wave velocity flow conditions.

2102.6 Protection of mechanical and electrical systems: New and replacement electrical equipment, and heating, ventilating, air conditioning and other service equipment shall be either placed above the base flood elevation or protected so as to prevent water from entering or accumulating within the system components during floods up to the base flood elevation. Installation of electrical wiring and outlet, switch, junction boxes and panels below the base flood elevation shall conform to the provisions of NFiPA 70 listed in Appendix A for location of such items in wet locations. Duct insulation subject to water damage shall not be installed below base flood elevation.

2102.7 Mobile units: New or replacement mobile units to be located in any hazard zone shall be placed in accordance with the applicable elevation requirements of Sections 2102.4.1 and 2102.5.1 and the anchor and tie-down requirements of Section 621.3.1.

2102.8 Alterations and repairs: Alterations and repairs to buildings located in any hazard zone shall require code compliance with Sections 103.0 and 119.0 except that in the case of damages or cost of reconstruction or restoration in excess of 50 percent of its replacement cost, the requirements of Section 120.4 shall apply.

2102.9 Increases in building height and floor area: Any increases in height or floor area of a building in any hazard zone shall be built in accordance with the provisions of Section 505.2.

2102.10 Certifications: Certifications shall be submitted in accordance with Sections 2102.10.1 through 2102.10.3.

2102.10.1 As-built elevation certifications: A licensed land surveyor, registered architect or professional engineer shall certify the actual elevation (in relation to mean sea level) of the lowest structural member required to be elevated by the provisions of this section.

2102.10.2 Water-resistant construction: In the case of buildings or structures to be constructed in accordance with Section 2102.4.4, the code official shall require that a registered professional architect or engineer provide plans and specifications showing details of floor, wall and foundation support components, loading computations and other essential technical data used in meeting the conditions of 2102.4.4. Said plans and specifications shall be accompanied by a statement bearing the signature of the architect or engineer indicating that the design and methods of construction proposed are in accordance with all applicable provisions of Section 2102.4.4.

2102.10.3 High hazard construction: In the case of buildings or structures to be constructed in accordance with Section 2102.5, the code official shall require that a registered professional architect or engineer provide plans and specifications showing details of foundation support and connection components used in meeting the requirements of Section 2102.5.3. Where solid walls

or partitions are proposed below the base flood elevations, wall, framing, and connection details of said walls shall be provided, including loading computations for the wall and foundation system used in meeting the conditions of Section 2102.5.2. Said plans and specifications shall be accompanied by a statement bearing the signature of the architect or engineer indicating that the design and methods of construction proposed are in accordance with all applicable provisions of Section 2102.5.

SECTION 2103.0 RATPROOFING

2103.1 General: All buildings or structures and the walls enclosing habitable or occupiable rooms and spaces in which persons live, sleep or work, or in which feed, food or foodstuffs are stored, prepared, processed, served or sold, shall be constructed in accordance with the provisions of this section.

2103.2 Grade protection: Buildings not provided with a continuous foundation shall be provided with protection against rodents at grade in accordance with either Section 2103.2.1 or 2103.2.2.

2103.2.1 Apron: When an apron is provided, the apron shall be not less than 8 inches (203 mm) above, nor less than 24 inches (610 mm) below grade. In all cases the apron shall not terminate below the lower edge of the siding material. The apron shall be constructed of an approved nondecayable, water-resisting and ratproofing material of required strength and shall be installed around the entire perimeter of the building. When constructed of masonry or concrete materials, the apron shall be not less than 4 inches (102 mm) in thickness.

2103.2.2 Grade floors: Where continuous concrete grade floor slabs are provided, open spaces shall not be left between slab and walls, and all openings in the slab shall be protected.

2103.3 Opening protection: Openings shall be protected in accordance with Sections 2103.3.1 through 2103.3.3.

2103.3.1 Wall openings: Openings in the wall or apron required for ventilation or other purposes shall be guarded with corrosion-resistive ratproof shields of not less than nominal 0.034-inch perforated steel sheets, or No. 20 B&S Gage aluminum (0.032 in.) or nominal 0.064-inch expanded steel or wire mesh screens, with not more than ½-inch (13 mm) mesh openings.

2103.3.2 Slab openings: Access openings 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.

2103.3.3 Pipe and conduit openings: All openings for pipe, conduit, cable and similar purposes at or near grade shall have snugly-fitted collars to eliminate all open spaces.

SECTION 2104.0 WEATHER PROTECTION

2104.1 General: To secure weather-tightness in framed walls and other unoccupied spaces, the exterior walls shall be faced with an approved weather-resisting covering properly attached to resist wind and rain. The cellular spaces shall be so ventilated as not to vitiate the firestopping at floor, attic and roof levels, or shall be provided with approved interior noncorrodible vapor-

type barriers, or other means shall be used to avoid condensation and leakage of moisture. The materials indicated in Table 2104.1 shall be acceptable as approved weather coverings of the minimum nominal thickness specified.

Table 2104.1
MINIMUM THICKNESS OF WEATHER COVERINGS

Covering type	Minimum thickness
Aluminum siding[b]	0.019 inch
Asbestos cement boards	1/8 inch
Asbestos shingles	5/32 inch
Brick and concrete masonry veneers	2 inches
Ceramic veneer (architectural terra cotta, anchored type)	1 inch
Clay tile (flat slab)	1/4 to 1 inch
Clay tile (structural)	1 3/4 inches
Exterior plywood (with sheathing)	5/16 inch
Exterior plywood (without sheathing)	see Section 1710.2
Glass fiber reinforced concrete panels	3/8 inch
Hardboard siding	1/4 inch
Marble slabs	1 inch
Particle board (with sheathing)	see Section 1711.5
Particle board (without sheathing)	see Section 1711.5
Precast stone facing	5/8 inch
Protected fiber board siding	1/2 inch
Rigid PVC siding[c]	0.035 inch
Steel (approved corrosion-resistive)	0.017 inch
Stone (cast artificial)	1 1/2 inches
Stone (natural)	2 inches
Structural glass	11/32 inch
Stucco or exterior plaster	3/4 inch
Wood shingles	3/8 inch
Wood siding (without sheathing)[a]	1/2 inch

Note a. For wood siding of a lesser thickness, see Section 2104.2.1.
Note b. See AAMA 1402.3 listed in Appendix A.
Note c. See ASTM D3679 listed in Appendix A.

2104.1.1 Basic hardboard: Basic hardboard shall meet the requirements of AHA A135.4 listed in Appendix A.

2104.1.2 Siding: Hardboard siding shall meet the requirements of AHA A135.6 listed in Appendix A, and when used structurally, shall be so identified by an approved agency.

2104.2 Backing surfaces for veneers: Veneers for other than buildings of Type 5 construction shall be attached only to substantial, rigid and noncombustible surfaces which are plumb, straight and of true plane. Wood backing surfaces shall not be used, except in buildings of Type 5 construction. The backing shall provide sufficient rigidity, stability and weather resistance, and the veneer shall be installed and anchored as required in this code for the specific material.

2104.2.1 Wood siding: Wood siding of thicknesses less than ½ inch shall be placed over sheathing which conforms to Section 1704.7.

2104.3 Building paper: When veneers of brick, clay tile, concrete, or natural or artificial stone are used, 14-pound felt or paper shall be attached to the sheathing with flashing wherever necessary to prevent moisture penetration behind the veneer.

2104.4 Nailing: All weather boarding and wall coverings shall be securely nailed with aluminum, copper, zinc, zinc-coated or other approved corrosion-resistive nails in accordance with the nailing schedule in Appendix C or the approved manufacturer's recommendations. 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 1-inch nominal thickness or plywood not less than $^5/_{16}$ inch thick. Where wood shingles or shakes are applied over fiber board shingle backer and fiber board sheathing, they shall be attached with approved corrosion-resistive annular grooved nails and the installation shall be done in accordance with the approved manufacturer's recommendations. Where wood shingles or shakes and asbestos shingles or siding are nailed directly to nail base fiber board sheathing, the sheathing shall be not less than ½-inch nominal thickness, the shingles, shakes and siding shall be attached with approved corrosion-resistive annular grooved nails, and the installation shall be done in accordance with the approved manufacturer's recommendations.

2104.5 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.

2104.6 Exterior wall pockets: In exterior walls of all buildings or structures, wall pockets or crevices in which moisture can accumulate shall be avoided or protected with adequate caps or drips, or other approved means shall be provided to prevent water damage.

2104.7 Flashings: 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 and at built-in gutters.

Exception: When approved by the code official, flashing is not required when an approved water-resistant sheathing is used and an approved water-resistant caulking is used at the top and sides of all window and door openings in such a manner to be leakproof.

SECTION 2105.0 WALL PANELS

2105.1 Solid panel walls: Panel, apron or spandrel walls as defined in this code shall not be limited in thickness, provided they meet the fireresistance rating requirements of Article 9 and Table 401, and are constructed of approved noncombustible weather-resisting materials of adequate strength to resist the wind loads specified in Section 1112.0.

2105.2 Light-transmitting plastic: Approved light-transmitting plastic materials shall not be used as wall panels in exterior walls in buildings of Use Groups A-1, A-2, H, I-2 and I-3. In all other uses, approved light-transmitting plastic materials shall not be used as wall panels in exterior walls unless the

walls are not required to have a fireresistance rating and the installation conforms to the requirements of Sections 2105.2.1 through 2105.2.7. Such panels shall be erected and anchored on a foundation coat, waterproofed or otherwise protected from moisture absorption and sealed with a coat of mastic or other approved waterproof coating. Refer to Section 2001.1 for requirements for approved light-transmitting plastics.

2105.2.1 Installation: Exterior wall panels installed as provided herein shall not alter the type of construction classification of the building.

2105.2.2 Height limitation: Approved light-transmitting plastics shall not be installed more than 75 feet (22860 mm) above grade level, except as allowed by Section 2105.2.6.

2105.2.3 Area limitation and separation: Area limitation and separation requirements of exterior wall panels shall be as provided in Table 2105.

Exception: Veneers of approved weather-resisting plastics used as exterior siding as an element of Type 5 construction in compliance with Section 926.2.1.

Table 2105
AREA LIMITATION AND SEPARATION REQUIREMENTS FOR PLASTIC WALL PANELS[a]

Fire sepration distance	Class of plastic	Max. % area of ext. wall in plastic panels	Max. sq. ft. single area	Minimum separation of panels (ft.)	
				Vertical	Horizontal
Less than 6 ft.	—	NP[c]	NP	—	—
6 ft. or more but less than 11 ft.	C1	10	50	8	4
	C2	NP	NP	—	—
11 ft. or more but less than 30 ft.	C1	25	90	6	4
	C2	15	70	8	4
Over 30 ft.	C1	50	Not limited	3[b]	0
	C2	50	100	6[b]	3

Note a. For combination of glazing and wall panel areas permitted, see Section 2105.2.7.
Note b. For reductions in vertical separation allowed, see Section 2105.2.5.
Note c. Not permitted.
Note d. 1 foot = 304.8 mm; 1 square foot = 0.093 m^2.

2105.2.4 Spandrel separation: Vertical spandrel wall separation between stories shall be 3 feet (914 mm) for Class C1 light-transmitting plastic wall panels and 4 feet (1219 mm) for Class C2 light-transmitting plastic wall panels. See Section 2001.1 for definition of C1 and C2 light-transmitting plastic.

2105.2.5 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 36 inches (914 mm) from the surface of the wall in which plastic wall panels are installed, vertical separation at that floor is not required except that provided by the vertical thickness of the projection.

2105.2.6 Automatic fire suppression: When an approved automatic fire suppression system is provided throughout the building, the maximum percent area of exterior wall in plastic panels and the maximum square feet of single area given in Table 2105 shall be increased 100 percent, but the area of plastic wall panels shall not exceed 50 percent of the wall area. These uses shall be exempt from height limitations.

2105.2.7 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 plastic as prescribed for wall panel installations.

SECTION 2106.0 METAL VENEERS

2106.1 Materials: 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 0.017-inch nominal thickness galvanized sheet steel mounted on wood or metal furring strips or approved sheathing on the wood construction.

2106.2 Construction: Metal veneer for buildings of other than Type 5 construction shall be securely attached to masonry; supported on approved metal framing protected by painting, galvanizing or other approved protection; or supported by wood furring strips treated with an approved preservative process complying with Section 1712.2.

2106.3 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.

2106.4 Grounding metal veneers: Grounding of metal veneers on all buildings shall comply with the requirements of Article 27 and NFiPA 70 listed in Appendix A.

SECTION 2107.0 MASONRY VENEERS

2107.1 General: Veneers of unit masonry shall be attached to the wood frame with at least 0.034-inch nominal thickness corrosion-resistive, corrugated, galvanized steel ties not less than ⅞ inch (22 mm) in width at vertical intervals of not more than 16 inches (406 mm) and horizontal intervals of not more than 32 inches (813 mm).

2107.2 Nonstructural: 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.

2107.3 Height of veneers: The average height of 4-inch masonry veneer shall be not more than 25 feet (7620 mm) above its supports on a foundation wall or on corbels of masonry or steel; and not more than 18 feet (5486 mm) in height for 2-inch veneers.

SECTION 2108.0 THIN STONE AND TILE VENEERS

2108.1 Size of units: In localities subject to frost and freezing temperatures, tile and terra cotta units shall be frostproof and shall not be more than 288 square inches (0.19 m^2) in area. Where not subject to frost action, the maximum size of the tile shall be 432 square inches (0.28 m^2).

2108.2 Construction: One-inch thick marble, granite, terra cotta and similar materials, or ceramic tile facing ¼ to 1 inch in thickness shall be installed in an approved manner.

SECTION 2109.0 STRUCTURAL GLASS VENEERS

2109.1 Dimensions: The minimum thickness of glass veneer shall be $^{11}/_{32}$ inch and the area of individual panels shall not exceed 10 square feet (0.93 m^2), with a maximum length of 4 feet (1219 mm). The edge of each unit shall be ground square with a slight arris. All exposed external corners and angles shall be rounded to a radius of not more than $^{3}/_{16}$ inch (5 mm).

2109.2 Construction: Structural glass veneer construction shall comply with Sections 2109.2.1 and 2109.2.2.

2109.2.1 Backing surface: The glass veneer shall be set in mastic cement on a float coat of 1-inch (25 mm) thick cement mortar reinforced with wire lath attached to noncombustible furring spaced not more than 12 inches (305 mm) on center.

2109.2.2 Support of veneer: The base course of glass units shall be supported on a corrosion-resistive metal frame anchored to the backing and caulked with a waterproof compound at grade.

2109.3 Reinforcement: Metal reinforcing of cold-formed corrosion-resistive angles of not less than 0.064-inch nominal thickness galvanized sheet steel or other approved reinforcement shall be provided in all horizontal joints anchored into the masonry wall with expansion or toggle bolts.

2109.4 Expansion joints: Expansion joints shall be provided at ends and intermediate sections caulked with an approved waterproofing compound. Where necessary for water-tightness, exposed edges shall be protected with corrosion-resistive metal or other approved noncombustible flashing.

2109.5 Other loads: Signs, awning brackets or other loads shall not 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 the glass.

ARTICLE 22

VERTICAL AND SLOPED GLASS AND GLAZING

SECTION 2200.0 GENERAL

2200.1 Scope: The provisions of this article shall govern the materials, design, construction and quality of glass and glazing in vertical and sloped applications. For the definition of approved light-transmitting plastic, see Section 2001.1.

SECTION 2201.0 GENERAL REQUIREMENTS FOR GLASS

2201.1 Labeling: Each light shall bear the manufacturer's label designating the type and thickness of glass. Labels shall not be omitted unless approved and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved plans and specifications. Labels shall not be omitted from tempered glass.

Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic-fired on the glass and be visible when the unit is glazed. Tempered spandrel glass is exempted from permanent labeling, but shall be labeled with a removable paper label by the manufacturer.

2201.2 Glass supports: Where one or more sides of any light of glass is not firmly supported, or is subjected to unusual load conditions, detailed shop drawings, specifications and analysis or test date assuring safe performance for the specific installation shall be prepared by engineers experienced in this work and approved by the code official. Analysis shall be based on the wind loads required by Section 1111.3.1 for components and cladding. The elevation of the glazed openings shall be computed by adding the distances from grade to the head and sill, respectively, and dividing the sum by two.

2201.3 Glass dimensional tolerance: Glass thickness tolerances shall comply with those established in the Table 2201.3. Where thickness is to be controlled, nominal values are stated subject to the tolerances shown in Table 2201.3.

Table 2202.1a
RELATIVE RESISTANCE TO WIND LOAD (cont'd.)

Glass type	Factor
Patterned[c]	1.00
Regular (annealed)	1.00
Sandblasted[d]	0.40
Wired	0.50

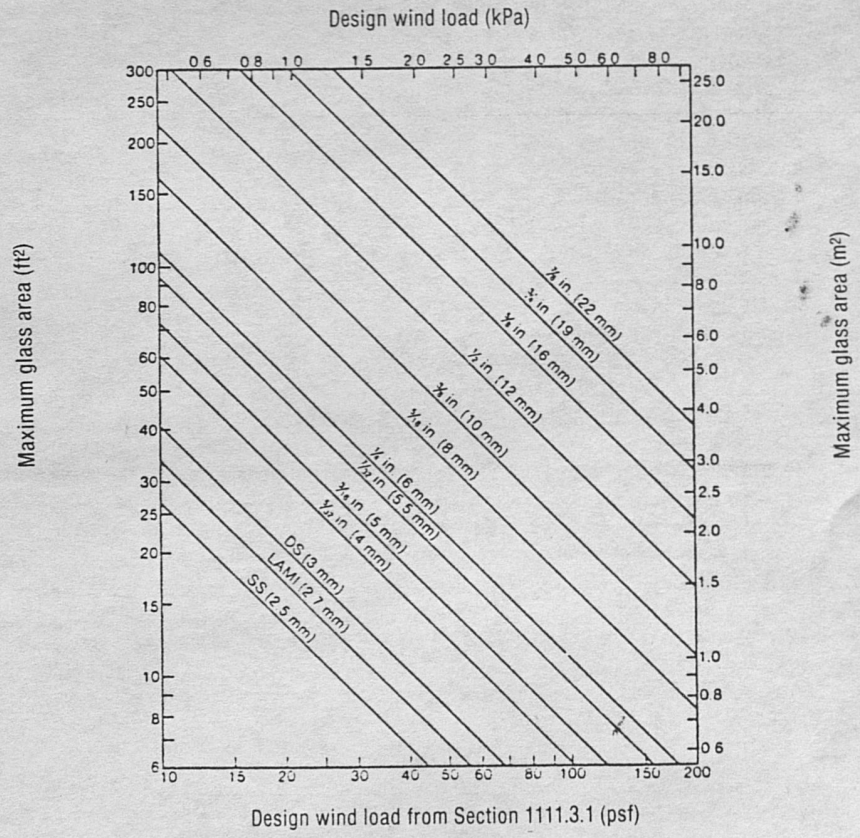
Note a. Applies when two plies are identical in thickness and type; use total glass thickness, not thickness of one ply.

Note b. Applies when each glass pane is the same thickness and type; use thickness of one pane; for asymmetrical insulating glass units, consult glass supplier for specific information.

Note c. Use minimum glass thickness, that is, measured at the thinnest part of the pattern; wind load chart shall be interpolated if necessary.

Note d. Factor varies depending upon depth and severity of sand blasting; value shown is minimum.

Table 2202.1b
REQUIRED NOMINAL THICKNESS OF FLOAT GLASS
(Based on minimum thickness allowed in Fed. Spec. DD-G-451D)
Design Factor = 2.5



SECTION 2203.0 SAFETY GLAZING

2203.1 Human impact loads: Individual glazed areas in hazardous locations such as those indicated in Section 2203.2 shall pass the test requirements of CPSC 16 CFR, Part 1201, listed in Appendix A. The requirements of this section and Sections 2203.2 and 2207.0 shall apply equally to replacement glass and new glass installation. Additional requirements as specified in Section 2207.2 are to be satisfied for glass used in locations where the hazard is of a continuous nature, such as glass enclosures for sporting activities as identified in Section 2207.1.

Exceptions

1. Polished wired glass used in required fireresistance rated assemblies and in items of glazing listed in items 6 and 7 of Section 2203.2 (glazed panels) shall comply with ANSI Z97.1 listed in Appendix A.
2. Plastic glazing shall meet the weathering requirements of ANSI Z97.1 listed in Appendix A.

2203.2 Specific hazardous locations: The following shall be considered specific hazardous locations for purposes of glazing.

1. Glazing in ingress and egress doors except jalousies (see Section 2201.4).
2. Glazing in fixed, sliding or swinging panels of sliding or swinging-type doors (patio and mall type).
3. Glazing in storm doors.
4. Glazing in all unframed swinging doors.
5. Glazing, operable or nonoperable, in shower and bathtub doors and enclosures with a horizontal edge less than 6 feet (1829 mm) above the room floor level or less than 70 inches (1778 mm) above the compartment floor.
6. Glazing, operable or nonoperable, adjacent to a door and within the same wall plane as the door whose nearest vertical edge is within 12 inches (305 mm) of the door in a closed position and whose bottom edge is less than 60 inches (1524 mm) above the floor or walking surface, unless an intervening interior permanent wall is between the door and the glazing.
7. Glazing in fixed panels having a glazed area in excess of 9 square feet (0.84 m^2) with the lowest edge less than 18 inches (457 mm) above the finish floor level or walking surface within 36 inches (914 mm) of such glazing and the finish floor or walking surface is extended on both sides of such glazing. In lieu of safety glazing, such glazed panels shall be protected with a horizontal member not less than 1½ inches (38 mm) in width when located between 24 inches (610 mm) and 36 inches (914 mm) above the walking surface.
8. All glazing in railings regardless of area or height above a walking surface. Included are structural baluster panels and nonstructural in-fill panels.

Exceptions: The following products, materials and uses are exempt from the above hazardous locations:

1. Openings in doors through which a 3-inch (76 mm) sphere is unable to pass.
2. Assemblies of leaded glass or faceted glass and items of carved glass when used for decorative purposes in locations described in Section 2203.2, items 1, 6 or 7.
3. Glazing materials used as curved glazed panels in revolving doors.
4. Commercial refrigerated cabinet glazed doors.

SECTION 2204.0 SLOPED GLAZING AND SKYLIGHTS

2204.1 Sloped glazing: Any installation of glass or other transparent, translucent, or opaque glazing material installed at a slope of 15 degrees (0.26 rad) or more from the vertical plane including skylights, roofs, and sloped walls shall comply with this section.

2204.2 Allowable glazing materials: Sloped glazing shall be any of the following materials, subject to the limitations specified in Section 2204.3 and the exceptions specified in Section 2204.4:

1. For monolithic glazing systems, the glazing material of the single light or layer shall be laminated glass with a minimum 30-mil (762 μm) polyvinyl butyral interlayer, wired glass, approved plastic materials, heat-strengthened glass, or fully-tempered glass;
2. For multiple layer glazing systems, each light or layer shall consist of any of the glazing materials specified in item 1 above.

For additional requirements for plastic skylights, see Section 2204.6. Glass block construction shall conform to the requirements of Section 1420.0.

2204.3 Limitations: Heat-strengthened glass and fully-tempered glass when used in monolithic glazing systems shall have screens installed below the glazing material, subject to exceptions in Section 2204.4, to protect building occupants from falling glass should breakage occur. The screens shall be capable of supporting the weight of the glass and shall be substantially supported below and installed within 4 inches (102 mm) of the glass. The screens shall be constructed of a noncombustible material not thinner than No. 12 B&S Gage (0.0808 inch) with a mesh not larger than 1 inch by 1 inch (25 mm by 25 mm). In a corrosive atmosphere, structurally equivalent noncorrosive screening materials shall be used. Heat-strengthened glass, fully-tempered glass, and wired glass when used in multiple layer glazing systems as the bottom glass layer over the walking surface shall be equipped with screening meeting the requirements specified for monolithic glazing systems.

2204.4 Exceptions: In monolithic and multiple layer sloped glazing systems, the following exceptions apply:

1. Fully-tempered glass installed without protective screens when glazed between intervening floors at a slope of 30 degrees (0.52 rad) or less from the vertical plane shall have the highest point of the glass 10 feet (3048 mm) or less above the walking surface;
2. Any glazing material, including annealed glass, installed without screens shall have the walking surface below the glazing material per-

manently protected from the risk of falling glass or the area below the glazing material shall not be a walking surface; and

3. Any glazing material, including annealed glass, is permitted to be installed without screens in the sloped glazing systems of commercial or detached greenhouses used exclusively for growing plants and not accessible to the public, provided the height of the greenhouse at the ridge does not exceed 20 feet (6096 mm) above grade. Greenhouse frames shall be noncombustible if the height of the sloped glazing exceeds 20 feet (6096 mm) above grade.

2204.5 Framing: In Types 1 and 2 construction, all sloped glazing and skylight frames shall be constructed of noncombustible materials. In buildings where acid fumes deleterious to metal are incidental to the use of the buildings, approved pressure-treated woods or other approved noncorrosive materials shall be permitted for sash and frames. All sloped glazing and skylights shall be designed to meet all structural requirements for roofs specified in Article 11. All skylights set at an angle of less than 45 degrees (0.79 rad) from the horizontal plane shall be mounted at least 4 inches (102 mm) above the plane of the roof on a curb construction as required for the frame. Skylights shall not be installed in the plane of the roof where the roof pitch is less than 45 degrees (0.79 rad) from the horizontal.

Exception: Curbs for skylights are not required on roofs with a minimum slope of three units vertical in 12 units horizontal (3:12) in buildings of Use Group R-3.

2204.6 Light-transmitting plastic glazing of skylight assemblies: Skylight assemblies glazed with approved light-transmitting plastic materials shall conform to the provisions of Sections 2204.6.1 through 2204.6.7.

Exceptions

1. These provisions shall not apply to a skylight of approved light-transmitting plastic on a building which is not more than one story in height, has a fire separation distance of at least 30 feet (9144 mm) and the room or space sheltered by the roof is not classified as Use Group H, I-2 or I-3 or a means of egress.
2. These provisions shall not apply to skylights in which the approved light-transmitting plastic meets the required roof covering class according to Section 2301.0.

2204.6.1 Mounting: The plastic shall be mounted above the plane of the roof on a curb constructed consistent with the requirements for the type of construction classification, but at least 4 inches (102 mm) above the plane of the roof. Edges of plastic skylights or domes shall be protected by metal or other noncombustible material, or the plastic dome or skylight shall be shown to be able to resist ignition when exposed at the edge to a flame from a Class B brand as described in ASTM E108 listed in Appendix A.

Exceptions

1. Curbs for skylights are not required when used on roofs with a minimum

slope of 3 units vertical in 12 units horizontal (3:12) in buildings of Use Group R-3 and on buildings with an unclassified roof covering.

2. The metal or noncombustible edge material is not required where unclassified roof coverings are permitted.

2204.6.2 Slope: Flat or corrugated plastic skylights shall slope at least 4 units vertical in 12 units horizontal (4:12). Dome-shape skylights shall rise above the mounting flange a minimum distance equal to 10 percent of the maximum span of the dome, but not less than 3 inches (76 mm).

Exception: Skylights which pass the Class B Burning Brand Test specified in ASTM E108 listed in Appendix A.

2204.6.3 Maximum area of skylight units: Each skylight unit shall have a maximum area within the curb of 100 square feet (9.30 m^2) except that the area of skylight units shall not be limited in buildings equipped throughout with an approved automatic fire suppression system.

2204.6.4 Aggregate area of skylights: The aggregate area of skylights shall not exceed 33 percent of the floor area of the room or space sheltered by the roof in which they are installed when Class C1 materials are used, and 25 percent when Class C2 materials are used.

Exception: The aggregate area limitations of approved plastic skylights shall be increased 100 percent beyond the limitations set forth above where the building is equipped throughout with an approved automatic fire suppression system.

2204.6.5 Separation: Skylights shall be separated from each other by a distance of not less than 4 feet (1219 mm) measured in a horizontal plane, except that the separation shall not be required where the building is equipped throughout with an approved automatic fire suppression system.

2204.6.6 Location: Where exterior wall openings are required to be fireresistance rated by Section 907.0, a skylight shall not be installed within 6 feet (1829 mm) of such exterior wall.

2204.6.7 Combinations of roof panels and skylights: Combinations of plastic roof panels and skylights shall be subject to the area and percentage limitations and separation requirements applicable to roof panel installations.

SECTION 2205.0 LIGHT-TRANSMITTING PLASTIC GLAZING OF UNPROTECTED OPENINGS

2205.1 Use in Type 5B construction: In buildings of Type 5B construction, doors, sashes and framed openings shall not be glazed with approved plastic materials unless such openings are not required to be fireresistance rated.

2205.2 Use Group F: In buildings of all types of construction of Use Group F, doors, sashes and framed openings shall not be glazed with approved plastic materials unless such openings are not required to be fireresistance rated.

2205.3 Other types of construction and use groups: In other types of construction and use groups, doors, sashes and framed openings shall not be glazed or

equipped with approved plastic materials unless such openings are not required to be fireresistance rated according to Section 907.0 and the installation conforms to the requirements of Sections 2205.3.1 through 2205.3.4.

2205.3.1 Area: The area of such glazing shall not exceed 25 percent of the wall face of the story in which it is installed (see Section 2205.4).

2205.3.2 Size: The area of a unit or pane of glazing installed above the first story shall not exceed 16 square feet (1.49 m^2) and the vertical dimension of a unit or pane shall not exceed 4 feet (1219 mm). There shall be a minimum 3 feet (914 mm) vertical spandrel wall between stories.

2205.3.3 Height: Approved plastics shall not be installed more than 75 feet (22860 mm) above grade level.

2205.3.4 Protection: Approved thermoplastic materials installed in areas up to 50 percent of the wall area of each story in structures less than 150 feet (45720 mm) in height shall be provided on each floor above the first floor with continuous architectural projections constituting an effective fire canopy extending at least 3 feet (914 mm) 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.

2205.4 Automatic fire suppression: Where an approved automatic fire suppression system is provided throughout the building, the permissible area of glazing permitted by Section 2205.3.1 shall be increased 100 percent.

SECTION 2206.0 GLASS IN HANDRAILS AND GUARDRAILS

2206.1 Materials: Glass used as structural balustrade panels in railings shall be constructed of either single fully-tempered glass, laminated fully-tempered glass, or laminated heat-strengthened glass. Glazing in railing in-fill panels shall conform to ANSI Z97.1 listed in Appendix A or shall be an approved safety glazing material meeting the provisions of Section 2203.1. For all glazing types, the minimum nominal thickness shall be ¼ inch. Fully-tempered glass and laminated glass shall comply with Category II of CPSC 16 CFR Part 1201 listed in Appendix A. Wired glass shall comply with ANSI Z97.1 listed in Appendix A.

2206.1.1 Loads: The panels and their support system shall be designed to withstand the loads specified in Section 1109.7. A safety factor of four shall be used.

2206.1.2 Support: Each handrail or guardrail section shall be supported by a minimum of three glass balusters or be otherwise supported so that it remains in place should one baluster panel fail. Glass balusters shall not be installed without an attached handrail or guardrail.

2206.1.3 Parking garages: Glazing materials shall not be installed in railings in parking garages except for pedestrian areas not exposed to impact from vehicles.

SECTION 2207.0 GLAZING IN RACQUETBALL AND SQUASH COURTS

2207.1 Continuously hazardous locations: The following shall be considered continuously hazardous locations for purposes of glazing.

1. Glazing in squash and racquetball courts forming whole or partial wall sections.
2. Glazing in squash and racquetball courts used as a door or part of a door.

2207.2 Testing: Test methods and loads for individually glazed areas such as those described in Section 2207.1 shall conform to those of CPSC 16 CFR Part 1201 listed in Appendix A, with impacts being applied at a height from ground level of 59 inches (1499 mm) to an actual or simulated glass wall installation with fixtures, fittings and methods of assembly identical to those used in practice.

In order to be deemed acceptable, the following conditions shall be achieved for glass walls:

1. Any glass wall in a squash or racquetball court shall remain intact following a test impact.
2. The deflection of such walls shall be not greater than 1½ inches (38 mm) at the point of impact.

In order to be deemed acceptable, the following conditions shall be achieved for glass doors:

1. Glass doors shall remain intact following a test impact at the prescribed height in the center of the door.
2. The relative deflection between the edge of a glass door and the adjacent wall shall not exceed the following values for the impact test bag drop heights specified below.
   a. The thickness of the wall plus ⅛ inch (3 mm) for a drop height of 24 inches (610 mm).
   b. The thickness of the wall plus ¼ inch (6 mm) for a drop height of 36 inches (914 mm).
   c. The thickness of the wall plus ½ inch (13 mm) for a drop height of 48 inches (1219 mm).

ARTICLE 23

ROOFS AND ROOF COVERINGS

SECTION 2300.0 GENERAL

2300.1 Scope: The provisions of this article shall govern the materials, design, construction and quality of roofs and roof coverings. For the definition and requirements of approved light-transmitting plastics, see Section 2001.1.

SECTION 2301.0 FIRE CLASSIFICATION

2301.1 Classification: Roof covering materials shall be classified in accordance with Section 2301.3 when tested in accordance with ASTM E108 listed in Appendix A.

2301.2 Existing roofs: The repair of existing roofs shall comply with the provisions of Section 103.0, but more than 25 percent of the roof covering of any building shall not be replaced in a period of 12 months unless the entire roof covering is made to conform to the requirements for new roofing.

2301.3 Classification of use: Roof coverings shall be classified according to Sections 2301.3.1 through 2301.3.4.

2301.3.1 Class A roof coverings: Class A roof coverings are those which are effective against severe fire test exposure. Class A roof coverings shall include the following: masonry, concrete, slate, tile, cement-asbestos or assemblies listed and identified as Class A by an approved testing agency. Class A roof coverings shall be permitted for use in buildings or structures of all types of construction.

2301.3.2 Class B roof coverings: Class B roof coverings are those which are effective against moderate fire test exposure. Class B roof coverings shall include metal sheets and shingles or assemblies listed and identified as Class B by an approved testing agency. Class B roof coverings shall be permitted as the minimum for use in buildings or structures of Type 1 construction.

2301.3.3 Class C roof coverings: Class C roof coverings are those which are effective against light fire test exposure. Class C roof coverings shall include assemblies listed and identified as Class C by an approved testing agency. Class C roof coverings shall be permitted as the minimum for use in buildings or structures of Types 2, 3, 4 and 5A construction.

2301.3.4 Nonclassified roof coverings: Nonclassified roof coverings shall not be permitted.

Exceptions

1. Buildings and structures of Type 5B construction with a fire separation distance of not less than 30 feet (9144 mm) from the leading edge of the roof.
2. Detached buildings of Use Group R-3, and accessory buildings thereto, which have a fire separation distance of not less than 6 feet (1829 mm) from the leading edge of the roof.

* **2301.4 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 (see Section 2002.3.4).

2301.5 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 code official, metal roofs shall be grounded by bonding together each course or strip. 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 not have greater resistance than the conductor used to ground the electrical system within the building.

2301.5.1 Alternative methods of grounding metal roofing: Alternative methods of grounding metal roofing shall not be used unless they are at least equal in performance to the methods described herein and are approved.

SECTION 2302.0 WOOD SHINGLES

2302.1 General: Wood shingles, handsplit shakes and taper-sawn shakes used for roof covering where permitted in Section 2301.0 shall comply with the RCSHSB *Grading Rules for CertiGrade Red Cedar Shingles* or the TFS *Grading Rules for Pressure Treated Southern Pine Taper-Sawn Shakes* listed in Appendix A, and shall be installed on tight decking or on spaced roof boards.

2302.2 Reroofing: Not more than one overlay of wood shakes shall be applied over an existing asphalt shingle or wood shingle roof. One layer of 18-inch (457 mm) Type 30 felt shall be interlaced between each layer of shakes.

2302.3 Application over shakes: New roof covering shall not be applied over an existing shake roof.

SECTION 2303.0 ASPHALT SHINGLES

2303.1 General: Asphalt shingle roofs with a slope of four units vertical in 12 units horizontal (4:12) or more shall have an underlay consisting of one layer of Type 15 asphalt-saturated felt, adequately attached. Where January daily average temperature is 25 degrees F. (-4 degrees C.) or less, or where there is

possibility of ice forming along the eaves and causing a backup of water, an eaves flashing strip of mineral surfaced roll roofing shall be applied to extend to a point 12 inches (305 mm) minimum inside the interior wall line of the building. Asphalt shingles laid shall not be installed on slopes below 4:12 to as low as 2:12 unless the shingles are laid with double coverage, are approved self-sealing shingles or are hand-sealed and are installed with an underlayment consisting of two layers of Type 15 felt applied shingle fashion. In areas where the January daily average temperature is 25 degrees F. (-4 degrees C.) or less, or where there is a possibility of ice forming along the eaves and causing a backup of water, the two layers of felt shall be cemented together from the eaves up the roof to overlie a point 24 inches (610 mm) inside the interior wall line of the building.

2303.2 Reroofing: Not more than two overlays of asphalt shingles shall be applied over an existing asphalt shingle roof. Not more than two overlays of asphalt shingles shall be applied over wood shingles. Asphalt shingles applied over wood shingles shall have an underlay of not less than Type 30 nonperforated felt.

SECTION 2304.0 FLASHINGS

2304.1 General: 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; built-in gutters; at junctions of chimneys and roofs; and in all roof valleys and around all roof openings.

SECTION 2305.0 FASTENING

2305.1 General: All 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 Appendix C or the approved manufacturer's recommendations. Wood shingles or shakes shall not be applied over fiber board shingle backer or fiber board sheathing unless the installation is in accordance with the approved manufacturer's recommendations and the shingles or shakes are attached with approved corrosion-resistive annular grooved nails. Where wood shingles or shakes or asbestos shingles or siding are nailed directly to nail base fiber board sheathing not less than ½-inch nominal thickness, approved corrosion-resistive annular grooved nails shall be used and the installation shall be in accordance with the approved manufacturer's recommendations.

SECTION 2306.0 LIGHT-TRANSMITTING PLASTIC ROOF PANELS

2306.1 General: Approved light-transmitting plastic roof panels shall not be installed in buildings of Use Groups H, I-2 and I-3. In all other uses, approved

light-transmitting plastic roof panels shall not be installed unless one of the following conditions applies:

1. The building is equipped throughout with an approved automatic fire suppression system;
2. The roof construction is not required to have a fireresistance rating by Table 401; or
3. The roof panels meet the requirements for roof coverings.

2306.2 Separations: Individual roof panels shall be separated from each other by a distance of not less than 4 feet (1219 mm) measured in a horizontal plane, except that the separation between roof panels is not required in a building equipped throughout with an approved automatic fire suppression system.

2306.3 Location: Where exterior wall openings are required to be fireresistance rated by Section 907.0, a roof panel or unit shall not be installed within 6 feet (1829 mm) of such exterior wall.

2306.4 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 Table 2306.

Exceptions

1. The area limitations of Table 2306 shall be increased 100 percent in buildings equipped throughout with an approved automatic fire suppression system.
2. Low hazard use buildings such as swimming pool shelters and greenhouses are exempt from the area limitations of Table 2306 provided the buildings do not exceed 5,000 square feet (465 m²) in area and have a minimum fire separation distance of 4 feet (1219 mm).
3. Roof coverings over terraces and patios of buildings of Use Group R-3 are exempt from the area limitations of Table 2306 and shall be permitted with approved plastics.

Table 2306
AREA LIMITATIONS FOR ROOF PANELS

Class of plastic	Maximum area individual unit of panel (sq. ft.)	Maximum aggregate area (% of floor area)
C1	300	30
C2	100	25

Note a. 1 square foot = 0.093 m².

ARTICLE 24

MASONRY FIREPLACES

SECTION 2400.0 GENERAL

2400.1 Scope: The provisions of this article shall govern the design, installation, maintenance, repair, and approval of all masonry fireplaces.

2400.2 Mechanical code: All masonry fireplaces shall conform to the pertinent requirements of the mechanical code listed in Appendix A.

SECTION 2401.0 PLANS AND SPECIFICATIONS

2401.1 General: The plans and specifications shall describe in sufficient detail the location, size, and construction of all masonry fireplaces. The thickness and character of all material and the clearances from walls, partitions and ceiling shall be clearly shown and described.

SECTION 2402.0 CONSTRUCTION REQUIREMENTS

2402.1 Dimensions: The firebox of a masonry fireplace shall have a minimum depth of 20 inches (508 mm). The size of the chimney connection shall be a minimum cross-sectional area of 50 square inches (32258 mm^2). The minimum cross-sectional area of the fireplace shall equal the cross-sectional area of the chimney connection.

2402.2 Wall construction: Fireplace walls lined with a minimum of 2 inches of low-duty refractory brick conforming to ASTM C64 listed in Appendix A shall be a minimum total thickness of 8 inches (203 mm) solid masonry. Medium-duty fire clay mortar conforming to ASTM C105 listed in Appendix A or equivalent shall be used with the low-duty refractory brick. Unlined fireplace walls shall be solid masonry having a minimum total thickness of 12 inches (305 mm).

2402.2.1 Extension of liners: The liner of the fireplace walls shall extend a minimum of 4 inches (102 mm) into the throat of the fireplace.

2402.2.2 Throat and smoke chamber: The walls of the throat and smoke chamber shall be solid masonry having a minimum thickness of 8 inches (203 mm).

2402.2.3 Heat exchanger: Gravity-fed heat exchangers installed in the walls of masonry fireplaces shall not reduce the total thickness of solid masonry.

2402.3 Foundation and hearth: The foundation of a fireplace shall be constructed with noncombustible material and shall conform to the requirements of Article 10. The hearth and hearth extension shall be a minimum of 4 inches (102 mm) solid masonry.

2402.3.1 Hearth extension: The hearth shall extend a minimum of 16 inches (406 mm) beyond the face of the fireplace opening and a minimum of 8 inches (203 mm) on each side of the fireplace opening for fireplaces having an opening of less than 6 square feet (0.56 m^2). The hearth of larger size fireplaces shall extend a minimum of 20 inches (508 mm) beyond the face of the fireplace opening and a minimum of 12 inches (305 mm) on each side of the fireplace opening.

2402.4 Clearance to combustibles: The exterior surface of fireplace walls shall have a minimum 4 inches (102 mm) clearance to combustibles. The opening of fireplaces shall have a minimum 6 inches (152 mm) clearance to combustibles.

2402.5 Opening to the chimney: Means shall be provided to shut off the opening to the chimney when the fireplace is not in operation.

2402.5.1 Dampers: Dampers shall be constructed of metal having a minimum thickness of No. 12 Manufacturer's Standard Gage (0.105 in.).

2402.6 Chimneys with metal hoods: Metal hoods shall extend a minimum of 6 inches (152 mm) beyond the firebox. The hoods shall comply with the requirements for metal chimneys.

ARTICLE 25

MECHANICAL EQUIPMENT AND SYSTEMS

SECTION 2500.0 GENERAL

2500.1 Scope: The provisions of this article shall control the construction, inspection and maintenance of all mechanical equipment and systems in respect to structural strength, fire safety and operation.

2500.2 Boilers: All boilers and associated pressure piping shall meet the standards for construction, installation and inspection as set forth in Chapter 15 of Title 815 of the Kentucky Administrative Regulations.

2500.3 Unfired pressure vessels: All unfired pressure vessels shall meet the standards set forth in Section VIII of the 1986 Edition of the ASME Boiler and Pressure Vessel Code, ANSI/ASME PBV-VIII-I.

2500.4 Mechanical code: All mechanical equipment and systems not covered by Section 1600.2 or 1600.3 but which are required by other provisions of this code to be installed in accordance with the mechanical code listed in Appendix A, shall be constructed, installed and maintained in conformity with the *BOCA National Mechanical Code/1987* including all applicable standards listed in Appendix A.

SECTION 2501.0 PLANS AND SPECIFICATIONS

2501.1 General: Plans and specifications for the installation, repair, extension or removal of any mechanical equipment or system shall be submitted in accordance with the mechanical code listed in Appendix A, and a permit shall be secured prior to the commencement of any work.

2501.2 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; type of fuel; method of operation; and the method of compliance with all regulations for the class and type of equipment installed.

2501.3 Details: An application for permit shall be accompanied by specifications and diagrammatic mechanical drawings in sufficient detail, complying with the provisions of the mechanical code listed in Appendix A, before a permit shall be issued for the mechanical equipment or system. The plans shall be drawn to a scale of not less than ⅛ inch to the foot (10 mm/m), and shall

show the location and arrangement of all equipment and distribution elements including safeties and pressure-controlling devices.

SECTION 2502.0 INSPECTIONS AND TESTS

2502.1 Inspection: All mechanical equipment and systems requiring a permit shall be inspected in accordance with the mechanical code listed in Appendix A and shall not be placed in operation until having been tested and approved.

2502.2 Concealment: It shall be unlawful for owners, contractors or workers to lath over or in any way to conceal any piping, outlet boxes or other parts of the mechanical equipment or system requiring a permit until an inspection has been made thereof and due notice given that the work has been approved.

2502.3 Defects and repairs: Upon inspection or reinspection of a mechanical system, any defects or deficiencies which require repair to insure safe operation shall be rectified before the system is placed in use.

2502.4 Power to deem unsafe: When a system or any part thereof is found unsafe to life or property, it shall be deemed unsafe and such system shall not be restored to use until it has been made safe and approved.

SECTION 2503.0 EXISTING BUILDINGS

2503.1 Unsafe orders: All existing mechanical equipment and systems shall be maintained and operated in accordance with the requirements of this code and the mechanical code listed in Appendix A. Any such equipment which does not comply with the requirements, and the operation of which is deemed unsafe to the building occupants, shall be altered as ordered by the code official to secure adequate safety.

SECTION 2504.0 FEES

2504.1 General: A permit to begin work for new construction or alteration shall not be issued until the prescribed application and permit fees have been paid, nor shall an amendment to a permit necessitating an additional fee because of the additional work involved be issued until the additional fee has been paid.

SECTION 2505.0 DRYING ROOMS

2505.1 General: 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 6 for special uses.

2505.2 Piping clearance: All overhead heating pipes shall have a clearance of not less than 2 inches (51 mm) from combustible contents of the dryer.

2505.3 Insulation: When the operating temperature of the dryer is 175 degrees

F. (79 degrees C.) or more, metal enclosures shall be insulated from adjacent combustible materials by not less than 12 inches (305 mm) of air space, or the metal walls shall be lined with ¼-inch asbestos mill board or other approved equal insulation.

2505.4 Fire protection: Drying rooms designed for high hazard materials and processes, including special uses provided for in Article 6, shall be protected by an approved automatic fire suppression system conforming to the provisions of Article 10.

SECTION 2506.0 WASTE AND LINEN HANDLING SYSTEMS

2506.1 General: Waste and linen handling systems shall be installed in accordance with the provisions of Chapters 3 and 4 of NFiPA 82 listed in Appendix A.

SECTION 2507.0 REFUSE VAULTS

2507.1 Refuse vault enclosures: A vault for receiving combustible refuse from an exhaust system shall be constructed of not less than 3-hour fireresistance rated assemblies.

2507.2 Openings to boiler rooms: The opening between a vault and a boiler room shall not exceed 9 square feet (0.84 m^2) in area and shall be located at least 8 feet (2438 mm) from the firing door of the boiler, and the bottom of the opening shall be not less than 6 inches (152 mm) above the boiler room floor. All openings shall be equipped with fire doors of not less than 1½-hour fireresistance rating complying with Section 916.0.

2507.3 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 the mechanical code listed in Appendix A.

2507.4 Fire protection: A vault for combustible refuse which exceeds 360 cubic feet (10.1 m^3) in volume shall be protected by an approved automatic fire suppression system conforming to Article 10.

SECTION 2508.0 DUST, STOCK AND REFUSE CONVEYOR SYSTEMS

2508.1 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.

2508.2 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. A collector or separator shall not be located nearer than 10 feet (3048 mm) 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 30 feet (9144 mm).

2508.3 Discharge pipes: Discharge pipes shall conform to all the requirements for ducts, including clearances required for high heat appliances, as contained in the mechanical code listed in Appendix A. A delivery pipe from a cyclone collector shall not convey refuse directly into the firebox of a boiler, furnace, dutch oven, refuse burner, incinerator or other appliance.

2508.4 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.

2508.5 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.

2508.6 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 Section 618.0.

2508.6.1 Screens: When a screen is used in a safety relief vent, it shall be so attached as to permit ready release under emergency pressure.

2508.6.2 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.

SECTION 2509.0 MEDICAL GASES

2509.1 Nonflammable medical gases: Nonflammable medical gas systems shall be designed and installed in accordance with NFiPA 56F listed in Appendix A.

2509.2 Anesthetic systems: Inhalation anesthetic systems shall be designed and installed in accordance with Chapters 3 and 4 of NFiPA 99 listed in Appendix A.

SECTION 2510.0 OXYGEN SYSTEMS

2510.1 General: Nonmedical oxygen systems shall be designed and installed in accordance with NFiPA 50 and NFiPA 51 listed in Appendix A.

SECTION 2511.0 RANGEHOODS

2511.1 General: Rangehoods in kitchen exhaust systems shall comply with the requirements of the mechanical code listed in Appendix A. The bottom edge of the hood shall be located at a height of not more than 4 feet (1219 mm) above the cooking surface.

ARTICLE 26

ELEVATOR, DUMBWAITER AND CONVEYOR EQUIPMENT, INSTALLATION AND MAINTENANCE

SECTION 2600.0 GENERAL

2600.1 Scope: Except as otherwise provided by statute, the provisions of this article shall control the design, construction, installation, maintenance and operation of all elevators, dumbwaiters, escalators, moving walks and special hoisting and conveying equipment hereafter operated, installed, relocated or altered in all buildings and structures. The design, construction, installation, maintenance and operation of all miscellaneous hoisting and elevating equipment and amusement devices shall be subject to such special requirements as are deemed necessary by the code official to secure their safe operation. The provisions of this article shall not apply to portable elevating devices used to handle materials only, and located and operated entirely within one story. The construction, alteration, maintenance, operation, inspection and tests of manlifts shall comply with ASME A90.1 listed in Appendix A.

2600.2 Referenced standard: Except as otherwise provided in this code, and except where more restrictive provisions govern, the construction, alteration, maintenance, operation, inspections and tests of elevators, dumbwaiters, moving walks and escalators shall conform to ASME A17.1 listed in Appendix A.

2600.3 Purpose and exceptions: The purpose of this code is to provide reasonable safety for life and limb. In case of practical difficulty or unnecessary hardship, the code official shall grant exceptions from the literal requirements or permit the use of other methods, but only when it is clearly evident that reasonable safety is thereby secured.

SECTION 2601.0 PLANS, SPECIFICATIONS AND PERMITS

2601.1 Application: The person responsible for the installation, relocation, or alteration of any equipment covered by this article shall file an application for permit with the code official, accompanied by governing specifications and scaled or fully-dimensioned plans with sufficient clarity and detail showing:

the location of the installation in relation to the plans and elevation of the building; the location of the machinery room and equipment to be installed, relocated or altered; and all structural supporting members thereof, including foundations. Such plans and specifications shall specify all materials to be employed and all loads to be supported or conveyed and shall be sufficiently complete to illustrate all details of construction and design.

2601.2 Permits: Equipment or devices subject to the provisions of this code shall not be constructed, installed, relocated or altered unless a permit has been received from the code official before the work is commenced. A copy of such permit shall be kept at the construction site at all times while the work is in progress.

2601.3 Identification of equipment: In buildings containing more than one elevator or device and where such devices are subject to periodic inspections, each such elevator or device shall be identified by a serial number, in figures not less than 1 inch (25 mm) high, attached to, painted, stenciled or otherwise registered on the crosshead of the elevator car and on the motor or machine; and on devices other than elevators, on the motor or machine. After such devices have been so designated, their numbers shall not be changed, except by permission of the code official, and all correspondence in regard to such device shall refer to said number.

SECTION 2602.0 TESTS AND INSPECTIONS

2602.1 General: All equipment and devices covered by the provisions of this code shall be subjected to acceptance and maintenance tests and periodic inspections as required herein.

2602.2 Acceptance tests: Acceptance tests and inspections shall be required on all new, relocated and altered equipment subject to the provisions of this article. Tests and inspections shall be of such nature as to determine whether the entire installation is designed, constructed and installed in compliance with this code, and shall include all parts of the equipment and machinery. All such tests shall be made in conformance with the requirements of Section 2602.5, in the presence of the code official, by the person installing such equipment.

2602.3 Periodic tests and periodic inspections: Periodic tests shall be required on all new and existing power elevators, and periodic inspections shall be made of all new and existing equipment subject to the provisions of this article.

2602.3.1 Periodic tests: Periodic tests shall be made by the code official, or by an approved agency, and shall be made at the expense and responsibility of the owner. Where such tests are not made by the code official, the approved agency shall submit a detailed report of the tests to the code official on approved forms not more than 30 days following the completion of the tests.

2602.3.2 Periodic inspections: Periodic inspections shall be made by the code

official, or by an approved agency. Where such inspections are not made by the code official, the approved agency shall submit a detailed report of the inspection to the code official on approved forms not more than 30 days following the completion of the inspection.

2602.4 Frequency of tests and inspections: Tests and inspections shall be conducted at frequencies specified in Sections 2602.4.1 and 2602.4.2.

2602.4.1 Periodic inspection intervals: Periodic inspections shall hereafter be made at intervals of not more than 12 months for all elevators, manlifts and escalators.

2602.4.2 Periodic test intervals: Periodic tests shall be made at intervals not exceeding those set forth in ASME A17.1 listed in Appendix A.

2602.5 Minimum requirements for tests and inspections: The minimum requirements for the inspection and test of the devices subject to this article shall conform to this section.

2602.5.1 Elevators, dumbwaiters and escalators: The equipment and machinery of elevators, dumbwaiters and escalators shall be inspected and tested to the requirements of ASME A17.1 listed in Appendix A.

2602.5.2 Freight lifts, conveyors and amusement devices: Freight lifts, conveyors and amusement devices shall be inspected and subjected to tests to insure the load capacity and safety of operation. The tests shall cover all operating protectives and safety devices, structural adequacy of the supports, and anchorage to floors, walls, ceilings and foundations.

2602.5.3 Manlifts: All equipment and machinery of manlifts shall be inspected and tested to insure reasonable safety of operation and shall include tests of the brake, terminal and emergency stopping devices and belt tension. Acceptance tests shall also include a load capacity test as provided in ASME A90.1 listed in Appendix A.

2602.5.4 Miscellaneous hoisting and elevating equipment: All miscellaneous hoisting and elevating equipment shall be subjected to such tests and inspections as required by the code official to insure safe operation.

SECTION 2603.0 CERTIFICATE OF COMPLIANCE

2603.1 General: The operation of all equipment governed by the provisions of this article and hereafter installed, relocated or altered shall be unlawful by persons other than the installer thereof until such equipment has been inspected and tested as herein required and a final or limited certificate of compliance has been issued therefor by the code official.

2603.2 Final certificate of compliance: The code official shall issue a final certificate of compliance for each unit of equipment which has satisfactorily met all the inspections and tests required by this article. Such final certificate shall bear the signature of the person who made the inspection and tests, and shall designate the rated load and speed, the date of the acceptance tests and

inspections, and the name of the code official who made or witnessed such tests and inspections. The final certificate shall also include the necessary space for inserting the name of the person who made the periodic inspection and witnessed the periodic and maintenance tests and the date of the periodic inspection and the maintenance test.

2603.3 Limited certificate of compliance: The code official is authorized to issue a limited certificate of compliance for any equipment covered by this article, which is hereafter being installed, relocated or altered, to permit its limited use by the person designated therein during the period of such installation, relocation or alteration. Such certificate shall be signed by the code official, shall bear the dates of issue, renewal and expiration, and shall designate the class of service allowed.

2603.3.1 Tests and minimum safeguards required: A limited certificate shall not be issued for an elevator until such elevator has satisfactorily passed tests for rated load, car and counterweight safety, and terminal stopping devices. Permanent or temporary guards and enclosures shall be installed on the car, around the hoistway and at the landing entrances. Equipment other than elevators shall be tested and protectives provided as deemed necessary by the code official to insure safe operation for the limited service specified.

2603.3.2 Special conditions: Automatic and continuous-pressure operation elevators shall not be placed in temporary operation from the landing push-buttons unless the door locking device and interlocks required by ASME A17.1 listed in Appendix A are installed and operative. When the car can be operated only from the inside, landing entrance guards shall be provided with locks that can be released from the hoistway side only.

2603.3.3 Time limitation: Limited certificates of operation shall be issued for periods of not more than 30 days. The code official is authorized to renew the limited certificates of operation for additional periods of not more than 30 days each.

2603.4 Posting certificates of compliance: The owner or lessee shall post the last-issued certificate of compliance in a conspicuous place on the elevator available to the code official.

SECTION 2604.0 MAINTENANCE AND ACCIDENTS

2604.1 Owner responsibility: The owner or the owner's legal agent for the building in which the equipment is located shall be responsible for the care, maintenance and safe operation of all equipment covered by this article after the installation thereof and its acceptance by such owner or agent. The owner or legal agent shall make or cause to be made all periodic tests and inspections, and shall maintain all equipment in a safe operating condition, as required by this article.

2604.2 Contractor responsibility: The person installing any device covered by this article shall make all acceptance tests and be responsible for the care and

safe operation of such equipment during its construction and until temporarily or finally accepted by the building owner or the owner's legal agent.

2604.3 Maintenance items: All operating and electrical parts and accessory equipment or devices subject to this article shall be maintained in safe operating condition. The maintenance of elevators, dumbwaiters and escalators shall conform to ASME A17.1 listed in Appendix A.

2604.4 Unsafe conditions: If upon inspection any equipment covered in this article is found in an unsafe condition, or not in accordance with the provisions of this code, the code official shall thereupon serve a written notice of such finding upon the building owner or lessee, stating the time when recommended repairs or changes shall be completed. After the service of such notice, it shall be the duty of the owner to proceed within the time allowed to make such repairs or changes as are necessary to place the equipment in a safe condition. It shall be unlawful to operate such equipment after the date stated in the notice unless such recommended repairs or changes have been made and the equipment has been approved, or unless an extension of time has been secured from the code official in writing.

2604.4.1 Power to seal equipment: The code official, in addition to any other penalties herein provided, shall have the power to seal out of service any device or equipment covered by this article when in case of emergency in the opinion of the code official, such device is in a condition to render it unsafe for operation; or for willful failure to comply with recommendations and orders.

2604.4.2 Notice of sealing out of service: Before sealing any device out of service, the code official, except in case of emergency, shall serve written notice upon the building owner or lessee stating intention to seal the equipment out of service and the reasons therefor.

2604.4.3 Unlawful to remove seal: Any device sealed out of service by the code official shall be plainly marked with a sign or tag indicating the reason for such sealing. Any tampering with, defacing or removal of the sign, tag or seal without approval shall constitute a violation of this article.

2604.5 Accidents reported and recorded: The owner of the building shall immediately notify the code official of every accident involving personal injury or damage to apparatus on, about or in connection with any equipment covered by this article, and shall afford the code official every facility for investigating such accident. When an accident involves the failure, breakage, damage or destruction of any part of the apparatus or mechanism, it shall be unlawful to use such device until after an examination by the code official is made and approval of the equipment for continued use is granted. It shall be the duty of the code official to make a prompt examination into the cause of the accident and to enter a full and complete report thereof in the records of the building department. Such records shall be open for public inspection at all reasonable hours.

2604.6 Removal of damaged parts: It shall be unlawful to remove from the premises any part of the damaged construction or operating mechanism of

elevators, or other equipment subject to the provisions of this article, until permission to do so has been granted by the code official.

SECTION 2605.0 EXISTING INSTALLATIONS

2605.1 Retroactive provisions: The provisions of this article are not retroactive except as specifically provided hereunder; and except further that if, upon inspection of any device covered by this code, the equipment is found in a dangerous condition, or there is an immediate hazard to those riding on or using such equipment, or if the design or the method of operation in combination with devices used is considered inherently dangerous in the opinion of the code official, the code official shall notify the owner or lessee in writing of the existing condition and shall recommend such alterations or additions as are deemed necessary to eliminate the dangerous situation.

2605.2 Projections into hoistway: All ledges, floor beams, saddles, timbers and other projections that project more than 2 inches (51 mm) from the inside of the general surface of the hoistway enclosure shall be fitted with smooth beveled guards set directly over the entire length of the projection, except door interlocks and contacts, door closers, door tracks and hangers, and door operating or signal devices in front of car openings, landing sills and separator beams between adjacent elevators. The angle of the bevels or guard plates shall be not less than 60 degrees (1.05 rad) from the horizontal.

2605.3 Emergency interlock release switch: Emergency interlock release switches are prohibited.

2605.4 Lighting: The cars and entrances of all elevators shall be properly lighted at all times when in service. Minimum illumination shall be not less than 5 foot candles (53.82 lux) at the landing edge of the platform.

2605.5 Belt and chain-driven machines: Single-belted and chain-driven machines are permitted only on freight elevators, and only when equipped with electrically-released spring-applied brakes and with terminal-stopping and electrical safety devices required for new electric elevators. The brakes shall be applied directly to the hoisting machine and shall be arranged to operate automatically if the driving belt or chain breaks or comes off. Double-belted elevator machines are permitted only on freight elevators and when driven by a line shafting which is used to apply power for other purposes.

2605.6 Replacement or relocation of gate switches or interlocks: The code official shall require the replacement or relocation of car gate electric contacts, safety cutout switches or interlocks where such devices are found to be tied or blocked so as to render them inoperative.

2605.7 Removal of pipes from hoistway: The code official shall order the removal from existing elevator hoistways of any pipe conveying gases, vapors or liquids which would endanger life if discharged into the hoistway or ignited.

2605.8 Existing passenger elevators: In addition to other provisions of this section, existing passenger elevators shall comply with Sections 2605.8.1 through 2605.8.5.

2605.8.1 Hoistway enclosure: All existing passenger hoistways shall be fully enclosed from floor to ceiling on all floors to comply with Section 2608.0.

2605.8.2 Hoistway doors and interlocks: All existing electric and electrically controlled and operated hydraulic passenger elevators equipped with mechanical locks and electrical contacts in good operating condition are not required to be removed or altered. If not so equipped, such passenger elevators shall be provided with hoistway landing doors equipped with approved interlocks conforming to the requirements for new elevators; except that where approved interlock switches are installed in connection with existing hoistway door closers, the combination door closer and interlocks shall conform to all the requirements for approved interlocks, except as to the required tests. The use of service and emergency keys for opening hoistway doors from the landing shall conform to the requirements of ASME A17.1 listed in Appendix A.

2605.8.3 Car doors and gates: All openings on existing passenger elevator cars shall be provided with doors or gates. Car doors and gates of electric or electrically controlled and operated hydraulic passenger elevators shall be provided with approved car door or gate electric contacts conforming to ASME A17.1 listed in Appendix A.

2605.8.4 Hydraulic passenger elevators: Hydraulic passenger elevators, except those equipped with electric control and operating devices, shall be provided with self-closing hoistway doors arranged to lock automatically when closed in lieu of interlocks. Car doors or gates on electric or electrically controlled and operated hydraulic elevators shall be equipped with car door or gate electric contacts conforming to the requirements for new elevators.

2605.8.5 Emergency signal or telephone: Existing power passenger and freight elevators shall be provided with emergency signal devices conforming to the requirements of ASME A17.1 listed in Appendix A.

2605.9 Existing freight elevators: In addition to other provisions of this section, existing freight elevators shall comply with Sections 2605.9.1 through 2605.9.5.

2605.9.1 Hoistway enclosure: If not now enclosed, enclosures shall be required on existing freight elevators as required for existing passenger elevators in Section 2605.8, except as provided in Section 2605.9.3.

2605.9.2 Hoistway doors: All landing openings in existing electric or electrically controlled and operated hydraulic freight elevator hoistways which are enclosed in fireresistance rated partitions shall be provided with fire doors equipped either with approved hoistway door interlocks, or approved hoistway door electric contacts and mechanical locks conforming to ASME A17.1 listed in Appendix A, or with fusible links and automatic self-closing devices.

2605.9.3 Landing gates: Where automatic self-closing landing doors with fusible links are used, or where fireresistance rated hoistway enclosures are not required, the landing openings of electric or electrically controlled and operated hydraulic elevators shall be equipped with landing gates not less than

5½ feet (1676 mm) high and provided with either hoistway gate interlocks or hoistway gate electric contacts and mechanical locks conforming to ASME A17.1 listed in Appendix A.

2605.9.4 Hydraulic freight elevators: Interlocks or electric contacts shall not be used on hydraulic elevator landing doors or gates, except where such elevators are provided with electric control and operating devices; and provided further that the landing openings of such elevators shall be equipped with self-closing gates at least 5½ feet (1676 mm) high with approved mechanical locks. Full automatic gates shall be prohibited. Semi-automatic gates shall be prohibited, except on hydraulic elevators with mechanical control and operating devices.

2605.9.5 Gates on cars: All openings on existing electric or electrohydraulic freight elevator cars, except the opening immediately adjacent to the operating device, shall be provided with car gates and car gate electric contacts when the distance between the hoistway side of the landing door adjacent to such opening and the hoistway edge of the landing threshold is more than 4 inches (102 mm). All such elevators using lever, wheel or cable operating devices shall have car gates and car gate contacts installed at all car openings. All openings on existing continuous-pressure or automatic operation freight elevator cars that can be operated from the landings shall be provided with car gates and car gate electric contacts. Existing sidewalk elevators shall not be subject to the provisions of this section. Car gate electric contacts shall be of an approved type conforming to ASME A17.1 listed in Appendix A.

SECTION 2606.0 ALTERATIONS

2606.1 General: Alterations to existing elevators shall conform to ASME A17.1 listed in Appendix A. Alterations to all other devices subject to this article shall conform to such requirements as the code official deems necessary for safe operation.

2606.2 Relocated equipment: The relocation of an existing installation of any device covered by this article shall be deemed to be a new installation and shall conform to the requirements therefor.

SECTION 2607.0 POWER ELEVATOR OPERATION

2607.1 Designated operator: Every power elevator, except automatic and continuous-pressure operation types and sidewalk elevators, shall be in the charge of a competent designated operator.

2607.2 Emergency operation of elevators: In all structures where elevators are to be installed, elevator emergency operation shall be provided in accordance with the requirements of ASME A17.1 listed in Appendix A and Sections 2607.1 through 2607.2.3.

2607.2.1 Buildings with elevator service: In all buildings and structures serviced by an elevator, at least one elevator shall be provided with a minimum

clear distance between walls, or between wall and door excluding return panels, not less than 68 inches by 54 inches (1727 mm by 1372 mm), and a minimum distance from wall to return panel not less than 51 inches (1295 mm). The minimum clear width of the door shall be 32 inches (813 mm).

2607.2.2 Elevators for fire department use: In all structures where elevator service is required for fire department use (see Section 602.8), at least one elevator shall be provided with a minimum distance between walls, or between wall and door excluding return panels, not less than 80 inches by 54 inches (1727 mm by 1372 mm) and a minimum distance from wall to return panel not less than 51 inches (1295 mm), with a 42-inch (1067 mm) side-slide door to allow for turning a wheelchair or accommodating an ambulance stretcher in its horizontal position.

2607.2.3 Elevator operator: In every structure over 150 feet (45720 mm) in height, a competent elevator operator shall be available at all times to assist the fire department in obtaining access to any floor in the building or structure served by elevators except where an automatic or continuous-pressure operation elevator is available.

2607.3 Passenger restriction: Freight elevators shall be subject to the passenger restrictions indicated in Sections 2607.3.1 and 2607.3.2.

2607.3.1 Freight operators: Except as provided in Section 2607.3.2, it shall be unlawful for any person other than the operator or those individuals necessary to handle freight to ride on any elevator other than a passenger elevator. It shall be unlawful for the owner or other responsible person to permit any individual other than above specified to ride on any elevator other than a passenger elevator.

2607.3.2 Other employees: Employees of the owner shall not ride on a freight elevator, unless approved and in conformance with the requirements of ASME A17.1 listed in Appendix A.

2607.4 Use by handicapped persons: If interior access in multi-story buildings is provided by elevator(s), they shall conform with the requirements of ANSI A117.1 listed in Appendix A.

SECTION 2608.0 HOISTWAY ENCLOSURES AND VENTING

2608.1 Hoistway enclosures: Hoistway enclosures shall be constructed in accordance with Sections 2608.1.1 through 2608.1.3.

2608.1.1 Elevator enclosures: All elevator and other hoistway enclosures other than dumbwaiter shafts shall be constructed to afford at least the fireresistance rating specified in Table 401 with approved opening protectives conforming to Section 2611.0 and Article 9.

2608.1.2 Dumbwaiter enclosures: Shaft enclosures and dumbwaiters having a car area of more than 3 square feet (0.28 m^2) which travel through more than one story and serve more than two adjacent floors shall be of 1-hour fireresistance rated construction with approved ¾-hour opening protectives or the

approved labeled equivalent complying with Article 9, except that when the load capacity exceeds 100 psf (488.2 kg/m²), the enclosure and opening protectives shall comply with the requirements of Section 2608.1.1 for fireresistance rating.

2608.1.3 Special dumbwaiter enclosures: The enclosure of dumbwaiters not more than 3 square feet (0.28 m²) in area with a load capacity of not more than 25 pounds (11.35 kg), and all dumbwaiters serving not more than two adjacent levels, shall be enclosed with approved noncombustible materials.

2608.2 Number of elevators permitted in hoistway: Where four or more elevators serve all or the same portion of a building, they shall be located in not less than two hoistways, and more than four elevators shall not be located in any one hoistway.

2608.3 Vents required: Hoistways of elevators and dumbwaiters serving more than three stories shall be provided with means for venting smoke and hot gases to the outer air in case of fire, except as listed in Sections 2608.3.1 and 2608.3.2.

Exception: Venting of hoistways is not required in a building equipped with a smoke control system conforming to Section 1019.3.

2608.3.1 Fire suppression system alternative: In buildings other than Use Groups R-1, R-2, I-1 and I-2 and similar buildings with overnight sleeping quarters, hoistways not extending into the top story shall be vented as herein required or shall be provided with an approved automatic fire suppression system connected to the building water supply system or conforming to Section 1004.0.

2608.3.2 Sidewalk elevator hoistways: Sidewalk elevator hoistways are not required to be vented.

2608.4 Location of vents: Vents shall be located in the side of the hoistway enclosure directly below the floor or floors at the top of the hoistway, and shall open either directly to the outer air or through noncombustible ducts to the outer air. Cable slots entering the machine room shall be sleeved beneath the machine room floor and extended to not less than 12 inches (305 mm) below the shaft vent to inhibit the passage of smoke into the machine room.

2608.5 Area of vents: Except as herein provided, the area of the vents shall be not less than 3½ percent of the area of the hoistway nor less than 3 square feet (0.28 m²) for each elevator car, and not less than 3½ percent nor less than ½ square foot (0.047 m²) for each dumbwaiter car in the hoistway whichever is greater. Of the total required vent area, not less than one-third shall be of the permanently open type. Where mechanical ventilation conforming to the mechanical code listed in Appendix A provides equivalent venting, the required vent area shall be reduced, provided the conditions of Sections 2608.5.1 and 2608.5.2 are met.

2608.5.1 Restricted use: The building is not of Use Groups R-1, R-2, I-1 or I-2 or a similar building with overnight sleeping quarters.

2608.5.2 Vent location: The required vents in Section 2608.4 are so located that they do not have outside exposure.

2608.6 Closed vents: Closed portions of the required vent area shall consist of windows or duct openings glazed with plain glass not more than ⅛ inch thick.

2608.6.1 Windows: Windows used as required vents shall conform to Section 917.0 and they shall be glazed with ⅛-inch plain glass.

2608.7 Plumbing and mechanical systems: Plumbing and mechanical systems, other than floor drains, sumps and sump pumps at the base of the shaft, shall not be located in an elevator shaft.

SECTION 2609.0 ELEVATOR AND DUMBWAITER MACHINERY AND EQUIPMENT

2609.1 General: Elevator and dumbwaiter machinery and equipment shall conform to ASME A17.1 listed in Apppendix A.

SECTION 2610.0 MACHINE ROOMS AND RELATED CONSTRUCTION FOR PASSENGER AND FREIGHT ELEVATORS AND DUMBWAITERS

2610.1 General: The construction of machine rooms and related construction for passenger and freight elevators and dumbwaiters shall be protected from the weather, and shall be enclosed with fireresistive enclosures. Enclosures and access doors thereto shall have a fire endurance at least equal to that required for the hoistway enclosure in Table 401.

SECTION 2611.0 ELEVATOR OPENING PROTECTIVES

2611.1 General: All hoistway enclosure doors for elevators, dumbwaiters and other hoisting equipment shall be constructed in accordance with the provisions of Article 9 and as herein required.

2611.2 Hoistway doors: Door openings of elevator hoistway enclosures shall be equipped with protective assemblies having a fireresistance rating of not less than 1½ hours or their approved labeled equivalent. However, when the shaft opens into a vestibule enclosed with not less than 2-hour fireresistance rated construction in which all vestibule openings are protected with assemblies having a fireresistance rating of not less than 1 hour, the required fireresistance rating of the hoistway doors shall be ¾ hour.

2611.3 Hardware: All hardware on opening protectives shall be of an approved type installed as tested, except that interlocks, mechanical elevator door locks and electric contacts and door operating mechanisms of approved types shall be exempt from the fire test requirements.

2611.4 Door operation on dangerous floors: In every structure where elevator emergency operation is provided in accordance with Section 2607.2, each elevator lobby and associated elevator machine rooms shall be provided with a smoke detector installed in accordance with NFiPA 72E listed in Appendix A. A designated level, which shall be the main floor level or other level that best serves the needs of emergency personnel for fire fighting or rescue

purposes, shall be approved by the code official and the fire prevention code official. The activation of a smoke detector in any elevator lobby other than the designated level, or in any associated machine room, shall cause all cars in all groups that serve that lobby or are served by that machine room to return nonstop to the designated level. If a smoke detector at the designated level is activated, the cars shall return to an approved alternate level. Manual control to override the smoke detectors shall be provided at the designated level in accordance with ASME A17.1 listed in Appendix A. The smoke detector shall operate before the optical density exceeds 0.03 per foot (0.098 per m). The detector is permitted to serve to close the lobby doors.

Exception: Freight elevators located in or at openings into industrial areas.

SECTION 2612.0 ELEVATOR CAR EMERGENCY SIGNALS AND SIGNS

2612.1 Emergency signals: Elevator cars shall be provided with car emergency signals conforming to the requirements of ASME A17.1 listed in Appendix A.

2612.2 Emergency signs: A pictograph sign, of an approved standarized type, shall be posted over each elevator call station on all floors, indicating that in case of fire, occupants shall not use elevators and that stairways are the approved method of exit.

SECTION 2613.0 MANLIFTS

2613.1 Restricted use: Manlifts shall be accessible and their use shall be restricted to employees only. They shall comply with the applicable requirements of this article and shall be installed only when permitted by the code official in feed, flour and cereal mills, grain elevators and in similar buildings of other use groups.

2613.2 Enclosures: When the clear vertical distance between mounting platform and ceiling guard is less than 7½ feet (2286 mm), the manlift shall be completely enclosed to comply with Section 2108.0 without access openings.

2613.3 Accessibility: Entrances to manlifts shall not be provided from any floor or level with a clear ceiling height of less than 9 feet (2783 mm), and the minimum clearance between the head pulley and the roof or other overhead obstruction shall be not less than 5 feet (1524 mm).

2613.4 Speed: The speed of manlifts shall not exceed 80 feet per minute (0.406 m/s) except by special approval.

2613.5 Manlift safeties: Manlift safeties shall conform to Sections 2613.5.1 through 2613.5.3.

2613.5.1 Manlift manual stops: An approved manually-operated stopping device shall be provided to permit passengers riding on a manlift to control the operation of the lift at all floors and at any level in the travel of the device.

2613.5.2 Manlift automatic stops: An approved safety device shall be pro-

vided which will automatically stop the lift in the event that a rider fails to alight at the top landing but such automatic device shall not be capable of restoring the operating circuit when it has been interrupted for any cause.

2613.5.3 Secondary manlift stop: All new installations shall be provided with a secondary safety stop to act immediately after and in the event of a failure of the automatic stop brake or other device required in Section 2613.5.2.

2613.6 Manlift construction: Manlifts shall be constructed in accordance with Sections 2613.6.1 through 2613.6.6.

2613.6.1 Floor openings: Floor openings shall be circular and not less than 24 inches (610 mm) in dimension from belt to perimeter. The floor openings shall be provided with bevel guards underneath the landing with a slope of not less than 45 degrees (0.79 rad) from the horizontal, extending not less than 42 inches (1067 mm) back from the handhold.

2613.6.2 Guards: The floor opening shall be protected with a railing or guard of metal or other approved noncombustible material at least 42 inches (1067 mm) in height on the up-running side and 66 inches (1676 mm) in height on the down-running side, located not more than 12 inches (305 mm) from the edge of the opening.

2613.6.3 Entrance and exit: The entrance to and egress from the manlift shall be equipped with a gate at all floors and landings, hung to swing away from the opening and located not less than 2 feet (610 mm) from the floor openings. The landings shall be constructed to provide safe footing and shall be kept clear of obstructions and lighted to an intensity of not less than 3 foot candles (32.29 lux). The runs of the manlift shall be illuminated throughout the entire height to an intensity of not less than 1 foot candle (10.76 lux).

2613.6.4 Steps: Manlift steps shall be uniform in size and not less than 12 inches (305 mm) nor more than 14 inches (356 mm) deep from the plane of the belt to the edge of the tread. Steps shall be of adequate strength to support a load of 400 pounds (181.6 kg). The vertical distance between step treads shall be not less than 16 feet (4877 mm).

2613.6.5 Belts: All manlift belts shall be of approved types, not less than 12 inches (305 mm) wide and of adequate strength to support a load of 200 pounds (90.8 kg) on each step of one run without loss of traction.

2613.6.6 Handholds: Manlift handholds shall be located not less than 4 feet (1219 mm) nor more than 4 2/3 feet (1422 mm) above each step tread on both runs of the manlift with a 2-inch (51 mm) clearance from the belt. Such handholds shall be not less than 9 inches (229 mm) in length in the clear.

2613.7 Final acceptance: All manlifts shall be subject to approval and periodic tests and inspections as provided in Section 2602.0.

2613.8 Manlift instruction signs: Manlift instruction signs shall be provided in accordance with Sections 2613.8.1 and 2613.8.2.

2613.8.1 Landing signs: Approved signs shall be provided on each landing and

stenciled on the belt at approximately eye level above each step giving the following instructions: *For Employees Only. Face the Belt. Use the Handhold. To Stop, Pull Rope.*

2613.8.2 Terminal sign: The top landing shall be provided with an illluminated warning sign in block letters not less than 2 inches (51 mm) high which shall be located within easy view of ascending passengers at a level of not more than 2 feet (610 mm) above the top landing, reading: *Top Floor, Get Off.*

SECTION 2614.0 INDUSTRIAL LIFTS AND LOADING RAMPS

2614.1 General: Except as exempted by Section 2600.0 or as otherwise provided by statute, the provisions of this section and Section 2615.0 shall control the design, construction, installation, maintenance and operation of all automotive lifts, industrial lifts and loading dock ramps hereafter installed, relocated or altered in all buildings or structures. The purpose of this code is to provide safety for life and limb. In case of practical difficulty or unnecessary hardship, the code official shall grant exceptions from the literal requirements or permit the use of other methods, but only when it is evident that safety is hereby secured.

2614.2 General requirements: Industrial lifts and loading ramps shall comply with the requirements of Sections 2614.2.1 through 2614.2.3.

2614.2.1 Markings and labels: All material lifts and loading ramps shall be marked with the name of manufacturer, model number, serial number, and rated capacity. Such markings shall be legibly stamped or etched on a metal plate which shall be permanently secured in a convenient place for inspection. Such data plates shall not be obscured, obliterated or changed.

2614.2.2 Controls: The controls shall be so located that the operator has a full and unobstructed view of the lift area at all times. All control devices shall be accessible to the operator without exposing him to danger. Alterations or changes shall not be made in the control device, or its manner of use, which will render its normal functioning inoperative.

2614.2.3 Lift control: When the device used for controlling the travel of the lift in either direction is not continuous-pressure or deadman type, an emergency stop button shall be provided and so located as to be readily accessible to the operator at all times.

2614.3 Maintenance: Maintenance of industrial lifts and loading ramps shall be provided in accordance with Sections 2614.3.1 through 2614.3.3.

2614.3.1 Owner responsibility: The owner or the owner's agent shall be responsible for the care, maintenance, and safe operation of all equipment covered by this article after the installation thereof and its acceptance by such owner or agent or its approval. The owner or agent shall not permit the equipment to be used unless it is, to the best of such owner's or agent's knowledge, in safe operating condition.

2614.3.2 Housekeeping: The spaces around or beneath the equipment shall be

kept clean. Rubbish or oil shall not be allowed to accumulate therein, nor shall any part of this space be used for storage of materials or equipment. All parts, except those requiring freedom of movement, shall be kept tight at all times. All mechanical working parts shall be kept free of rust, and properly lubricated and adjusted. The owner, or the owner's agent, shall be responsible for inspecting the oil level in all hydraulic systems to insure that it is at or above the manufacturer's prescribed minimum level.

2614.3.3 Lighting: The entire operating area shall be illuminated to provide a distributed intensity of not less than 3 foot candles (32.29 lux) over the area of operating floor and platform.

2614.4 Pressure tanks: All separate tanks for liquid storage under pressure, not an integral part of the cylinder assembly, shall conform to the provisions of ASME *Code for Unfired Pressure Vessels* listed in Appendix A and shall be marked with a securely attached metal label to indicate the approved operating pressure. For hydropneumatic systems, the storage capacity shall be such that with the lift in fully elevated position there shall remain not less than 3 inches (76 mm) of usable oil in the storage tank. Adequate means shall be provided to determine that the oil level in reservoir, with lift in the lowest position, is at or above the safe minimum operating level as prescribed by the manufacturer.

2614.5 Design and construction: The construction and installation of all power industrial lifts and loading ramps shall comply with the provisions of this section and ANSI A10.5 listed in Appendix A.

2614.5.1 Rated load: The lifting capacity shall be not less than 50 psf (244.1 kg/m^2) for gross platform area.

2614.5.2 Platform construction: The platform and its supports shall be designed for the loads to be transmitted within strength and deflection limitations such that when one-half the capacity load is applied as a static center concentration within 12 inches (305 mm) of the loading edge, the lift platform shall not deflect more than ½ inch (13 mm) at any edge point.

2614.6 Platform and hoist protection: Platform and hoist protection shall be provided in accordance with Sections 2614.6.1 through 2614.6.4.

2614.6.1 Unprotected space not more than 5 feet: When the lift rise is such that the unprotected vertical distance from the landing to the bottom edge of the vertical side of the platform is not more than 5 feet (1524 mm), protection shall be provided as described in Sections 2614.6.1.1 through 2614.6.1.3.

2614.6.1.1 Toe guards: A toe guard plate not less than 8 inches (203 mm) in width shall be provided on all unprotected sides. It shall be made of steel, not less than 0.120-inch nominal thickness, attached flush with the vertical edge of the platform, and slanted inwardly at an angle of approximately 30 degrees (0.52 rad) from the vertical. Toe guards are not required where skirts are used.

2614.6.1.2 Skirts: For automatic operation, the unprotected sides of the platform shall be provided with metal or wood sheathing or skirts attached to the platform to protect the exposed vertical openings.

2614.6.1.3 Enclosures: When toe guard or skirt protection is not provided, the unprotected sides shall be provided with solid or mesh enclosures to the full height of the lift rise. Mesh enclosure shall, by test, reject a 2-inch (51 mm) ball.

2614.6.2 Unprotected space more than 5 feet: When the unprotected space exceeds that set forth in Section 2614.6.1, protection shall be provided as described in Sections 2614.6.2.1 and 2614.6.2.2.

2614.6.2.1 Loading or unloading side: Sides used for loading or unloading at the lower level shall be protected with skirts as described in Section 2614.6.1, or by a landing gate with electrical contact, or an automatic landing gate.

2614.6.2.2 Other sides: Sides not used for loading or unloading shall be protected with skirts or enclosures as described in Section 2614.6.1.

2614.6.3 Lift rise more than 5½ feet: When the lift rise exceeds 5½ feet (1676 mm) above the lowest level, additional protection shall be provided as described in Sections 2614.6.3.1 and 2614.6.3.2.

2614.6.3.1 Landing gate: The upper landing shall be provided with a landing gate equipped with mechanical lock and electrical contact.

2614.6.3.2 Enclosure: The sides of the platform not used for loading or unloading shall be provided with railings, mesh, or solid enclosures not less than 3½ feet (1067 mm) high.

2614.6.4 Surface installations: When the lift is surface mounted, toe clearance space shall be provided on all unprotected sides. Such toe clearance shall provide not less than 3 inches (76 mm) vertical and 4 inches (102 mm) horizontal clearance when the platform is at its lowest position.

2614.7 Platform protection, loading ramps: The sides or edges of loading ramps which rise above the surrounding platform shall be provided with skirts or toe guards protecting the opening under the sides of the ramp.

2614.8 Overload protection: Overload protection shall be provided in accordance with Sections 2614.8.1 and 2614.8.2.

2614.8.1 Electric hydraulic operation: Hydraulic overload protection shall be provided by means of a relief valve that will prevent raising of the elevating device when it is loaded to 125 percent of rated capacity. The relief valve shall be so designed that its operation will not cause the platform to lower.

2614.8.2 Electric operation: Electric overload protection shall be provided by means of a thermal cutout or other suitable device.

SECTION 2615.0 AUTOMOTIVE LIFTS

2615.1 General: All electric, hydraulic and hydropneumatic automotive lifts shall comply with the requirements of Section 2606.0 and ANSI B153.1 listed in Appendix A.

2615.2 Types: Lifts shall be classified as semi-hydraulic, full hydraulic or

mechanical lifts according to their operation as described in Sections 2615.2.1 through 2615.2.3.

2615.2.1 Semi-hydraulic hydropneumatic: A semi-hydraulic lift is an automotive lift of the plunger type which employs compressed air as the primary lifting and load-sustaining agent; such compressed air acts continuously against a column of liquid to provide the lifting and load-sustaining effort.

2615.2.2 Full hydraulic: A full hydraulic lift is an automotive lift of the plunger type that employs a liquid under pressure as the direct lifting and load-sustaining agent. Such a lift is so designed and constructed that the full weight of the load and lifting assembly rests on a continuous column of liquid which extends from the cylinder to the liquid control valve.

2615.2.3 Mechanical lifts: A mechanical lift is an automotive lift so designed that the motive power is transmitted to the lifting frame by mechanical means. There are three principal types: cable and drum; rack and pinion; and screw type.

2615.3 Safeties: All mechanical automotive lifts shall be equipped with approved safeties as specified in Sections 2615.3.1 through 2615.3.3.

2615.3.1 Limit stop: Every mechanical automotive lift shall be equipped with an automatic overtravel device to stop the motor or drive machine before the lifting frame reaches safe limits of travel.

2615.3.2 Holding brake: When the friction of the gear train of the driving mechanism is insufficient to hold the load, the mechanical automotive lift shall be equipped with a brake or other locking device to automatically hold the lift at any level immediately on failure of the lifting power for any cause.

2615.3.3 Stopping brake: When the structural members of the lifting frame are so designed that they interfere with open doors or other projections from the vehicle, the automotive lift shall be provided with a quick-acting automatic brake to stop the ascent of the lift in case of emergency.

2615.4 Controls: Controls shall be provided in accordance with Sections 2615.4.1 and 2615.4.2.

2615.4.1 Automatic release: The direct control device shall be of a type that will automatically return itself to the neutral or off position upon release by the operator.

2615.4.2 Speed control: A speed control device shall be provided to control the descent of the lift at a speed of not more than 20 feet per minute (0.10 m/s) under rated load.

SECTION 2616.0 CONVEYORS

2616.1 Enclosures: All package elevators, boosters or lifts connecting successive floors or levels shall be enclosed in fireresistance rated construction in conformance with the requirements of Sections 2608.0 and 2610.0 and Article 9.

2616.2 Opening protectives: Opening protectives shall be provided in accordance with Sections 2616.2.1 through 2616.2.3.

2616.2.1 Plans and specifications: Whenever conveyor or other material handling devices are designed to pass through floors, ceilings, partitions or walls, the plans and specifications shall give the necessary details of the opening protectives in respect to location, structural strength and fireresistance rating.

2616.2.2 Fire curtains: Openings in partitions and walls through which conveyors pass shall have automatic fire dampers or curtains to prevent the spread of fire when, in the opinion of the code official, such protection is necessary due to the hazard of operation of the conveyors.

2616.2.3 Fire doors: All opening protectives shall meet the fireresistance rating requirements of Article 9 for the location, type of construction and use of the building or structure.

2616.3 Machinery guards: All conveying devices shall be manufactured, installed, and guarded in accordance with ASME B20.1 listed in Appendix A.

2616.4 Chute enclosures: All slides and chutes shall be enclosed with fireresistance rated construction, or protected with approved automatic shutters of noncombustible construction, to insure a full firestop between floors of the building or structure.

2616.5 Conveyor safeties: All power-operated conveyors, belts and other material moving devices shall be equipped with automatic limit switches which will shut off the power in an emergency and automatically stop all operation of the device.

SECTION 2617.0 ESCALATORS

2617.1 General: All escalators and their enclosures shall comply with the provisions of this section and ASME A17.1 listed in Appendix A.

2617.2 Construction materials: Escalator construction materials shall comply with the provisions of Sections 2617.2.1 and 2617.2.2.

2617.2.1 Machine room enclosure: The stairwell is not required to be enclosed when protected with an exhaust system or ventilation and water curtains as provided in Section 606.3, or with a power-operated shutter conforming to Section 2617.3; except that the machine room shall be enclosed with 1-hour fireresistance rated construction and shall be properly lighted and ventilated.

2617.2.2 Noncombustible materials: The escalator shall be constructed entirely of noncombustible and fire-retardant materials except electrical equipment, wiring, wheels, handrails and the use of 1/28-inch wood veneers on balustrades backed up with noncombustible materials.

2617.3 Automatic fire shutter: Unenclosed escalators, which are not protected as specified in Section 606.3, shall be equipped with a power-operated automatic shutter at every floor pierced thereby, constructed of noncombustible materials with a fireresistance rating of not less than 1½ hours.

2617.3.1 Construction: The shutter shall close immediately upon the automatic detection of fire or smoke by an approved device and shall completely shut off the well opening. The shutter shall operate at a speed of not more than 30 feet per minute (0.15 m/s) and shall be equipped with a sensitive leading edge to arrest its progress when in contact with any obstacle, and to continue its progress on release therefrom.

SECTION 2618.0 WHEELCHAIR AND STAIRWAY LIFTS

2618.1 General: Except as herein provided, inclined stairway chairlifts and inclined and vertical wheelchair lifts shall conform to the requirements of ASME A17.1 listed in Appendix A.

Exception: Vertical wheelchair lifts are permitted to have a travel not to exceed 23 feet (7010 mm) and penetrate a floor subject to the following additional requirements.

1. The platform shall be fully enclosed on the top and any side which is not used as an exit or entrance. Enclosures shall conform to the requirements of ASME A17.1 listed in Appendix A.

2. The runway shall be fully enclosed from the floor to the ceiling on all floors conforming with the requirements of Section 2608.0.

3. All runway entrances shall be protected by a door of unperforated construction conforming to the requirements of Section 2611.0.

4. All runway entrance doors shall be equipped with approved interlocks conforming to the requirements of ASME A17.1 listed in Appendix A.

ARTICLE 27

ELECTRIC WIRING, EQUIPMENT AND SYSTEMS

SECTION 2700.0 GENERAL

2700.1 Scope: The provisions of this article shall control the design and construction of all new installations of electrical conductors, equipment and systems in buildings or structures; and all alterations to existing wiring systems therein to insure safety. All such installations shall conform to the provisions of NFiPA 70 listed in Appendix A.

2700.2 Exceptions: Electrical wiring shall not be installed in a building or structure, nor shall an alteration of an existing electric wiring system be made, until a permit has been issued therefor as required in Section 2704.0, except as provided in Sections 2700.2.1 through 2700.2.3.

2700.2.1 Public service agencies: The provisions of this code shall not apply to installations for electric supply or communication agencies in the generation, transmission or distribution of electricity, or the operation of signals, or the transmission of intelligence, or to installations located within or on buildings or premises used exclusively by such agency, or on public thoroughfares.

2700.2.2 Railway utilities: The provisions of this code shall not apply to the installations or equipment employed by a railway utility in the exercise of its functions as a public carrier, and located outdoors or in buildings used exclusively for that purpose.

2700.2.3 Radio and television transmitting stations: The provisions of this code shall not apply to electrical equipment used for radio and television transmission, except the equipment and wiring for power supply and the installations of towers and antennae, whether erected on buildings or on the ground.

2700.3 Electric installation standards: Conformance of installation of electric conductors and equipment to NFiPA 70 listed in Appendix A shall be the prima facie evidence that such installations are reasonably safe for use in the service intended and in compliance with the provisions of this code.

2700.4 Electric equipment standards: The materials, appliances, and other equipment listed in published reports of inspected electrical equipment by the Underwriters Laboratories, Inc. (UL), and other approved agencies and testing organizations, and installed in accordance with any instructions included as part of such listing, shall be approved as meeting the requirements of this code.

2700.5 Electrical inspections: Inspections conducted to determine compliance with the National Electrical Code shall be conducted by a certified electrical inspector in accordance with 815 KAR 35:015.

2700.5.1 Tentative Interim Amendment: Notwithstanding the provisions of Section 310-15(b) of the National Electrical Code dealing with ampacities of underground conductors, compliance with Tentative Interim Amendment #87-4, dated April 6, 1988, is incorporated by reference and shall be deemed to satisfy the intent of the Code. Copies of which are available from the Department of Housing, Buildings and Construction, The 127 Building, U.S. 127 South, Frankfort, KY 40601.

SECTION 2701.0 PLANS AND SPECIFICATIONS

2701.1 General: Plans, specifications and schedules in sufficient detail shall be filed with the code official showing the location and capacity of all lighting facilities, electrically operated equipment and electrical circuits required for all service equipment of the building or structure except as modified by the code official.

2701.2 Items covered: All electrically controlled devices, including signal, communicating and lighting systems and their wiring, whenever required under the provisions of this code shall be shown on the plans and elevations of the building or structure with respect to those uses covered by Sections 2701.2.1 through 2701.2.8.

2701.2.1 Emergency and hazard use lighting: Places of public assembly and education and control of emergency lighting systems in accordance with Section 824.0 and hazardous uses in Article 6.

2701.2.2 Exit and elevator lighting: Stairway and exit illumination in accordance with Article 7 and Section 824.0; *Exit* sign lighting circuits, Section 823.0; elevator car illumination, Section 2605.0.

2701.2.3 Service equipment: Electrical equipment and control of heating, refrigerating and ventilating machinery and devices, in accordance with the mechanical code listed in Appendix A.

2701.2.4 Fire alarm and signal systems: Fire alarm signal systems, fire department communication and supervisory service in accordance with Sections 1017.0, 1018.0 and 1020.0.

2701.2.5 Construction operations: Temporary construction lighting requirements equivalent to 3 foot candles (32.29 lux) in accordance with Section 3017.0.

2701.2.6 Signs and towers: Wiring of display signs in accordance with Sections 2907.0 and 2914.0; and radio and television antennae, Sections 623.0 and 624.0.

2701.2.7 Elevators and moving stairways: Power control electric operation and circuit wiring of elevators and escalators in accordance with Article 26.

2701.2.8 Toilets and bathrooms: Illumination of toilets and bathrooms equivalent to 3 foot candles (32.29 lux) in accordance with Section 703.1.1.

SECTION 2702.0 INSPECTION AND TESTS

2702.1 During installation: During the installation of electric systems and equipment, the certified electrical inspector shall make inspections to insure compliance with the provisions of this article, except as provided in Section 2704.0.

2702.2 Concealing work: Work in connection with an electric system shall not be covered or concealed until it has been inspected and permission to conceal has been approved by the certified electrical inspector.

2702.3 Final inspection and test: On completion of the work, the certified electrical inspector shall inspect the work and cause tests to be made of the operation of the entire system to insure compliance with all requirements.

SECTION 2703.0 TEMPORARY USE

2703.1 Permission: The certified electrical inspector is authorized to give temporary permission for a reasonable time to supply and use current in part of an electric installation before such installation has been fully completed and the final certificate of approval has been issued. The part covered by the temporary certificate shall comply with all the requirements specified for temporary lighting, heat or power in NFiPA 70 listed in Appendix A.

SECTION 2704.0 PERMIT AND CERTIFICATE OF INSPECTION

2704.1 General: Electrical wiring or equipment shall not be installed within or on any building, structure or premises, nor shall any alteration be made in any such existing installations, without first securing approval and a permit from the code official except as provided in Section 2704.2. It shall be unlawful to use or allow the use of, or to supply current for an electrical system in a building or structure, unless the required certificate of inspection and permit have been issued by the code official.

2704.2 Exemptions: A permit shall not be required for the execution and use of the classes of work specified in Sections 2704.2.1 through 2704.2.4.

2704.2.1 Repairs and maintenance: Minor repair work, including the replacement of lamps or the connection of approved portable electrical equipment to approved permanently installed receptacles.

2704.2.2 Public service agencies: The installation, alteration or repair of electrical equipment for the operation of communications and signals or the transmission of intelligence by wire by public service agencies, except as provided in Article 10 for fire alarm systems.

2704.2.3 Power companies: The installation, alteration or repair of electrical equipment of a power or public service company for its use in the generation, transmission, distribution or metering of electricity.

2704.2.4 Temporary testing systems: The installation of any temporary system required for the testing or servicing of electrical equipment or apparatus.

SECTION 2705.0 EXISTING INSTALLATIONS

2705.1 General: Alterations shall not be made to any existing installations of electric wiring or equipment for which a permit is required within or on any building, structure or premises, except as provided in Section 2704.0, without first securing the approval and a permit from the code official.

2705.2 Defective wiring: If, upon inspection, an electric wiring system is found defective and unsafe, the code official shall revoke all certificates and permits in effect. Use of such system shall be discontinued until it has been made to conform to this article and the approved rules and after a new permit has been issued.

2705.3 Additional loads: When additional electrical loads are to be connected to existing service in buildings or structures in other than buildings of Use Group R, the existing load shall be established as not less than the actual maximum demand figures. New loads shall be computed in accordance with the requirements of NFiPA 70 listed in Appendix A.

SECTION 2706.0 EMERGENCY ELECTRICAL SYSTEMS

2706.1 General: Emergency electrical systems are those systems required to automatically supply power for illumination and equipment in the event of failure of the normal power supply. The emergency electrical system shall conform to NFiPA 70 Article 700 listed in Appendix A, except as otherwise provided herein. The systems shall pick up their connected loads within 10 seconds after failure of the normal power supply and shall operate under all weather conditions.

2706.2 Capacity: The emergency systems shall have the capacity to operate equipment such as egress lighting, exit signs, door locks, and any other emergency equipment as required by other sections of this code.

2706.3 Power source: The emergency electrical system shall not be connected to a standby power system unless the load pickup time complies with Section 2706.1 and the standby system is sized for the additional load.

SECTION 2707.0 STANDBY POWER SYSTEMS

2707.1 General: Standby power systems are those intended to automatically supply power to selected loads required by this code, other than those classified as emergency systems, in the event of failure of the normal power source.

Standby power systems shall conform to NFiPA 70 Article 701 listed in Appendix A, except as otherwise provided herein. The systems shall pick up their connected loads within 60 seconds of failure of the normal power supply and shall operate under all weather conditions.

2707.2 Capacity: Standby power systems shall have the capacity and rating to operate equipment such as mechanical systems, fire pumps, signal, lighting, communication, elevators, and other standby equipment as required by other sections of this code. The capacity and rating shall include the ability to start all rotating equipment from a standing start. The system capacity need not be sized to operate all the connected equipment simultaneously where loads can be manually controlled.

2707.3 Connection of emergency systems: Where an emergency electrical system is connected to the standby power system as provided for in Section 2706.3, the load pickup time for emergency equipment shall comply with Section 2706.1 and the standby system shall be sized for the additional load.

ARTICLE 28

PLUMBING SYSTEMS

SECTION 2800.0 GENERAL

2800.1 Scope: The design and installation of plumbing systems, including sanitary and storm drainage, sanitary facilities, water supplies and storm water and sewage disposal in buildings shall comply with the requirements of Chapter 318 of the Kentucky Revised Statutes and the Kentucky State Plumbing Code as set out in Title 815, Chapter 20, Kentucky Administrative Regulation.

ARTICLE 29

SIGNS

RESERVED FOR LOCAL ORDINANCE

ARTICLE 30

PRECAUTIONS DURING BUILDING OPERATIONS

SECTION 3000.0 GENERAL

3000.1 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.

3000.2 Other laws: Nothing herein contained shall be construed to nullify any rules, regulations or statutes of state agencies governing the protection of the public or workers from health or other hazards involved in manufacturing, mining and other processes and operations which generate toxic gases, dust or other elements dangerous to the respiratory system, eyesight or health.

3000.3 Combustible and explosive hazards: The provisions of this code which apply to the storage, use or transportation of explosives, highly flammable and combustible substances, gases and chemicals shall be construed as supplemental to the requirements of the federal laws, the regulations of the Department of Transportation (DOT) and the rules and regulations of the jurisdiction.

SECTION 3001.0 PLANS, SPECIFICATIONS AND SPECIAL PERMITS

3001.1 Temporary construction: Before any construction operation is started, plans and specifications shall be filed with the code official showing the design and construction of all sidewalk sheds, truck runways, trestles, foot bridges, guard fences and other similar devices required in the operation. Approval shall be secured before the commencement of any work.

3001.2 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.

3001.3 Temporary encroachments: Subject to approval, sidewalk sheds, underpinning and other temporary protective guards and devices shall project beyond the interior and street lot lines where 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 3002.0 TESTS

3002.1 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 11 for allowable loads and working stresses.

3002.2 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, or the code official shall require a strength test to two and one-half 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 3003.0 INSPECTION

3003.1 Unsafe conditions: When inspection of any construction operation reveals that any unsafe or illegal conditions exist, the code official shall notify the owner and direct the owner to take the necessary remedial measures to remove the hazard or violation.

3003.2 Failure to comply with orders: Unless the owner so notified proceeds to comply with the orders of the code official within 24 hours, the building official shall have full power to correct the unsafe conditions as provided in Sections 121.0 and 123.0. All expenses incurred in the correction of such unsafe conditions shall become a lien on the property.

3003.3 Unsafe construction equipment: When the strength and adequacy of any scaffold or other device or construction equipment is in doubt, or when any complaint is made, the code official shall inspect such equipment and shall prohibit its use until tested as required in Section 3002.2 or until all danger is removed.

SECTION 3004.0 MAINTENANCE

3004.1 General: All construction equipment and safeguards shall be constructed, installed and maintained in a substantial manner and shall be so operated as to insure protection to the workers engaged thereon and to the general public. It shall be unlawful to remove or render inoperative any structural, fire protection or sanitary safeguard or device herein required except when necessary for the actual installation and prosecution of the work.

SECTION 3005.0 EXISTING BUILDINGS

3005.1 Protection: All existing and adjoining public and private property shall be protected from damage incidental to construction operations.

3005.2 Chimney, soil and vent stacks: Whenever a new building 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 the mechanical code listed in Appendix A, and the construction and extension of soil and vent stacks and the location of window openings shall comply with the provisions of Article 28, 815 KAR 20:090.

3005.3 Adjoining walls: The owner of the new or altered structure shall preserve all adjoining independent and party walls from damage as provided herein. The owner shall underpin where necessary and support the adjoining building or structure by proper foundations to comply with Section 3007.0.

3005.3.1 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 remain as safe and useful as it was before the excavation was commenced. During the demolition, the party wall shall be maintained weatherproof and structurally safe by adequate bracing until such time as the permanent structural supports shall have been provided.

3005.3.2 Beam holes: When a structure involving a party wall is being demolished, the owner of the demolished structure shall, at his own expense, bend over all wall anchors at the beam ends of the standing wall and shall brick up all open beam holes and otherwise maintain the safety and usefulness of the wall.

3005.3.3 Party wall exits: A party wall balcony or horizontal exit shall not be destroyed unless and until a substitute means of egress has been provided and approved.

3005.4 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 3006.0 PROTECTION OF PUBLIC AND WORKERS

3006.1 General: Whenever a building or structure is erected, altered, repaired, removed or demolished, the operation shall be conducted in a safe manner and suitable protection for the general public and workers employed thereon shall be provided.

3006.2 Fences: Every construction operation located 5 feet (1524 mm) or less from the street lot line shall be enclosed with a fence not less than 8 feet (2438 mm) high to prevent entry of unauthorized persons. When located more than 5 feet (1524 mm) from the street lot line, a fence or other barrier shall be erected when required by the code official. All fences shall be of adequate strength to resist wind pressure as specified in Section 1111.0.

3006.3 Sidewalk bridge: Whenever the ground is excavated under the side-

walk, a sidewalk bridge shall be constructed at least 4 feet (1219 mm) wide, or a protected walkway of equal width shall be erected in the street, provided the required permit for such walkway is obtained from the administrative authority.

3006.4 Sidewalk shed: Sidewalk sheds shall be provided in accordance with Sections 3006.4.1 through 3006.4.4.

3006.4.1 Within 10 feet of street lot line: When any building or part thereof which is located within 10 feet (3048 mm) of the street lot line is to be erected or raised to exceed 40 feet (12192 mm) in height, or whenever a building more than 40 feet (12192 mm) in height within 10 feet (3048 mm) 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.

3006.4.2 Within 20 feet of street lot line: When the building being demolished or erected is located within 20 feet (6096 m) of the street lot line and is more than 40 feet (12192 mm) in height, exterior flare fans or catch platforms shall be erected at vertical intervals of not more than two stories.

3006.4.3 Buildings higher than six stories: When the building being demolished or erected is more than six stories or 75 feet (22860 mm) in height, unless set back from the street lot line a distance more than one-half its height, a sidewalk shed shall be provided.

3006.4.4 Walkway: An adequately lighted walkway at least 4 feet (1219 mm) wide and 8 feet (2438 mm) high in the clear shall be maintained under all sidewalk sheds for pedestrians. Where ramps are required, they shall conform to the provisions of this article and Section 815.0.

3006.5 Thrust-out platforms: Thrust-out platforms or other substitute protection in lieu of sidewalk sheds shall not be used unless approved and deemed adequate to insure the public safety. Thrust-out platforms shall not be used for the storage of materials.

3006.6 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 3007.0 DEMOLITION AND EXCAVATION

3007.1 Notice of intent: The person intending to cause a demolition or an excavation shall deliver written notice of such intent to the owner of each potentially affected adjoining lot, building or structure at least one week prior to the commencement of work. The notice shall request license to enter the potentially affected lot, building or structure prior to the commencement of work and at reasonable intervals during its prosecution to inspect and preserve it from any damage which might result from the intended work.

3007.2 Protection of adjoining property: If afforded the necessary license to

enter the adjoining lot, building or structure, the person causing the demolition or excavation to be made shall at all times and at his own expense preserve and protect it from damage or injury. If the necessary license is not afforded, it shall be the duty of the owner of the adjoining lot, building or structure to make safe his own property, for the prosecution of which he shall be granted the necessary license to enter the premises of the demolition or excavation.

3007.2.1 Removal of debris: All waste materials shall be removed in a manner which prevents injury or damage to persons, adjoining properties and public rights of way.

3007.3 Notice to the code official: If the person causing a demolition or excavation to be made is not afforded license to enter an adjoining structure, he shall immediately notify in writing both the code official and the owner of the adjoining property that the responsibility of providing support to the adjoining lot, building or structure has become the exclusive responsibility of the owner of the adjoining property.

SECTION 3008.0 REGULATION OF LOTS

3008.1 Grading of lot: When a building has been demolished and building operations have not been projected or approved, the vacant lot shall be filled, graded and maintained in conformity to the established street grades at curb level. 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. Provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

3008.2 Utility connections: All service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the authority having jurisdiction.

SECTION 3009.0 RETAINING WALLS AND PARTITION FENCES

3009.1 General: 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 1223.0 and shall be provided with a guardrail or fence not less than 42 inches (1067 mm) in height.

SECTION 3010.0 STORAGE OF MATERIALS

3010.1 General: All materials and equipment required in construction operations shall be stored and placed so as not to endanger the public, the workers or adjoining property.

3010.2 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.

3010.3 Special loading: Unless the construction is designed for special loading, materials stored on sidewalk sheds and scaffolds shall not exceed a one-day 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.

3010.4 Pedestrian walkways: Materials or equipment shall not 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 highway or street. The piles shall be arranged to maintain a safe walkway not less than 4 feet (1219 mm) wide, unobstructed for its full length, and adequately lighted at night and at all necessary times for the use of the public.

3010.5 Obstructions: Material and equipment shall not be placed or stored so as to obstruct access to fire hydrants, standpipes, fire or police alarm boxes, utility boxes, catch basins or manholes, nor shall they be located within 20 feet (6096 mm) of a street intersection, or so placed as to obstruct normal observations of traffic signals or to hinder the use of public transit loading platforms.

SECTION 3011.0 REMOVAL OF WASTE MATERIAL

3011.1 General: Material shall not be dropped by gravity or thrown outside the exterior walls of a building during demolition or erection. Wood or metal 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 3012.0 PROTECTION OF ADJOINING PROPERTY

3012.1 General: 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 3007.0.

SECTION 3013.0 PROTECTION OF FLOOR AND WALL OPENINGS

3013.1 Noncombustible floor construction: The arches, slabs or structural floor fillings of buildings of Types 1 and 2 construction shall be installed as the building progresses.

3013.2 Combustible floor construction: In Types 3, 4 and 5 construction when double flooring is used, the underfloor shall be laid on each story as the building progresses; and when double floors are not used, the floors shall be planked over two stories below the level where work is being performed.

3013.3 Steel structural frames: In steel construction, the entire tier of iron or steel beams upon which the structural work is in progress shall be planked

over, with the exception of necessary hoistways and permanent openings. Steel work shall not advance more than six floors ahead of the permanent floor construction.

3013.4 Guardrails: All floor and wall openings shall be protected with substantial guardrails and toe boards in accordance with ANSI A12.1 listed in Appendix A.

SECTION 3014.0 SCAFFOLDS

3014.1 Load capacity: Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load. All platforms and supporting elements of scaffolds shall be designed and constructed to support uniform minimum live loads in pounds per square foot of the platform area in accordance with the classifications described in Table 3014.

3014.2 Erection: Built-up, swinging and suspended scaffolds shall be erected by competent workers only.

3014.3 Scaffolding: Scaffolding shall be constructed in accordance with Sections 3014.3.1 and 3014.3.2.

3014.3.1 All buildings: All scaffolding exceeding 85 feet (25908 mm) or seven stories in height used in construction operations involving the erection, alteration or maintenance of buildings, shall be constructed of noncombustible or fire-retardant materials complying with the provisions of Section 903.0.

Table 3014
SCAFFOLD LOAD CAPACITY

Classification	Service type	Load (pounds per square foot)
Light duty	Carpenters	25
	Stone setters	25
	(no stone on scaffold)	
	Miscellaneous	25
	(no material on scaffold)	
Medium duty	Bricklayers	50
	Stucco	50
	Lathers and plasterers	50
Heavy duty	Stone masons	75

Note a. 1 psf = 4.882 kg/m².

3014.3.2 Use Group I: All scaffolding used in construction operations involving the repair or partial demolition during occupancy of buildings of Use Groups I-2 and I-3 shall be constructed of noncombustible or fire-retardant materials complying with the provisions of Section 903.0.

SECTION 3015.0 HOISTS

3015.1 Hoist protection: All material hoists shall be adequately protected. When erected on the outside of a building over 85 feet (25908 mm) or seven stories in height, the hoist structure shall be built of noncombustible or approved fire-retardant materials with the exception of the loading platform.

3015.2 Passengers prohibited: Persons shall not be permitted to ride a material hoist. Temporary elevators shall be installed when necessary to transport workers as provided in Article 26.

3015.3 Guarding of cables: All hoisting cables and signal cords shall be guarded whenever they pass through or cross working spaces to prevent injury to persons.

3015.4 Rigger's license: All persons engaged in the erection of derricks and other hoisting apparatus shall secure a license or certificate of fitness for the performance of such work from the authorized administrative official.

SECTION 3016.0 STAIRWAYS AND LADDERS

3016.1 Temporary stairways: When a building has been constructed to a greater height than 50 feet (15240 mm) or four stories, or when an existing building exceeding 50 feet (15240 mm) 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.

3016.2 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 42 inches (1067 mm) above the floor level which they serve.

SECTION 3017.0 LIGHTING

3017.1 General: All stairways and parts of buildings under demolition, erection or repair shall be adequately lighted while persons are engaged at work, to comply with the provisions of Sections 824.0 and 2701.2.5.

SECTION 3018.0 FIRE HAZARDS

3018.1 General: The provisions of this code and of the fire prevention code listed in Appendix A shall be strictly observed to safeguard against all fire hazards attendant upon construction operations.

3018.2 Temporary heating: Whenever salamanders or other heating devices are used for temporary heating, all regulations as to maximum temperature, distance from combustible materials, spark arrestors, removal of noxious gases, and other requirements prescribed by the code official shall be fully observed. When the source of temporary heat consists of salamanders or other open-flame devices, temporary canvas enclosures shall comply with Section 904.0.

3018.3 Steam boilers: All temporary or permanent high-pressure steam boilers shall be operated only by licensed operating engineers in accordance with the provisions of the mechanical code listed in Appendix A. When located within a building or within 10 feet (3048 mm) thereof, all such boilers shall be enclosed with approved noncombustible construction.

3018.4 Storage of flammables: Storage of gasoline for hoists, oils, paints and other highly flammable materials shall be permitted only as specified in Article 6 and when stored in approved safety containers. The storage of larger quantities shall not be approved unless stored in separate compartments or enclosures of approved noncombustible construction.

3018.5 Flame cutting and welding: The use of oxyacetylene torches for cutting or welding shall be permitted only in accordance with ANSI Z49.1 listed in Appendix A.

3018.6 Concrete forms: Combustible materials shall not be stored on any floor of a building under construction until all combustible concrete forms are removed from the tier immediately above.

3018.7 Fire extinguishers: Fire exinguishers shall be provided as required by Section 1021.0.

3018.8 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 by the fire department as the structure progresses in accordance with the provisions of Section 1013.0. Free access from the street to such standpipes shall be maintained at all times. Materials shall not be stored within 5 feet (1524 mm) of any fire hydrant or in the roadway between such hydrant and the center line of the street.

3018.9 Housekeeping: Rubbish and trash shall not be allowed to accumulate on the site and shall be removed as fast as conditions warrant. Combustible rubbish shall be removed daily, and shall not be disposed of by burning on the premises or in the immediate vicinity. The entire premises and area adjoining and around the operation shall be kept in a safe and sanitary condition and free of accumulation of trash, rubbish, nuts, bolts, small tools and other equipment.

SECTION 3019.0 HEALTH HAZARDS

3019.1 General: Every construction or maintenance operation which results in the diffusion of dust, stone and other small particles, toxic gases or other harmful substances in quantities hazardous to health shall be safeguarded by means of local ventilation or other protective devices to insure the safety of the public as required by the regulations of the administrative official.

3019.2 Removal of dust: Dust, sand blasts or other harmful agents, when employed or occurring in construction operations, shall be disposed of at or near the point of origin to prevent their diffusion over adjoining premises or streets.

3019.3 Protective equipment: Facilities shall be provided in approved closed containers for housing the necessary vision, respiratory and protective equipment required in welding operations, and in accordance with the regulations of the administrative official.

SECTION 3020.0 WELDING SAFETY PRECAUTIONS

3020.1 Welding enclosures: All welding and flame-cutting operations shall be performed in protected areas with full consideration of safety and fire hazards. Such closed spaces shall be properly ventilated while welding or cutting is being done. Suitable protection against the rays of the electric arc shall be maintained by the contractor where arc welding operations might be viewed within harmful range by persons other than the welding operators and inspectors.

3020.2 Flammable materials: Proper precautions shall be taken to avoid all risk of fire or explosion, and flammable or explosive materials shall not be stored in the vicinity of welding or cutting operations.

SECTION 3021.0 SANITATION

3021.1 General: Every building in the course of demolition, erection or repair shall be provided with toilet and drinking water facilities which shall be constructed and installed in accordance with the plumbing code listed in Appendix A.

SECTION 3022.0 DISPUTES

3022.1 General: The code official, when requested by any person, aggrieved or otherwise, shall serve a written notice on any owner, tenant and their agents who fail to conform to the requirements of this article directing such person to take the necessary remedial action. If the person whose duty it is to protect his own or adjoining property under those provisions fails to proceed to fully comply with such notice within three days of receipt thereof, or within a reasonable time thereafter as determined by the code official, the code official is authorized to 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 jurisdiction shall institute appropriate action for its recovery.

ARTICLE 31

ENERGY CONSERVATION

SECTION 3100.0 GENERAL

3100.1 Scope: The provisions of this article regulate the design and construction of the exterior envelope and selection of HVAC, service water heating, electrical distribution and illuminating systems and equipment required for the purpose of effective use of energy, and shall govern all buildings or structures, or portions thereof, hereafter erected that provide facilities or shelter for human occupancy.

Exceptions

1. Buildings or structures, or portions thereof, which are neither heated nor cooled.
2. Buildings or structures, or portions thereof, whose peak design rate of energy usage is less than 1 Watt per square foot (10.75 W/m²) or 3.4 Btu per hour per square foot (10.75 W/m²) of floor area for all purposes.
3. Buildings of Use Groups F and U whose peak design rate of annual energy usage is less than 29,784 Btu per square foot (94 kW/m²) or 8.76 kW hours per square foot (94 kW/m²) of floor area.
4. Buildings and structures shall comply with this code or with the CABO *Model Energy Code* listed in Appendix A.

3100.2 Other standards: Compliance with the applicable provisions of ASHRAE 90A or 90B listed in Appendix A shall be deemed to meet the requirements of this article, unless otherwise specifically provided herein.

SECTION 3101.0 PLANS AND SPECIFICATIONS

3101.1 General: Plans, specifications and necessary computations shall be submitted to indicate conformance with this section and other applicable sections of this code, and the mechanical and plumbing codes listed in Appendix A.

3101.2 Details: The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed, including but not limited to exterior envelope, component materials, *U* values of the respective elements including insulation, *R* values of insulating materials, size and type of apparatus and equipment, equipment and system controls and other pertinent data to indicate conformance with the requirements herein.

SECTION 3102.0 EXTERIOR ENVELOPE REQUIREMENTS

3102.1 General: The intent of this section is to provide minimum requirements for exterior envelope construction in the interest of energy conservation. Calculation and measurement procedures and information contained in ASHRAE 90A listed in Appendix A shall be used, except where otherwise noted, to determine conformance with the requirements herein.

In addition to the criteria set forth in this article, the proposed design is permitted to include consideration of the thermal mass of the building with regard to energy conservation.

3102.1.1 Thermal performance: All buildings and structures that are heated or mechanically cooled shall be constructed so as to provide the required thermal performance of the various components.

The required thermal transmittance values U_o of any one component, such as roof/ceiling, wall or floor shall be increased and the U_o values for other components decreased when it is shown that the overall heat gain or loss for the entire building envelope does not exceed the total resulting from conformance to the required U_o values.

3102.1.2 Different requirements: A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements for the exterior envelope as provided in this section when requirements differ.

3102.1.3 Exterior walls: For the purpose of this article, the gross area of exterior walls consists of all opaque wall areas, including foundation walls above grade, 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.

3102.1.4 Roof assembly: For the purpose 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.

3102.1.4.1 Gross roof area: 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.

3102.1.4.2 Ceiling plenums: Where air-ceiling plenums are employed, the roof/ceiling assembly shall for thermal transmittance purposes not include the ceiling proper nor the plenum space as part of the assembly and for gross area purposes shall be based upon the interior face of the upper plenum surface.

3102.2 Criteria for residential buildings: The requirements herein shall apply to all buildings or structures or portions thereof of Use Group R that are heated or mechanically cooled when not more than three stories in height.

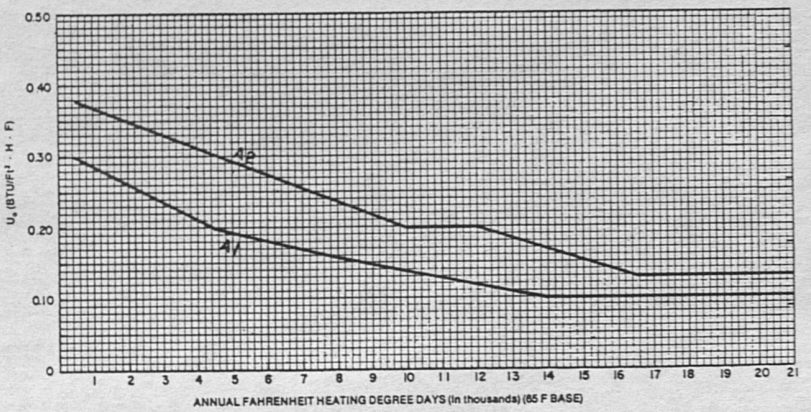
3102.2.1 Walls: The gross area of exterior walls above grade, including

foundation walls, shall have a combined thermal transmittance (U_o) value not exceeding those specified in Figure 3102.2.1a.

Exceptions

1. In locations with less than 500 heating degree days, there shall not be a maximum U_o requirement if only heating is provided and the U_o shall be 0.30 maximum for Type A1 and 0.38 maximum for Type A2 buildings as described in Figure 3102.2.1a if the building is mechanically cooled.
2. Where the opaque exterior wall areas are constructed having thermal transmittance U_w values in conjunction with glazed openings areas in accordance with Figures 3102.2.1b and 3102.2.1c.

Figure 3102.2.1a
MAXIMUM ALLOWABLE U_o VALUES
FOR GROSS EXTERIOR WALL ASSEMBLIES[a]



Note a. Line A1 inside graph denotes detached one- and two-family dwellings and Line A2 inside graph denotes all other residential buildings not more than three stories in height.

3102.2.2 Roof/ceiling: The roof/ceiling assemblies shall have a combined thermal transmittance value U_o as specified in Figure 3102.2.2.

Exceptions

1. The maximum U_o value for roof/ceiling assemblies in which the finished interior surface is essentially the underside of the roof deck shall be 0.08 for any heating degree day area.
2. Where domed skylights are used, the domed skylight area is exempt from the roof/ceiling U_o value computation, provided all the following conditions are met.
   a. The area of the domed skylights does not exceed 10 percent of the roof/ceiling area.
   b. Double-domed units are used when heating degree days exceed 2,500.
   c. Curbs are insulated to a U_o value of 0.21 maximum.

d. The infiltration coefficient of the skylight units does not exceed 0.05 Btu per hour per square foot per degree F. (0.28 W/m² · K).
e. If domed skylights exceed 10 percent of the roof/ceiling area, energy balance calculations made in accordance with AAMA Standard 1602.1 listed in Appendix A shall be used to calculate the percentage of skylights permitted.

Figure 3102.2.1b
SINGLE GLAZED OPENINGS

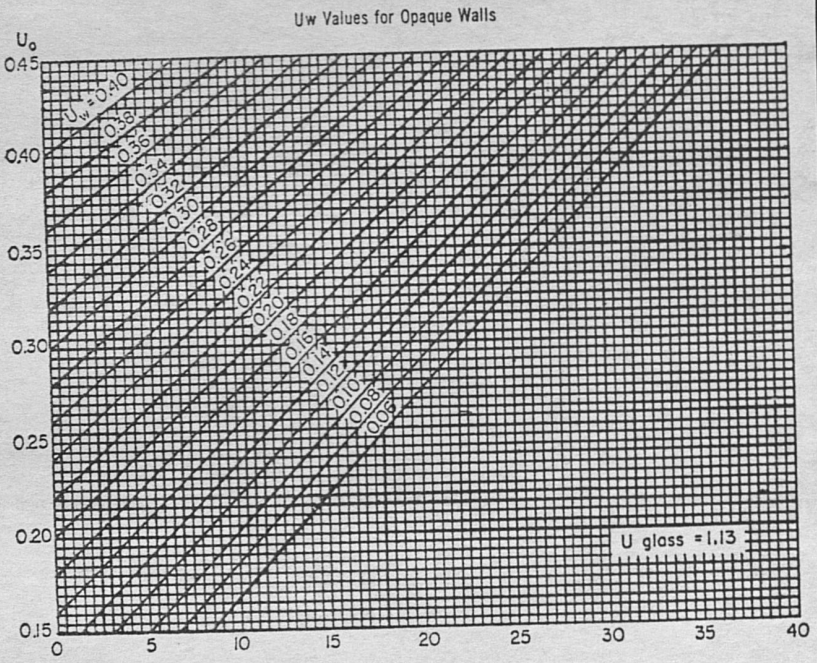
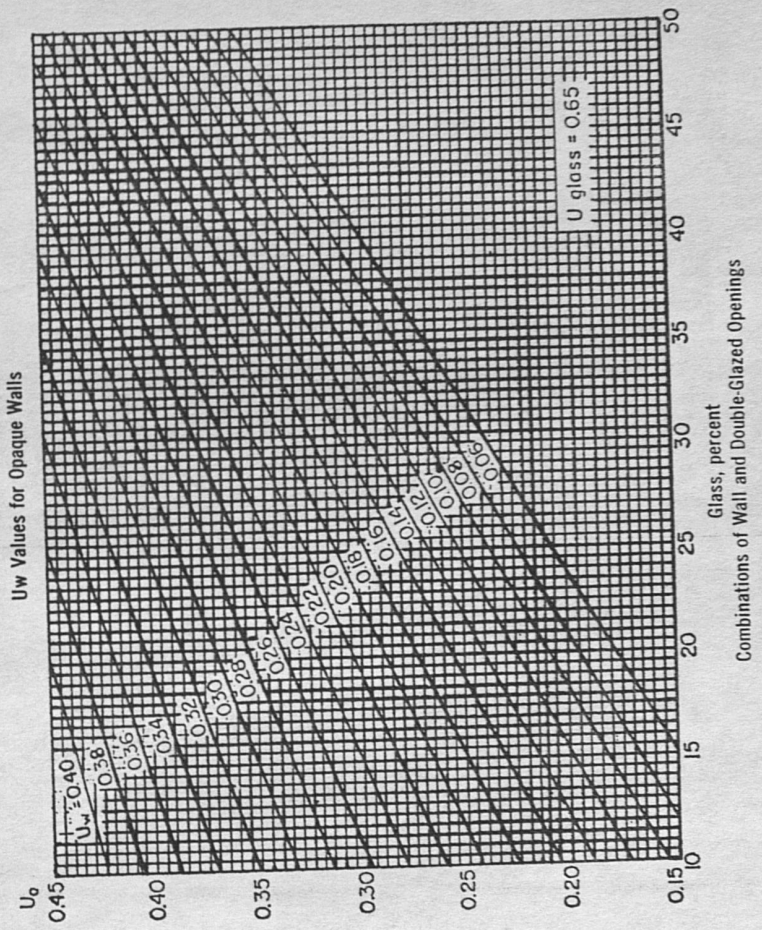


Figure 3102.2.1c
DOUBLE GLAZED OPENINGS



3102.2.3 Floors over unheated spaces: The floor of a heated or mechanically cooled space located over an unheated space shall have a combined thermal transmittance value U_o as specified in Figure 3102.2.3. For floors over outdoor air, such as overhangs, the U_o value shall meet the same requirements as for roofs in Section 3102.2.2.

3102.2.4 Slab-on-grade floors: For slab-on-grade floors, the perimeter of the floor shall be insulated with a material having a thermal resistance value R not

less than those specified in Figure 3102.2.4. The insulation shall extend downward from the top of the slab for a minimum distance of 24 inches (610 mm), or downward to the bottom of the slab then horizontally beneath the slab for a minimum total distance of 24 inches (610 mm).

Exception: Insulation is not required for heated slabs in locations having less than 500 heating degree days or for unheated slabs in locations having less than 2,500 heating degree days.

Figure 3102.2.2
MAXIMUM ALLOWABLE U_0 VALUES
FOR ROOF/CEILING ASSEMBLIES

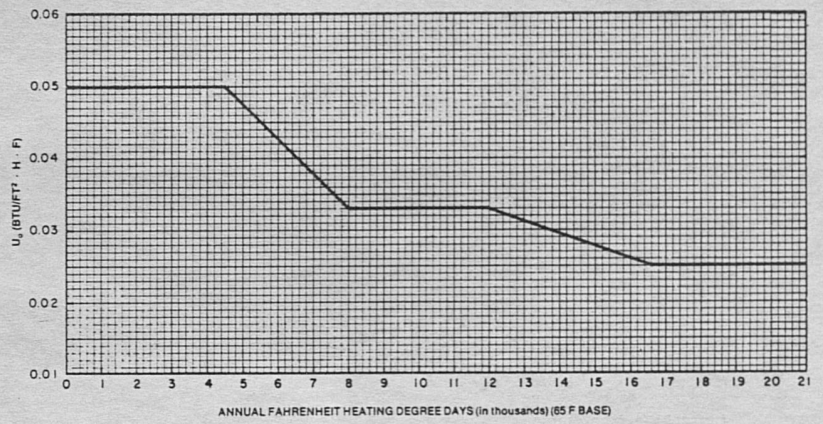


Figure 3102.2.3
MAXIMUM ALLOWABLE U_0 VALUES
FOR FLOORS OVER UNHEATED SPACES

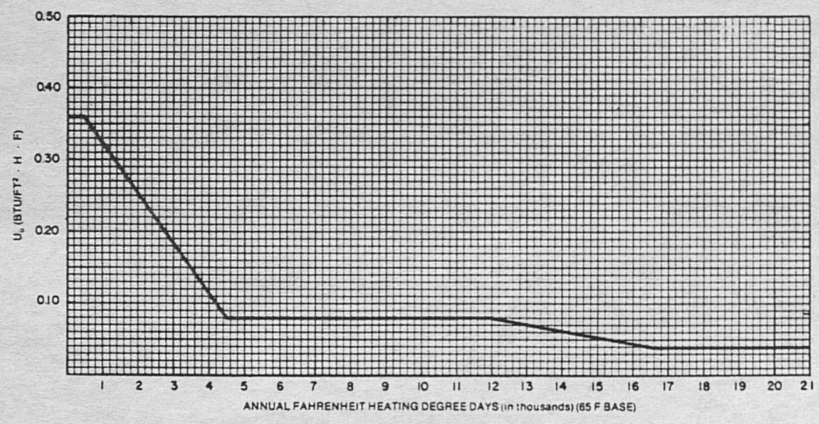
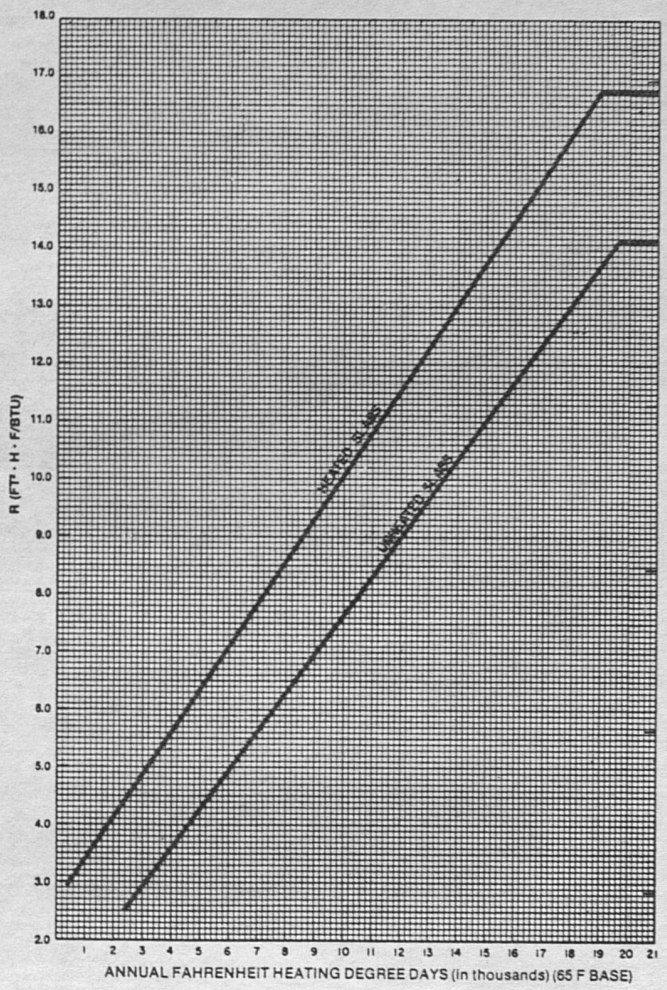


Figure 3102.2.4
MINIMUM ALLOWABLE *R* VALUES
FOR PERIMETER INSULATION FOR SLAB-ON-GRADE FLOORS



3102.2.5 Crawl space plenums: The exterior walls of crawl spaces used as plenums for supply or return air shall be insulated to provide a thermal resistance *R*, excluding film resistances, of

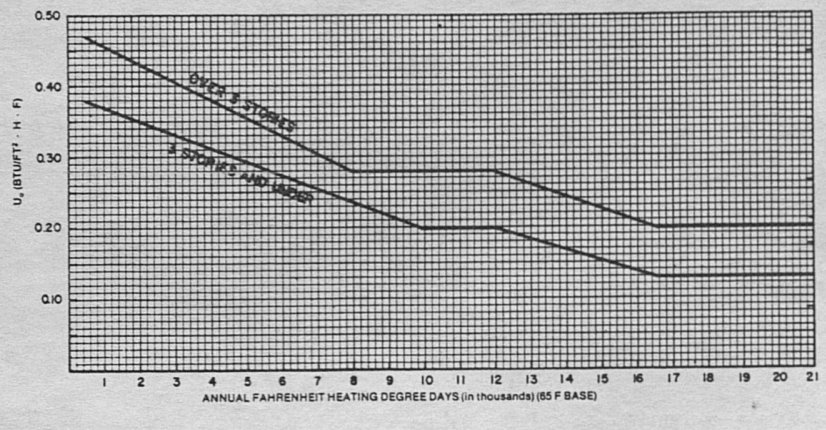
$$R = \frac{\Delta t}{15} \text{ where;}$$

Δt is the design temperature differential between the air in the plenum and the outdoor air.

3102.3 Other buildings: The requirements herein shall govern all buildings and structures or portions thereof other than defined by Section 3102.2.

3102.3.1 Heating criteria for walls: All buildings or structures included in this section that are heated shall have a combined thermal transmittance value U_o for the gross area of exterior walls not exceeding those specified in Figure 3102.3.1.

Figure 3102.3.1
MAXIMUM ALLOWABLE U_o VALUES
FOR GROSS EXTERIOR WALL ASSEMBLIES

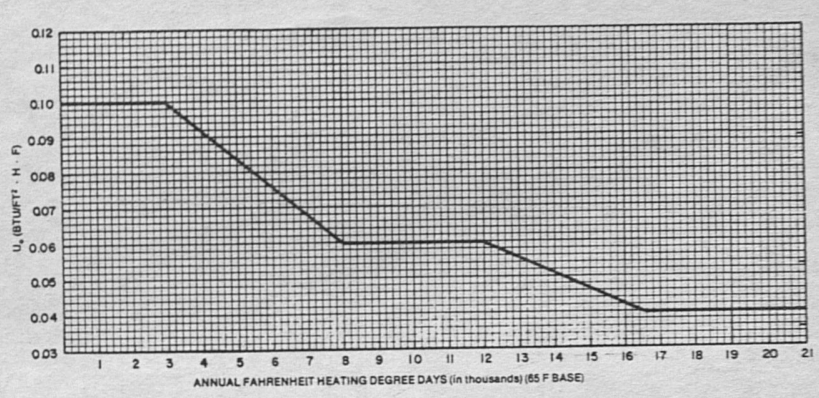


3102.3.2 Heating criteria for roof/ceiling: All buildings or structures that are heated shall have a combined thermal transmittance value U_o for roof/ceiling assemblies not exceeding those specified in Figure 3102.3.2.

Exceptions

1. Where domed skylights are used, the domed skylight area is exempt from the roof/ceiling U_o value computation provided the following conditions are met.
   a. The area of the domed skylights does not exceed 10 percent of the roof/ceiling.
   b. Double-domed units are used when heating degree days exceed 2,500.
   c. Curbs are insulated to a U_o value of 0.21 maximum.
   d. The infiltration coefficient of the skylight units does not exceed 0.05 Btu per hour per square foot per degree F. (0.28 W/m² · K).
   e. If domed skylights exceed 10 percent of the roof/ceiling area, energy balance calculations made in accordance with AAMA Standard 1602.1 listed in Appendix A shall be used to calculate the percentage of skylights permitted.

Figure 3102.3.2
MAXIMUM ALLOWABLE U_o VALUES
FOR ROOF/CEILING ASSEMBLIES



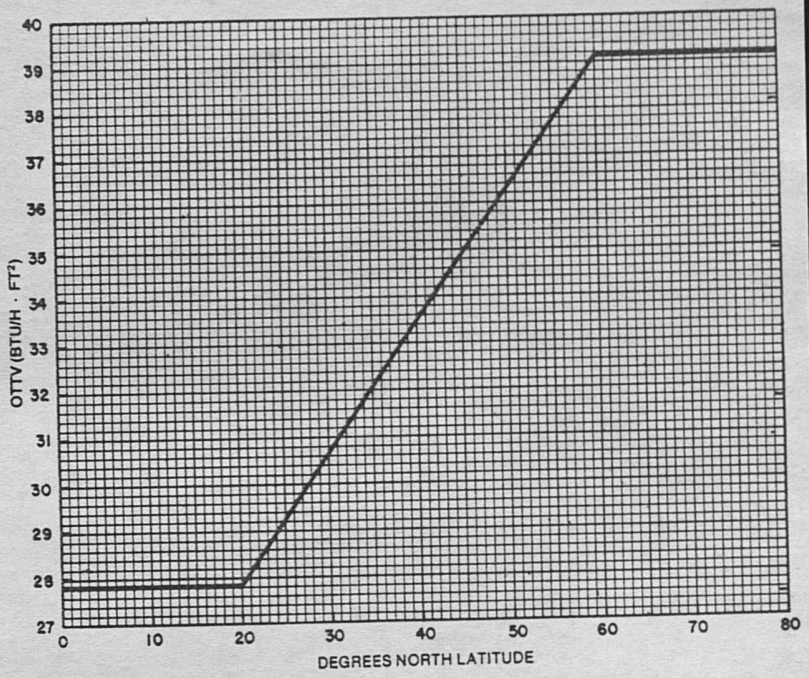
3102.3.3 Heating criteria for floors over unheated spaces: The floor of a heated space located over an unheated space shall have a thermal transmittance value U_o not exceeding those specified in Figure 3102.2.3.

3102.3.4 Heating criteria for slab-on-grade floors: For slab-on-grade floors, the perimeter of the floor shall be insulated with a material having a thermal resistance value R not less than those specified in Figure 3102.2.4. The insulation shall extend downward from the top of the slab for a minimum distance of 24 inches (610 mm), or downward to the bottom of the slab then horizontally beneath the slab for a minimum total distance of 24 inches (610 mm).

3102.3.5 Cooling criteria for walls: All buildings or structures or portions thereof that are mechanically cooled shall have an overall thermal transfer value for the gross area of exterior walls not exceeding those specified in Figure 3102.3.5.

3102.3.6 Cooling criteria for roof/ceiling: All buildings or structures or portions thereof that are mechanically cooled shall have an overall thermal transfer value *OTTV* for the gross area of the roof assembly not exceeding 8.5 Btu per hour per square foot (26.8 W/m²).

Figure 3102.3.5
MAXIMUM OVERALL THERMAL TRANSFER VALUES
FOR GROSS EXTERIOR WALLS



3102.3.6.1 Thermal transmittance value U_o: All buildings or structures or portions thereof that are mechanically cooled shall have a combined thermal transmittance value U_o for roof/ceiling assemblies not exceeding those specified in Figure 3102.3.2 for heating.

Exceptions

1. Where domed skylights are used, the domed skylight area is exempted from the roof/ceiling U_o value computation provided the following conditions are met.
   a. The area of the domed skylights does not exceed 10 percent of the roof/ceiling area.
   b. Double-domed units are used when heating degree days exceed 2,500.
   c. Curbs are insulated to a U_o value of 0.21 maximum.
   d. The infiltration coefficient of the skylight units does not exceed 0.05 Btu per hour per square foot per degree F. (0.28 W/m² · K).

e. If domed skylights exceed 10 percent of the roof/ceiling area, energy balance calculations made in accordance with AAMA Standard 1602.1 listed in Appendix A shall be used to calculate the percentage of skylights permitted.

3102.3.7 Exposed floors: All buildings or structures or portions thereof that are mechanically cooled shall have a combined thermal transmittance value U_o for floors exposed to outdoor air not exceeding those specified in Figure 3102.2.3.

3102.4 Air leakage: The requirements of this section shall apply to all buildings or structures and apply only to those locations separating outdoor ambient conditions from interior spaces that are heated or mechanically cooled and are not applicable to separation of interior spaces from each other.

3102.4.1 Standard: Compliance with the criteria for air leakage shall be determined by ASTM E283 listed in Appendix A at a pressure differential of 1.567 lb/ft^2 (75.03 Pa).

3102.4.2 Acceptance criteria: The air infiltration rate for windows shall not exceed 0.5 cfm per foot (0.00077 m^3/s · m) of sash crack.

3102.4.2.1 Sliding and swinging doors: The air infiltration rate for sliding and swinging doors in buildings of Use Group R shall not exceed 0.5 cfm per square foot (0.0024 m^3/s · m^2) of door area.

3102.4.2.2 Other doors: The air infiltration rate for swinging, revolving or sliding doors in other than buildings of Use Group R shall not exceed 11 cfm per lineal foot (0.017 m^3/s · m) of door crack.

3102.4.3 Caulking and sealants: Exterior joints around windows and door frames, between wall cavities and window or door frames, between wall and foundation, between wall and roof, between wall panels, at penetrations or utility services through walls, floors and roofs, and all other openings in the exterior envelope shall be sealed in an approved manner.

SECTION 3103.0 ENERGY CONSERVATION IN ELECTRICAL DISTRIBUTION SYSTEMS

3103.1 Lighting switching: Switching shall be provided for each lighting circuit, or for portions of each circuit, to enable selective operation of the partial lighting required for custodial or for effective complementary use with natural lighting.

3103.2 Separate metering: In all buildings of Use Group R-2, provisions shall be made to determine the electrical energy consumed by each tenant by separately metering individual dwelling units.

SECTION 3104.0 MECHANICAL SYSTEMS

3104.1 General: Heating, ventilating and air conditioning equipment and systems shall comply with the energy conservation provisions of the mechanical code listed in Appendix A.

SECTION 3105.0 WATER HEATING

3105.1 General: Hot water heating systems and equipment shall comply with the energy conservation provisions of the plumbing code listed in Appendix A.

SECTION 3106.0 ALTERNATIVE SYSTEMS

3106.1 General: Alternative building systems and equipment designs which do not conform to the provisions of this article shall be approved by the code official when they can be shown to have energy consumption not greater than that of a similar building with similar forms of energy requirements, designed in accordance with the provisions of this article.

3106.1.1 Nondepletable sources: When such alternative systems utilize solar, geothermal, wind or other nondepletable energy sources for all or part of its energy sources, such nondepletable energy supplied to the building shall be excluded from the total energy chargeable to the proposed alternative design.

3106.2 Documentation: Proposed alternative designs, submitted as requests for exception to the standard design criteria, must be accompanied by an energy analysis prepared in accordance with ASHRAE 90B listed in Appendix A.

ARTICLE 32

REPAIR, ALTERATION, ADDITION TO, AND CHANGE OF USE OF EXISTING BUILDINGS

SECTION 3200.0 GENERAL

3200.1 Scope: The provisions of this article are intended to maintain or increase the current degree of public safety, health, and general welfare in existing buildings while permitting repair, alteration, addition, and/or change of use without requiring full compliance with Articles 2 through 31, except where compliance with other provisions in this code is specifically required in this article.

SECTION 3201.0 COMPLIANCE

3201.1 General: For repairs, alterations, additions, and changes of use to existing buildings that are evaluated in accordance with this article, compliance with this article shall be accepted by the code official.

3201.2 Hazards: Where the code official determines that an unsafe condition exists, as provided for in Section 120.0, such unsafe condition shall be abated in accordance with Section 120.0.

SECTION 3202.0 APPLICABILITY

3202.1 General: The provisions in the following Sections 3202.1.1 through 3202.1.5 shall apply to existing buildings that will continue to be, or are proposed to be, in Use Groups A, B, E, F, M, R and S. These provisions shall not apply to historic buildings as provided for in Section 102.5

3202.1.1 Change in use: If an existing building is changed to a new use group classification and Article 32 is applicable, the provisions of Article 32 for the new use group shall be used to determine compliance with this code.

3202.1.2 Part change in use: If a portion of the building is changed to a new use group classification, and that portion is separated from the remainder of the building with vertical and horizontal fire separation assemblies having a fireresistance rating corresponding to the highest fire grading prescribed in Table 902 for the separate uses, or with approved compliance alternatives, the portion changed shall be made to conform to the provisions of this article.

If a portion of the building is changed to a new use group classification, and that portion is not separated from the remainder of the building with vertical and horizontal fire separation assemblies having a fireresistance rating corresponding to the highest fire grading prescribed in Table 902 for the separate uses, or with approved compliance alternatives, the provisions of this article applying to each use shall apply to the entire building. If there are conflicting provisions, those requirements which secure the greater public safety shall apply to the entire building or structure.

3202.1.3 Additions: Additions to existing buildings shall comply with all requirements of this code for new construction. The combined height and area of the existing building and new addition shall not exceed the height and area allowed by Sections 501.0 and 502.0. Where a fire wall complying with Section 908.0 is provided between the addition and the existing building, the addition shall be considered a separate building.

3202.1.4 Alterations and repairs: An existing building, or portion thereof, which does not comply with the requirements of this code for new construction shall not be altered or repaired in a manner that results in the building being less safe or sanitary than it is currently. If, in the alteration or repair, the current level of safety or sanitation is to be reduced, the portion altered or repaired shall conform to the requirements of Articles 2 through 30.

3202.1.5 Handicapped requirements: All portions of the buildings proposed for change in use shall conform to the provisions of Article 33 as required by Section 3302.1.

SECTION 3203.0 IMPLEMENTATION

3203.1 Investigation and evaluation: For all proposed work covered by this article, the building owner shall cause the existing building to be investigated and evaluated in accordance with the provisions of this article.

3203.1.1 Structural analysis: The owner shall have a structural analysis of the existing building made to determine adequacy of all structural systems for the proposed alteration, addition or change of use. The existing building shall be capable of supporting the minimum required loads.

3203.2 Submittal: The results of the investigation and evaluation required in Section 3203.1, along with all proposed compliance alternatives, shall be submitted to the code official.

3203.3 Determination of compliance: The code official shall determine whether the existing building, with the proposed additions, alterations or change of use, complies with the provisions of this article in accordance with the evaluation process in Sections 3204.1 through 3204.2.16.

SECTION 3204.0 FIRE SAFETY EVALUATION

3204.1 General: The fire safety evaluation shall be comprised of three categories: fire safety, means of egress and general safety as defined in Sections 3204.1.1 through 3204.1.3.

3204.1.1 Fire safety: Included within the fire safety category are the structural fireresistance, detection, alarm and extinguishing system features of the facility.

3204.1.2 Means of egress: Included within the means of egress category are the configuration, characteristics and support features for means of egress in the facility.

3204.1.3 General safety: Included within the general safety category are the fire safety parameters and the means of egress parameters.

3204.2 Evaluation process: The evaluation process specified herein shall be followed in its entirety to evaluate existing buildings. Table 3205 shall be used for tabulation of the results of the evaluation. References to other sections of this code indicate that compliance with those sections is required in order to gain credit in the evaluation herein outlined. When applying this article to mixed uses in existing buildings, Section 313.0 shall be utilized. Where different uses are not separated as required in Sections 313.1.2 or 313.1.3, the lower score achieved in each section of the evaluation process shall be used for the entire building. Where mixed uses are separated as required in Sections 313.1.2 or 313.1.3, the score for each use shall apply to each portion of the structure which is properly separated. Where the separation between mixed uses only conforms to Section 313.1.2, the more restrictive height and area score shall apply to the entire building.

3204.2.1 Building height: The value for building height shall be determined by the formula in Section 3204.2.1.1. Section 501.0 shall be used to determine the allowable height of the building, including allowable increases due to fire suppression provided for in Section 502.3. Subtract the actual building height from the allowable and divide by 12½ feet. Enter the height value and its sign (positive or negative) in Table 3205 under safety parameter 3204.2.1, building height, for fire safety, means of egress and general safety. In determining the height value, the following conditions shall apply:

1. Round the value off to the nearest whole number.
2. The maximum score for an unlimited height building is 10.
3. If a fire suppression system and standpipe are not provided when required in Section 602.0, 1002.0 or 1012.0, the maximum score is 5.

3204.2.1.1 Height formula: The following formula shall be used in computing building height value.

$$\text{Height value} = \frac{(AH) - (EBH)}{12.5} \times CF$$

AH = Allowable Height from Table 501
EBH = Existing Building Height
CF = 1 if $(AH) - (EBH)$ is positive
CF = Type of construction factor shown in Table 3204.2.6.3 if $(AH) - (EBH)$ is negative.

3204.2.2 Building area: The value for building area shall be determined by the formula in Section 3204.2.2.2. Section 501.0 and the formula in Section

3204.2.2.1 shall be used to determine the allowable area of the building. This shall include any allowable increases due to open perimeter, fire suppression, and reductions to the area due to height as provided for in Sections 502.2, 502.3 and 501.4. Subtract the actual building area from the allowable area and divide by 1,200 square feet. Enter the area value and its sign (positive or negative) in Table 3205 under safety parameter 3204.2.2, building area, for fire safety, means of egress and general safety. In determining the area value, the following conditions shall apply:

1. Round the value off to the next whole number.
2. The maximum permitted positive value for area is 50 percent of the fire safety score as listed in Table 3206, Mandatory Safety Scores.

3204.2.2.1 Allowable area formula: The following formula shall be used in computing allowable area.

$$AA = \frac{(SP + OP - HR + 100) \times (\text{area in Table 501})}{100}$$

AA = Allowable area
SP = Percent increase for sprinklers (Section 502.3)
OP = Percent increase for open perimeter (Section 502.2)
HR = Percent reduction for excess height (Section 501.4)

3204.2.2.2 Area formula: The following formula shall be used in computing the area value.

$$\text{Area value} = \frac{\text{Allowable area} - \text{Actual area}}{\text{1,200 square feet}}$$

3204.2.3 Fire area: Evaluate the fire areas created by fireresistance rated enclosures which comply with Sections 602.3.2.3 and 602.3.2.4 and which are exclusive of wall elements considered under Sections 3204.2.4 and 3204.2.5. Conforming fire areas shall be figured as the net area and do not include shafts, chases, stairways, walls or columns. Under the categories and use groups in Table 3204.2.3, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.3, fire area, for fire safety, means of egress and general safety.

3204.2.3.1 Categories: The categories for fire area are:

a. Greater than 15,000 square feet (1395 m²).
b. 10,001 (930 m²) to 15,000 square feet (1395 m²).
c. 7,501 (698 m²) to 10,000 square feet (930 m²).
d. 7,500 square feet (698 m²) or less.

Table 3204.2.3
FIRE AREA VALUES

Use groups	Categories			
	a	b	c	d
A-1, A-3	-8	-2	2	3
A-2	-12	-6	-2	-1
A-4, B, E, S-2	-6	-1	4	5
F, M, R, S-1	-4	0	6	8

3204.2.4 Space division: Evaluate the subdivision of a fire area by partitions which are not included in the evaluation under Sections 3204.2.3 and 3204.2.5. Under the categories and use groups in Table 3204.2.4, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.4, space division, for fire safety, means of egress and general safety.

Exception: If the partitions being evaluated do not provide any protection to the occupants from the spread of smoke and/or flames, Category *a* shall be entered into Table 3205.

3204.2.4.1 Categories: The categories for space division are:

a. No partitions, or partial partitions.
b. Fixed partitions to ceilings, with self-closing doors.
c. Floor-to-deck partitions with doors that are not self-closing.
d. Floor-to-deck partitions with self-closing doors.

Table 3204.2.4
SPACE DIVISION VALUES

Use groups	Categories			
	a	b	c	d
A-1	0	0	0	0
A-2	-6	-4	-1	0
A-3, A-4, E, B, F, M, R, S-1	0	1	4	6
S-2	1	4	6	8

3204.2.5 Corridor walls: Evaluate the fireresistance rating and degree of completeness of partitions or walls which separate corridors from other spaces on the floor in accordance with Section 810.0 This evaluation shall not include wall elements considered under Sections 3204.2.3 and 3204.2.4. Under the categories and use groups in Table 3204.2.5, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.5, corridor walls, for fire safety, means of egress and general safety.

3204.2.5.1 Categories: The categories for corridor walls are:

a. No partitions, incomplete partitions, no doors, or doors not self-closing.
b. Less than 1 hour (or not floor-to-deck).
c. One to less than 2-hour rated partitions with doors conforming to Section 810.4.2 or without corridor as required by Section 810.4.
d. Two-hour or greater rated partitions with doors conforming to Section 810.4.2.

Table 3204.2.5
CORRIDOR WALL VALUES

Use groups	Categories			
	a	b	c	d
A-1	-10	-4	0	2
A-2	-30	-12	0	2
A-3, F, M, R, S-1	-7	-3	0	2
A-4, B, E, S-2	-5	-2	0	5

3204.2.6 Vertical openings: Evaluate the fireresistance rating of vertical exit enclosures, hoistways, escalator openings, and other shaft enclosures within the building, and all openings between two or more floors. Table 3204.2.6.2 contains the appropriate protection values. Multiply that value by the construction type factor found in Table 3204.2.6.3. Enter the vertical opening value and its sign (positive or negative) in Table 3205 under safety parameter 3204.2.6, vertical openings, for fire safety, means of egress and general safety. If the structure is a one-story building, enter a value of 2. Unenclosed vertical openings conforming to the requirements of Section 606.0 or 816.8 shall not be considered in the evaluation of vertical openings. The vertical opening value shall be rounded off to the next whole number.

3204.2.6.1 Vertical opening formula: The following formula shall be used in computing vertical opening value.

$$VO = PV \times CF$$

VO = Vertical opening value
PV = Protection value (Table 3204.2.6.2)
CF = Construction type factor (Table 3204.2.6.3)

Table 3204.2.6.2
VERTICAL OPENING PROTECTION VALUE

Protection	Value
None (unprotected opening)	–10
Less than 1-hour	–5
1- to 2-hour	1
2-hour or more	2

Table 3204.2.6.3
CONSTRUCTION TYPE FACTOR

Factor	Type of construction (refer to Section 401.0)									
	1A	1B	2A	2B	2C	3A	3B	4	5A	5B
	1	1.2	1.5	2.2	3.5	2.5	3.5	2.3	3.3	7

3204.2.7 HVAC systems: Evaluate the number of floors served by an individual HVAC system. Under the categories and use groups in Table 3204.2.7, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.7, HVAC systems, for fire safety, means of egress and general safety.

Table 3204.2.7
HVAC SYSTEM VALUES

Use groups	Categories			
	a	b	c	d
A-1, A-4, B, E, S-2	0	2	5	7
A-2	–10	–5	0	2
A-3, F, M, R, S-1	–5	0	2	5

3204.2.7.1 Categories: The categories for HVAC systems are:

a. Greater than 5 floors or, combustible materials are located in air plenums or, corridors are used as air plenums.
b. Three to five floors.
c. Two floors.
d. One floor or central boiler/chiller system is used without ductwork connecting two or more floors.

3204.2.8 Automatic alarms: Evaluate the smoke detection capability based on the location and operation of automatic alarms in accordance with Section 1018.0 and Section M-307.0 of the mechanical code listed in Appendix A. Under the categories and use groups in Table 3204.2.8, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.8, automatic alarms, for fire safety, means of egress and general safety.

3204.2.8.1 Categories: The categories for automatic alarms are:

a. None.
b. HVAC return only.
c. Elevator lobby only.
d. Elevator lobbies (if there are elevators) and in duct returns and single station units in residential uses.
e. All corridors including elevator lobby.
f. Total space.

Table 3204.2.8
AUTOMATIC ALARM VALUES

Use groups	Categories					
	a	b	c	d	e	f
A-1, A-3, F, M, R, S-1	-10	-5	0	2	4	6
A-2	-30	-10	-5	0	2	4
A-4, B, E, S-2	0	2	4	6	8	12

3204.2.9 Communications: When an alarm system is provided, evaluate the capability of the system in accordance with Sections 602.5, 602.6 and 1017.0. Under the categories and use groups in Table 3204.2.9, determine the appropriate value and enter that value into the Table 3205, under safety parameter 3204.2.9, communications, for fire safety, means of egress and general safety.

Table 3204.2.9
COMMUNICATION VALUES

Use groups	Categories			
	a	b	c	d
A-1, A-2, A-3, A-4, E	-10	-5	0	5
B, M, R	-5	0	5	10
F, S	0	5	10	15

3204.2.9.1 Categories: The categories for communications are:

a. None.
b. Manual fire alarms conforming with Section 1017.0.
c. Manual fire alarms and a voice alarm or manual fire alarms and a public address system conforming with Sections 602.5 and 1017.0.
d. Central control station conforming with Section 602.6.

3204.2.10 Smoke control: Evaluate the ability of a natural or mechanical venting, exhaust or pressurization system to control the movement of smoke from a fire. Under the categories and use groups in Table 3204.2.10, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.10, smoke control, for means of egress and general safety.

3204.2.10.1 Categories: The categories for smoke control are:

a. None.
b. Operable windows throughout the building which are operable without special keys or tools.
c. One smokeproof enclosure and building having operable windows.
d. One stair having operable exterior windows and building having operable windows.
e. Smoke control systems designed to exhaust the fire area in accordance with Section 1019.2.2
f. Smokeproof enclosures in accordance with Section 818.0 and/or pressurized stairs (all stairs) in accordance with Section 602.3.1.4.6 and/or all stairs having operable exterior windows.

Table 3204.2.10
SMOKE CONTROL VALUES

Use groups	Categories					
	a	b	c	d	e	f
A-1, A-2, A-3	-6	-5	-4	-3	0	0
A-4, E	-3	-3	-3	-2	0	2[a]
B, M, R	0	2[a]	3[a]	3[a]	3[a]	4[a]
F, S	0	2[a]	2[a]	3[a]	3[a]	3[a]

Note a. This value shall be considered 0 if compliance with categories d, e or f in Table 3204.2.8 has not been obtained.

3204.2.11 Exit capacity: Evaluate the capacity of and the number of exit routes available to the building occupants. Article 8 shall be used to determine the adequacy of the means of egress routes leading to a safe area. In applying this section, exits are required to conform with Section 804.2, Unsafe Means of Egress; Section 806.0, Occupant Load; Section 807.0, Types and Locations of Means of Egress (except Section 807.5); Section 808.0, Capacity of Exits; and Section 809.0, Number of Exits. Under the categories and use groups in Table 3204.2.11, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.11, exit capacity, for means of egress and general safety.

3204.2.11.1 Categories: The categories for exit capacity are:

a. Minimum number of exits are provided as required in Section 809.0.
b. Exit capacity exceeds the requirements of Section 808.0.
c. Horizontal exits are provided in conformance with Section 814.0.
d. Number of exits exceed the requirements of Section 809.0.

Table 3204.2.11
EXIT CAPACITY VALUES

Use groups	Categories			
	a	b	c	d
A-1, A-2, A-3, A-4, E, R	0	5	10	20
B, M	0	2	5	10
F, S	5	10	20	30

3204.2.12 Dead ends: Evaluate the length of the exit access travel path in which the building occupants are confined to a single path of travel. Under the categories and use groups in Table 3204.2.12, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.12, dead ends, for means of egress and general safety.

3204.2.12.1 Categories: The categories for dead ends are:

a. Dead end more than 20 feet (6096 mm) and not exceeding 50 feet (15240 mm).
b. Dead end 20 feet (6096 mm) or less.

Table 3204.2.12
DEAD END VALUES

Use groups	Categories	
	a	b
A-1, A-3, A-4, E, R	-5	0
A-2	-10	0
B, F, M, S	0	5

3204.2.13 Maximum travel distance to an exit: Evaluate the length of exit access travel to an approved exit. Under the categories and use groups in Table 3204.2.13, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.13, maximum travel distance, for means of egress and general safety.

3204.2.13.1 Categories: The categories for maximum exit access travel distance to an exit are:

a. Exceeds the limits of Table 807.
b. Complies with the limits of Table 807.
c. Is less than half the limits of Table 807.

Table 3204.2.13
MAXIMUM EXIT ACCESS TRAVEL DISTANCE VALUES

Use groups	Categories		
	a	b	c
A-1, A-2, A-3, A-4, E, R	-10	0	5
B, F, M, S	-5	0	10

3204.2.14 Elevator control: Evaluate the elevator equipment and controls that are available to the fire department to rescue building occupants from upper floors during a fire when such equipment is installed in accordance with ASME A17.1 listed in Appendix A. Under the categories and use groups in Table 3204.2.14, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.14, elevator control, for fire safety, means of egress and general safety.

3204.2.14.1 Categories: The categories for elevator controls are:

a. Controls are not provided or an elevator is not present in buildings of four stories or more in height.
b. Fire department control is provided or an elevator is not present in buildings less than four stories in height.
c. Automatic recall.
d. Fire department control and automatic recall is provided, or the building is only one story in height.

Table 3204.2.14
ELEVATOR CONTROL VALUES

Use groups	Categories			
	a	b	c	d
A-1, A-2	0	3	6	9
A-3, A-4, B, E, F, M, R	-7	0	3	6
S	-10	-7	0	3

3204.2.15 Means of egress lighting: Evaluate the presence of and reliability of emergency means of egress lighting. Under the categories and use groups in Table 3204.2.15, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.15, means of egress lighting, for means of egress and general safety.

3204.2.15.1 Categories: The categories for emergency means of egress lighting are:

a. None.
b. Lighting provided in compliance with Section 824.0 but without emergency power.
c. Lighting provided in full compliance with Section 824.0.

Table 3204.2.15
MEANS OF EGRESS LIGHTING VALUES

Use groups	Categories		
	a	b	c
A-1, A-2, A-3, A-4, E	-20	-10	0
B, M, R	-10	0	2
F, S-1	-5	0	2
S-2	0	2	7

3204.2.16 Mixed uses: When a building is occupied for two or more uses, not included in the same use group, the evaluation of this section shall be based on conformance with the provisions of Section 313.0. Under the categories and the use groups in Table 3204.2.16, determine the appropriate value and enter that value into Table 3205 under safety parameter 3204.2.16, mixed use, for fire safety and general safety.

3204.2.16.1 Categories: The categories for mixed use are:

a. Not in compliance with Section 313.0.
b. In compliance with Section 313.0.

Table 3204.2.16
MIXED USE VALUES

Use groups	Categories	
	a	b
A-1, A-2, R	-10	0
A-3, A-4, B, E, F, M, S	-5	0

SECTION 3205.0 BUILDING SCORE

3205.1 General: After determining the appropriate data from Section 3204.0, enter that data in Table 3205 and total the building score.

Table 3205
SUMMARY SHEET - BUILDING SCORE

Existing use _____ Proposed use _____

Year building was constructed _____ No. of stories _____ Height in ft. _____

Type of construction _____ Area per floor _____

Percentage of open perimeter _____ % Percentage of height reduction _____ %

Completely suppressed: Yes ___ No ___ Corridor wall rating _____

Compartmentation: Yes ___ No ___ Required door closers: Yes ___ No ___

Fireresistance rating of vertical opening enclosures _____

Type of HVAC System _____, serving number of floors _____

Automatic alarms: Yes ___ No ___, type and location _____

Communication systems: Yes ___ No ___, type _____

Table 3205 (cont'd.)
SUMMARY SHEET - BUILDING SCORE

Smoke control: Yes ___ No ___, type _____

Adequate exit routes: Yes ___ No ___ Dead ends: Yes ___ No ___

Maximum exit access travel dist. _____ Elevator controls: Yes ___ No ___

Emergency lighting: Yes ___ No ___ Mixed uses: Yes ___ No ___

Safety parameters	Fire safety (FS)	Means of egress (ME)	General safety (GS)
3204.2.1 Building height			
3204.2.2 Building area			
3204.2.3 Compartment area			
3204.2.4 Space division			
3204.2.5 Corridor walls			
3204.2.6 Vertical openings			
3204.2.7 HVAC systems			
3204.2.8 Automatic alarms			
3204.2.9 Communications			
3204.2.10 Smoke control	* * * *		
3204.2.11 Exit capacity	* * * *		
3204.2.12 Dead ends	* * * *		
3204.2.13 Max. exit access travel dist.	* * * *		
3204.2.14 Elevator control			
3204.2.15 Egress lighting	* * * *		
3204.2.16 Mixed uses		* * * *	
Building score - total value			

* * * * = No applicable value to be inserted.

SECTION 3206.0 SAFETY SCORES

3206.1 General: The values in Table 3206 are the required mandatory safety scores for the evaluation process listed in Section 3204.2.

Table 3206
MANDATORY SAFETY SCORES

Use groups	Fire safety (MFS)	Means of egress (MME)	General safety (MGS)
A-1	10	24	24
A-2	5	19	19
A-3	9	21	21
A-4, E	17	29	29
B	28	40	40
F, S-1	26	53	53
M, R	23	35	35
S-2	38	65	65

SECTION 3207.0 EVALUATION OF BUILDING SAFETY

3207.1 General: The mandatory safety score in Table 3206 shall be subtracted from the building score in Table 3205 for each category. If the final score for any category equals zero or more, the building is in compliance with the requirements of this article for that category. If the final score for any category is less than zero, the building is not in compliance with the requirements of this article.

Table 3207
EVALUATION FORMULAS

Formula	Table 3205		Table 3206		Score	Pass	Fail
FS-MFS ≥ 0	_____ (FS)	-	_____ (MFS)	=	_____	_____	_____
ME-MME ≥ 0	_____ (ME)	-	_____ (MME)	=	_____	_____	_____
GS-MGS ≥ 0	_____ (GS)	-	_____ (MGS)	=	_____	_____	_____

FS = Fire Safety
ME = Means of Egress
GS = General Safety
MFS = Mandatory Fire Safety
MME = Mandatory Means of Egress
MGS = Mandatory General Safety

3207.2 Mixed Uses: For mixed uses, the following provisions shall apply:

1. If the uses are not separated by a separation as required by Section 313.1.2 or 313.1.3, the mandatory safety scores for the use with the lowest general safety score in Table 3206 shall be used.
2. If the uses are separated as required by Section 313.1.2, the mandatory safety scores for each use shall be placed against the evaluation scores for the appropriate use and the most restrictive height and area limitations in this code shall be used in the calculation of the height value in Section 3204.2.1 and the area value in Section 3204.2.2 and the values so determined shall apply to both uses.
3. If the uses are separated as required by Section 313.1.3, the mandatory safety scores for each use shall be placed against the evaluation scores for the appropriate use.

ARTICLE 33

BARRIER FREE DESIGN

SECTION 3300.0 PHYSICALLY DISABLED AND AGED

3300.1 Purpose and scope: It is the express intention of this regulation to achieve uniformity in the technical design criteria necessary to establish a barrier free environment thereby allowing a physically disabled person to get to, enter and use a building or facility, so that they may have access to education, employment, living and recreational opportunities and be as self-sufficient as possible.

SECTION 3301.0 NEW CONSTRUCTION

3301.1 New construction: This regulation shall be mandatory to and in all new buildings and facilities, including both rooms and spaces, site improvements, exterior facilities and public walks as follows.

1. Storage, miscellaneous and temporary occupancies in which the total occupant load is in excess of 100 persons or 20,000 square feet or three stories.
2. Factory and industrial occupancies in which the total occupant load is in excess of 100 persons or 20,000 square feet.
3. Business occupancies in which the total occupant load is in excess of 100 persons, or 10,000 square feet.
4. Mercantile occupancies in which the total occupant load is in excess of 100 persons, 3,000 square feet of consumer area or 10,000 square feet of the total floor area.
5. Churches, parochial and private schools and other similar nonpublic assembly type occupancies in which the total occupant load is in excess of 250 persons or 3,200 square feet.
6. Assembly occupancies (other than those in Subsection [3301.1.5]) in which the total occupant load is in excess of 50 persons or 1,500 square feet total area.
7. Residential occupancies, with the exception of single family dwellings, duplexes and multi-family housing projects of less than 25 units. The common areas of condominiums are required to be accessible, but not the interior of the condominium units.

Figures referred to in this article will appear on Pages 498 - 518.

8. Institutional occupancies, with the exception of child day care facilities providing care for less than 13 children.
9. All buildings and facilities which are leased or owned by the state, county, city or other municipal corporation, regardless of type of use, occupant load or total square footage. Only new leases will be treated as new facilities.
10. Any establishment which is physically located within any building or facility otherwise covered by this section or within the premises of which is physically located any such covered establishment; and which also holds itself out as serving patrons of such covered establishment.
11. All gasoline service stations, regardless of size or occupant capacity.
12. Any building of an occupant load, occupancy type or size not listed in this section shall be exempted from the requirements of this regulation as a "small business concern."

SECTION 3302.0 EXISTING BUILDINGS

3302.1 Existing buildings: This regulation shall be mandatory for existing buildings of the categories listed in 3301.0, as follows.

1. Alterations and repairs may be made to any structure without requiring other areas of the existing structure to comply with the accessibility requirement of this regulation provided such new work conforms to that of a new structure.
2. Additions to an existing facility shall comply with the standards established by this regulation; however, the existing portion need not comply provided such addition does not result in decreased accessibility.
3. Remodeling involving major structural changes to a building shall require full compliance with all applicable provisions of this regulation.
4. The restoration or authentic reconstruction of buildings designated as historic properties by the Kentucky Heritage Commission or the National Register of Historic Places are exempt from the requirements of this regulation.

SECTION 3303.0 MODIFICATIONS

3303.1 Modifications: Modifications of the technical provisions of this regulation may be allowed where such modification provides equal facilitation.

SECTION 3304.0 PROBLEM SITES

3304.1 Problem sites: It is not the intent of this regulation to discourage development of sites with extreme conditions, for example, where housing would be built on steep slopes or recreation facilities provided in natural terrain, and where full accessibility might prove impractical.

SECTION 3305.0 INTERPRETATIONS

3305.1 Interpretive decisions: Where any provision of this regulation can be shown to be clearly unreasonable or impractical as applied to a particular building or use, or if full compliance would create a safety hazard, because of a particular use or condition, any person may request to appear before the Architectural Barriers Advisory Committee of the Department of Housing, Buildings and Construction. After advice from the committee, the department shall render its decision in the matter and said decision shall be appealable to the Board of Housing, Buildings and Construction.

SECTION 3306.0 ENFORCEMENT

3306.1 Enforcement: It shall be the duty of the local building official or the state building official having plan review and inspection responsibility under the *Kentucky Building Code* to enforce the provisions of this regulation.

SECTION 3307.0 ELEMENT DISTRIBUTION

3307.1 Distribution of accessible elements: Residential units accessible to the physically handicapped must not be segregated from other units. For example, in large apartment complexes, hotels or motels, all the units or rooms for the disabled may not be placed in one building but must be dispersed throughout the complex.

SECTION 3308.0 DISAGREEMENTS

3308.1 Disagreements: Any figures or numbers not in agreement with the written language of this regulation shall be superceded by said written words or numbers.

3308.2 Technical provisions: Section 3310.0 through 3342.0 constitute the technical provisions of this regulation.

SECTION 3309.0 GENERAL DEFINITIONS

3309.1 Definitions: The following terms shall, for the purpose of this regulation, have the meaning indicated in this section.

Access aisle: An accessible pedestrian space between elements such as parking spaces, seating, and desks, that provides clearances appropriate for use of the elements.

Accessible: Describes a site, building, facility, or portion thereof that complies with this section and that can be approached, entered, and used by physically disabled people.

Accessible element: Part of an accessible route or accessible functional space; an item specified by this regulation (for example, telephone, controls, and the like).

Accessible route: A continuous unobstructed path connecting all accessible elements and spaces in a building or facility that can be negotiated by a severely disabled person using a wheelchair and that is also safe for and usable by people with other disabilities. Interior accessible routes may include corridors, floors, ramps, elevators, and clear floor space at fixtures. Exterior accessible routes may include parking access aisle, curb ramps, walks and ramps.

Adaptability: The ability of certain building elements, such as kitchen counters and sinks to be added to, raised, lowered, or otherwise altered so as to accommodate the needs of either the disabled or nondisabled, or to accommodate the needs of persons with different types or degrees of disability.

Assembly area: A room or space accommodating 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 ingress. Such areas as conference rooms would have to be accessible in accordance with other parts of this standard but would not have to meet all of the criteria associated with assembly areas.

Automatic door: A door equipped with a power operated mechanism and controls that open and close the door automatically upon receipt of a momentary actuating signal. The switch that begins the automatic cycle may be a photoelectric device, floor mat, or manual switch mounted on or near the door itself (see power assisted door).

Circulation path: An exterior or interior way of passage from one place to another for pedestrians including, but not limited to, walks, hallways, courtyards, stairways and stair landings.

Clear: Unobstructed.

Common use: Refers to those interior and exterior rooms, spaces, or elements that are made available for the use of a restricted group of people (for example, residents of an apartment building, occupants of an office building, or guests of such residents or occupants).

Coverage: The extent or range of accessibility that a particular administrative authority adopts and requires.

Cross slope: The slope of a pedestrian way that is perpendicular to the direction of travel (see running slope).

Curb ramp: A short ramp cutting through a curb or built up to it.

Detectable: Perceptible by one or more of the senses.

Disability: A limitation or loss of use of a physical, mental, or sensory body part or function.

Dwelling unit: A single unit providing complete, independent living facilities for one or more persons including permanent provisions for living, sleep-

ing, eating, cooking, and sanitation.

Egress, means of: A continuous and unobstructed path of travel from any point in a building or structure to a public way and consists of three separate and distinct parts;

1. The exitway access;
2. The exitway; and
3. 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.

Emergency: Refers to facilities resulting from or anticipating unforeseen combinations of circumstances, for example, storm shelters, bomb shelters, and comparable refuges.

Functional spaces: The rooms and spaces in a building or facility that house the major activities for which the building or facility is intended.

Handicapped: Those with significant limitations in using specific parts of the environment.

Housing: A building, facility, or portion thereof, excluding in-patient health care facilities, that contains one or more dwelling units or sleeping accommodations. Housing may include, but is not limited to, one and two family dwellings, apartments, group homes, hotels, motels, dormitories, and mobile homes.

Marked crossing: A crosswalk or other identified path intended for pedestrian use in crossing a vehicular way.

Operable part: A part of a piece of equipment or appliance used to insert or withdraw objects, or to activate, deactivate, or adjust the equipment or appliance (for example, coin slot, pushbutton, handle).

Power assisted door: A door with a mechanism that helps to open the door, or relieve the opening resistance of a door, upon the activation of a switch or a continued force applied to the door itself. If the switch or door is released, such doors immediately begin to close or close completely within three to 30 seconds (see automatic door).

Principal entrance: An entrance intended to be used by the residents or users to enter or leave a building or facility. This may include, but is not limited to, the main entrance.

Public use: Describes interior and exterior rooms or spaces that are made available to the general public. Public use may be provided at a building or facility that is privately or publicly owned.

Ramp: A walking surface that has a running slope greater than 1:20.

Reasonable number: A number that is sufficient to accommodate the disabled users of a site, building, facility, or element.

Running slope: The slope of a pedestrian way that is parallel to the direction of travel (see cross slope).

Service entrance: An entrance intended primarily for delivery or service.

Signage: Verbal, symbolic, and pictorial information.

Site: A parcel of land bounded by a property line or a designated portion of a public right-of-way.

Site improvements: Landscaping, paving for pedestrian and vehicular ways, outdoor lighting, recreational facilities, and the like, added to a site.

Sleeping accommodations: Rooms in which people sleep, for example, dormitory and hotel or motel guest rooms, but not including dwelling units.

Tactile: Describes an object that can be perceived using the sense of touch.

Tactile warning: A standardized surface texture applied to or built into walking surfaces or other elements to warn visually impaired people of hazards in the path of travel.

Temporary: Applies to facilities that are not of permanent construction but are extensively used or essential for public use for a given (short) period of time; for example, temporary classrooms or classroom buildings at schools and colleges, or facilities around a major construction site to make passage accessible, usable, and safe for everybody. Structures directly associated with the actual processes of major construction, such as port-a-potties, scaffolding, bridging, trailers, and the like, are not included.

Vehicular way: A route intended for vehicular traffic, such as a street, driveway, or parking lot.

Walk: An exterior pathway with a prepared surface intended for pedestrian use, including general pedestrian areas such as plazas and courts.

Walking aid: A device used by a person who has difficulty walking (for example, a cane, crutch, walker or brace).

SECTION 3310.0 MINIMUM REQUIREMENTS

3310.1 Accessible site and exterior facilities: An accessible site shall meet the following minimum requirements.

1. Route:	At least one accessible route complying with Section 3312.0 shall be provided from public transportation stops, accessible parking spaces, accessible passenger loading zones if provided, and public street or sidewalks to an accessible building entrance.
2. Buildings:	At least one accessible route complying with Section 3312.0 shall connect accessible buildings, facilities, elements, and spaces that are on the same site.

3. Protrusions:	All objects that protrude from surfaces or posts into circulation paths shall comply with Section 3312.3.
4. Surfaces:	Ground surfaces along accessible routes and in accessible spaces shall comply with Section 3312.2.
5. Parking:	When parking is provided, parking spaces and access aisles shall comply with Section 3313.0.
6. Stairs:	Stairs shall comply with Section 3316.0 (816.0).
7. Elevators:	All passenger elevators shall comply with Section 3317.0.
8. Doors:	All doors or gates to accessible spaces and elements and along accessible routes shall comply with Section 3320.0.
9. Drinking fountains:	All drinking fountains along accessible routes shall comply with Section 3322.0.
10. Toilet rooms:	All toilet rooms provided for public use or as otherwise required by the *Kentucky Building Code* shall comply with Section 3329.0. Bathing facilities on accessible routes shall comply with Section 3330.0.
11. Tactile warnings:	Tactile warnings shall be provided at hazardous conditions as specified in Section 3336.0.
12. Signs:	All signs shall comply with Section 3337.0.
13. Telephones:	If public telephones are provided, they shall comply with Section 3338.0.
14. Seating:	If seating, tables, or work surfaces are provided in accessible spaces, they shall comply with Section 3339.0.
15. Assembly areas:	If places of assembly are provided, they shall comply with Section 3340.0.

3310.2 Accessible buildings: Accessible buildings and facilities shall meet the following minimum requirements.

1. Accessible route:	At least one accessible route complying with Section 3312.1 shall connect accessible building or facility entrances with all accessible spaces and elements within the building or facility.
2. Protrusions:	All objects that overhang circulation paths shall comply with Section 3312.3.
3. Surfaces:	Ground and floor surfaces along accessible routes and in accessible rooms and spaces shall comply with Section 3312.2.
4. Stairs:	Stairs shall comply with Section 3316.0 (816.0). This requirement is not mandatory within dwelling units.
5. Elevators:	All passenger elevators shall comply with Section 3317.0.

6. Windows:	If windows intended to be operated by occupants are provided, then a reasonable number, but always at least one of the windows in each accessible space, shall comply with Section 3319.0.
7. Doors:	All doors to accessible spaces along accessible routes shall comply with Section 3320.0.
8. Entrances:	All principal entrances shall comply with Section 3321.0.
9. Drinking fountains:	All drinking fountains along accessible routes shall comply with Section 3322.0.
10. Toilet rooms:	All toilet rooms provided for public use or as otherwise required by the *Kentucky Building Code* shall comply with Section 3329.0. Bathing facilities on accessible routes shall comply with Section 3330.0.
11. Storage:	If storage facilities such as cabinets, shelves, closets and drawers are provided in accessible spaces, they shall comply with Section 3332.0.
12. Controls:	Controls and operating mechanisms in accessible spaces, along accessible routes, or as parts of accessible elements (for example, light switches and dispenser controls), shall comply with Section 3334.0.
13. Emergency warning:	If emergency warning systems are provided, they shall comply with Section 3335.0.
14. Tactile warnings:	Tactile warnings shall be provided at hazardous conditions as specified in Section 3336.0.
15. Signs:	If signs are provided, they shall comply with Section 3337.0.
16. Telephones:	If public telephones are provided, they shall comply with Section 3338.0.
17. Seating:	If seating tables, or work surfaces are provided in accessible spaces, they shall comply with Section 3339.0.
18. Assembly areas:	If places of assembly are provided, they shall comply with Section 3340.0.
19. Sleeping accommodations:	If sleeping accommodations are provided, they shall comply with Section 3341.0.

3310.3 Accessible housing: Accessible housing shall comply with the minimum requirements in Subsections 3310.1 and 3310.2. It shall also meet the following requirements.

1. Dwelling units:	Accessible dwelling units shall comply with Section 3342.0.
2. Accessible route:	Each accessible dwelling unit shall be connected to an accessible entrance complying with Section

3321.0 by an accessible route complying with Section 3312.0.

3. Common areas: Common use spaces and facilities (for example, swimming pools, playgrounds, entrances, rental offices, lobbies, elevators, mail box areas, lounges, storage rooms, halls, corridors, and the like) that serve one or more accessible dwelling units shall comply with Subsections 3310.1 and 3310.2. At least one accessible route shall connect all accessible entrances to each accessible dwelling unit.

SECTION 3311.0 SPACE ALLOWANCES AND REACH RANGES

3311.1 Wheelchair passage width: The minimum clear width for single wheelchair passage shall be 32 inches at a point and 35 inches continuously.

3311.2 Width for wheelchair passing: The minimum width for two wheelchairs to pass is 60 inches.

3311.3 Wheelchair turning space: The space required for a wheelchair to make a 180 degree turn is a clear space of 60 inches diameter or a T-shaped space with a minimum clear width of 36 inches.

3311.4 Clear floor or ground space for wheelchairs:

1. Size and approach: The minimum clear floor or ground space required to accommodate a single, stationary wheelchair and occupant is 30 inches by 48 inches. The minimum clear floor or ground space for wheelchairs may be positioned for forward or parallel approach to an object. Clear floor or ground space for wheelchairs may be part of the knee space required under objects.
2. Maneuvering space: One full unobstructed side of the clear floor or ground space for a wheelchair shall adjoin or overlap an accessible route or adjoin another wheelchair clear floor space. If a clear floor space is located in an alcove or otherwise confined in all or part of three sides, additional maneuvering clearances shall be provided (see Figure 1).
3. Surfaces: Clear floor or ground spaces for wheelchairs shall comply with Section 3312.2.

3311.5 High forward reach: If the clear floor space only allows forward approach to an object, the maximum high forward reach allowed shall be 40 inches. If the high forward reach is over an obstruction, reach and clearances shall be shown in Figure 2.

3311.6 Side reach: If the clear floor space allows parallel approach by a person in a wheelchair, the maximum high side reach allowed shall be 48 inches and the low side reach shall be no less than 9 inches above the floor. If the side reach is over an obstruction, the reach and clearances shall be as shown in Figure 3.

SECTION 3312.0 ACCESSIBLE ROUTE, GROUND AND FLOOR SURFACES AND PROTRUDING OBJECTS

3312.1 Accessible route: All walks, halls, corridors, aisles, and other spaces that are part of an accessible route shall comply with this subsection.

1. Location:
    1. At least one accessible route shall be provided from public transportation stops, accessible parking and accessible passenger loading zones, and public streets or sidewalks to the accessible building entrance they serve.
    2. At least one accessible route shall connect accessible buildings, facilities, elements and spaces that are on the same site.
    3. At least one accessible route shall connect accessible building or facility entrances with all accessible spaces and elements and with all accessible dwelling units within the building or facility.
    4. An accessible route shall connect at least one accessible entrance of each accessible dwelling unit with those exterior and interior spaces and facilities that serve the accessible dwelling unit.
2. Width: The minimum clear width of an accessible route shall be 36 inches except at doors (see Section 3320.5). If a person in a wheelchair must make a turn around an obstruction, the minimum clear width of the accessible route shall be as shown in Figure 4.
3. Passing space: If an accessible route has less than 60 inches clear width, then passing spaces at least 60 inches by 60 inches shall be located at reasonable intervals not to exceed 200 feet. A T-intersection of two corridors or walks is an acceptable passing place.
4. Head room: Accessible routes shall comply with Subsection 3312.3.2.
5. Surface texture: The surface of an accessible route shall comply with Subsection 3312.2.
6. Slope: An accessible route with a running slope greater than 1:20 is a ramp and shall comply with Section 3315.0 (815.0). Nowhere shall the cross slope of an accessible route exceed 1:50.
7. Changes in level: Changes in level along an accessible route shall comply with Subsection 3312.2.1. If an accessible route has changes in level greater than ½ inch, then a curb ramp, ramp or elevator shall be provided that complies with Sections 3314.0, 3315.0 and 3317.0, respectively. Stairs shall not be part of an accessible route.
8. Doors: Doors along an accessible route shall comply with Section 3320.0.
9. Egress: At least one accessible route serving any accessible space or element shall also serve as a means of egress.

3312.2 Ground and floor surfaces: Ground and floor surfaces along accessible routes and in accessible rooms and spaces, including floors, walks, ramps, stairs, and curb ramps, shall be stable, firm and relatively nonslip under all weather conditions and shall comply with this subsection.

1. Changes in level: Changes in level up to ¼ inch may be vertical and without edge treatment. Changes in level between ¼ inch and ½ inch shall be beveled with a slope no greater than 1:2. Changes in level greater than ½ inch shall be accomplished by means of a ramp that complies with Section 3314.0 or 3315.0.
2. Carpet: If carpet or carpet tile is used on a ground floor surface, then it shall be securely attached; have a firm cushion, pad, or backing or no cushion or pad; and have a level loop, textured loop, level cut pile or level cut/uncut pile texture. The maximum combined thickness of pile, cushion and backing shall be ½ inch. Exposed edges and trim shall be securely fastened in place and shall comply with item 1 of Section 3312.2.
3. Gratings: If gratings are located in walking surfaces, then they shall have spaces no greater than ½ inch wide in one direction. If gratings have elongated openings, then they shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

3312.3 Protruding objects:

1. Protrusions: Objects projecting from walls (for example, telephones) with their leading edges between 27 inches and 80 inches above the finished floor shall protrude no more than four inches into walks, halls, corridors, passageways, or aisles. Objects mounted with their leading edges at or below 27 inches above the finished floor may protrude any amount. Free standing objects mounted on posts or pylons may overhang 12 inches maximum from 27 inches to 80 inches above the ground or finished floor. Protruding objects shall not reduce the clear width of an accessible route or maneuvering space (see Figure 5).
2. Head room: Walks, halls, corridors, passageways, aisles, or other circulation spaces shall have 80 inches in minimum clear head room (see Figure 5).

SECTION 3313.0 PARKING AND PASSENGER LOADING ZONES

3313.1 Minimum number: Where parking spaces are provided, the minimum number of spaces shall be in accordance with Table 3313.1 and shall comply with Subsections 3313.2 through 3313.4. Where passenger loading zones are provided at least one shall comply with Subsection 3313.5.

Table 3313.1
PARKING SPACES

1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 or over	2% of total — 20 plus 1 for each 200 over 1,000

3313.2 Parking spaces: Parking spaces for disabled people shall be at least 96 inches wide and shall have an adjacent access aisle 60 inches wide minimum (see Figure 6). Parking access aisles shall be part of the accessible route to the building or facility and shall comply with Section 3312.1. Two accessible parking spaces may share a common access aisle. Parked vehicle overhangs shall not reduce the clear width of an accessible circulation route.

3313.3 Signage: Accessible parking spaces shall be designated as reserved for the disabled by a sign showing the international symbol of accessibility. Such signs shall be above grade.

3313.4 Passenger loading zones: Passenger loading zones shall provide an access aisle at least 48 inches wide and 20 feet long adjacent and parallel to the vehicle pull up space. If there are curbs between the access aisle and the vehicle pull up space, then a curb ramp complying with Section 3314.0 shall be provided.

3313.5 Vertical clearance: Provide minimum vertical clearance of eight feet six inches at accessible parking spaces, at accessible passenger loading zones and along vehicle access route to such areas from site entrances.

SECTION 3314.0 CURB RAMPS

3314.1 Location: Curb ramps complying with this section shall be provided wherever an accessible route crosses a curb.

3314.2 Slope: Slopes of curb ramps shall comply with Section 815.0. The slope shall be measured at a ratio of rise to horizontal run.

3314.3 Width: The minimum width of a curb ramp shall be 36 inches, exclusive of flared sides.

3314.4 Surface: Surfaces of curb ramps shall comply with Section 3312.2. Transitions from ramps to walks and ramps to gutters or streets shall be flush and free from abrupt changes.

3314.5 Sides or curb ramps: Curb ramps shall comply with Figure 20. If a curb ramp is located where pedestrians must walk across the ramp, then it shall have flared sides; the maximum slope of flare shall be 1:10. Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramps. Curb ramps shall not have handrails.

3314.6 Built up curb ramps: Built up type curb ramps that project into vehicular way, shall not be permitted in new construction. They may be permitted in existing conditions only where such application is determined to be the only reasonable means of access and where the location of the built up curb ramp is not in an uncontrolled vehicular way. Built up curb ramps shall comply with this section.

3314.7 Warning textures: A curb ramp shall have a tactile warning texture contrasting to adjoining surfaces and complying with Section 3336.0, extending the full width and depth of the curb ramps, including any flares.

3314.8 Obstructions: Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.

3314.9 Location at marked crossings: Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides.

3314.10 Diagonal curb ramps: If diagonal (or corner type) curb ramps have returned curbs or other well defined edges, such edges shall be parallel to the direction of pedestrian flow. If diagonal curb ramps have flared sides, they shall also have at least a 24 inch long segment of straight curb located on each side of the curb ramps and within the marked crossing.

3314.11 Islands: Any raised islands in crossings shall be cut through level with the street or have curb ramps at both sides and a level area at least 48 inches long in the part of the island intersected by the crossings.

3314.12 Uncurbed intersections: If there is no curb at the intersection of a walk and an adjoining street, parking lot, or busy driveway, then the walk shall have a tactile warning texture complying with Section 3336.5 at the edge of the vehicular way.

SECTION 3315.0 RAMPS

3315.1 Ramps: Any part of an accessible route with a slope greater than 1:20 shall be considered a ramp and shall comply with Section 815.0.

SECTION 3316.0 STAIRS

3316.1 Stairs: Stairways shall comply with Section 816.0. These specifications are not mandatory for stairs within dwelling units.

SECTION 3317.0 ELEVATORS

3317.1 Accessibility: All public passenger elevators shall be required to be accessible and shall comply with the provisions of Article 26.

3317.2 Where required: At least one public passenger elevator shall be required in buildings three stories or greater in height; except that residential buildings three stories in height and containing no more than 24 units shall not be required to have an elevator.

3317.3 Exceptions: Elevators are not mandatory for buildings of less than three stories. If an elevator is provided, however, it shall have dimensions sufficient to accommodate a person in a wheelchair. This means the vertical access for wheelchairs from one level to the other is not required except in buildings three stories or more.

SECTION 3318.0 PLATFORM LIFTS

3318.1 Platform lifts: Platform lifts are permitted if they conform to ANSI standards for inclined stairway lifts or inclined and vertical wheelchair lifts and if they are not in violation of fire safety regulations as established by the department.

SECTION 3319.0 WINDOWS

3319.1 General: If windows intended to be operated by occupants are provided, at least one operable window in each accessible space shall comply with this section.

3319.2 Window hardware: Windows requiring pushing, pulling or lifting to open (for example, doublehung, sliding, or casement and awning units without cranks) shall require no more than five pounds of pressure to open or close. Locks, cranks, and other window hardware shall comply with Section 3334.0.

SECTION 3320.0 DOORS

3320.1 General: All doors to accessible spaces and elements and along accessible routes shall comply with the requirements of this section.

3320.2 Revolving doors and turnstiles: Revolving doors or turnstiles shall not be the only means of passage at an accessible entrance or along an accessible route.

3320.3 Gates: Gates, including ticket gates, shall meet applicable specifications of this section.

3320.4 Double leaf doorways: If doorways have two door leaves, then at least one leaf shall meet the specifications in Subsections 3320.5 and 3320.6. That leaf shall be an active leaf.

3320.5 Clear width: Doorways shall have a minimum clear opening of 32 inches with the door open 90 degrees, measured between the face of the door and the stop. Openings more than 24 inches in depth shall have a minimum clear opening of 36 inches.

3320.6 Maneuvering clearances at doors: Minimum maneuvering clearances for doors that are not automatic shall be as shown in Figure 7. The floor or ground area within the required clearances shall be level and clear. Doors required to be a minimum of 44 inches in institutional buildings shall be exempt from the requirements for space at the latch side of the door.

3320.7 Two doors in series: The minimum space between two doors in series shall be 48 inches plus the width of any door swinging into the space. Doors in series shall swing either in the same direction or away from the space between the doors.

3320.8 Thresholds at doorways: Thresholds at doorways shall not exceed ½ inch in height except that thresholds at exterior sliding doors shall not exceed ¾ inch. Raised thresholds and floor level changes at accessible doorways shall be beveled with a slope no greater than 1:2, and shall meet the requirements of item 1 of Section 3312.2.

3320.9 Door hardware: Handles, pulls, latches, locks and other operating devices on accessible doors shall have a shape that is easy to grasp with one

hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate. Lever operated mechanisms, push type mechanisms and U shaped handles are acceptable designs. When sliding doors are full open, operating hardware shall be exposed and usable from both sides. Doors to hazardous areas shall have hardware complying with Section 3336.3.

3320.10 Door closers: If a door has a closer, then the sweep period of the closer shall be adjusted so that from an open position of 70 degrees, the door will take at least three seconds to move to a point three inches from the latch, measured to the leading edge of the door.

3320.11 Door opening force: The maximum force for pushing or pulling open a door shall be as follows:

1. Fire doors shall have a minimum opening force of 15 pounds and as required in Section 812.4.
2. Other doors: Exterior hinged doors, 8.5 pounds; interior hinged doors, five pounds; sliding or folding doors, five pounds. These forces do not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.

3320.12 Automatic doors and power assisted doors: If an automatic door is used, then it shall comply with American National Standard for Power-Operated Doors, ANSI A156.10-1979. Slowly opening, low powered, automatic doors shall be considered a type of custom design installation as described in Paragraph 1.1.1. of ANSI A156.10-1979. Such doors shall not open to back check faster than three seconds and shall require no more than 15 pounds to stop door movement. If a power assisted door is used, its door opening force shall comply with Subsection 3320.11 of this section and its closing shall conform to the requirements in Section 10 of ANSI A156.10-1979.

3320.13 Framed glass doors: Where framed glass doors are used, the bottom rail shall be a minimum height of 7½ inches.

SECTION 3321.0 ENTRANCES

3321.1 Principal entrances: Principal entrances to a building or facility shall be part of an accessible route and shall comply with Section 3312.1. Such entrances shall be connected by an accessible route to public transportation stops, to accessible parking and passenger loading zones, and to public streets or sidewalks if available. They shall also be connected by an accessible route to all accessible spaces or elements within the building or facility.

3321.2 Service entrances: A service entrance shall not be the sole accessible entrance unless it is the only entrance to a building or facility (for example, in a factory or garage).

SECTION 3322.0 DRINKING FOUNTAINS AND WATER COOLERS

3322.1 Minimum number: Where drinking fountains or water coolers are required, a reasonable number, but always at least one per floor or wing or both, shall comply with this section and shall be on an accessible route.

3322.2 Spout height: Spouts shall be no higher than 36 inches, measured from the floor or ground surfaces to the spout outlet. Dual units with one spout at 30 inches and another at 36 inches or higher are acceptable.

3322.3 Spout location: The spouts of drinking fountains and water coolers shall be at the front of the unit and shall direct the water flow in a trajectory that is parallel or nearly parallel to the front of the unit. The spout shall provide a flow of water so as to allow the insertion of a cup or glass under the flow of water.

3322.4 Controls: Controls shall comply with Section 3334.4.

3322.5 Clearances: Wall and post mounted cantilevered units shall have a clear knee space between the bottom of the apron and the floor or ground at least 27 inches high, 30 inches wide, and 17 inches to 19 inches deep. Such units shall also have a minimum clear floor space 30 inches by 48 inches to allow a person in a wheelchair to make a parallel approach to the unit. This clear floor space shall comply with Section 3311.4.

SECTION 3323.0 WATER CLOSETS

3323.1 General: Accessible water closets shall comply with this section. For water closets in adaptable dwelling units, see Section 3342.4.2.

3323.2 Clear floor space: Clear floor space for water closets not in stalls shall comply with Figure 9. Clear floor space may be arranged to allow either a left handed or right handed approach.

3323.3 Height: The height of water closets shall be 17 inches to 19 inches measured to the top of the toilet seat (see Figure 10). Seats shall not be sprung to return to a lifted position when not in use.

3323.4 Grab bars: Grab bars for water closets shall comply with Figures 9 and 10, and Section 3311.4. Grab bars may be mounted by any desired method as long as they have a gripping surface at the location as shown and do not obstruct the required floor area.

3323.5 Flush controls: Flush controls shall be hand operated and shall comply with Section 3334.4. Controls for flush valves shall be mounted no more than 40 inches above the floor.

3323.6 Dispensers: Toilet paper dispensers shall be installed within reach as shown in Figure 10. Dispensers shall not control delivery and shall permit continuous paper flow.

SECTION 3324.0 TOILET STALLS

3324.1 Location: Accessible toilet stalls shall be on an accessible route and shall meet the requirements of this section.

3324.2 Water closets: Water closets in stalls shall comply with Section 3323.0.

3324.3 Size and arrangement: The size and arrangement of the toilet stalls shall comply with Figure 11a. In existing buildings, alternate stalls (Figure 11b) may be used where available space prohibits installation of the standard stall. Arrangements shown for stalls may be reversed to allow either a left or right handed approach.

3324.4 Toe clearances: In standard stalls, the front partition and at least one side partition shall provide a toe clearance of at least 9 inches above the floor. If the depth of the stall is greater than 60 inches, then the toe clearance is not required.

3324.5 Doors: Toilet stall doors shall comply with Section 3320.0. Doors of toilet stalls shall be out swinging doors. Doors on toilet stalls shall have either a self-closing mechanism or a pull mounted on the hinged side of the stall door.

3324.6 Grab bars: Provide grab bars at toilet stalls as shown in Figures 10 and 11. Grab bars may be mounted by any desired method as long as they have a gripping surface at the locations shown and do not obstruct the required clear floor area. Grab bars shall comply with Section 3333.0.

SECTION 3325.0 URINALS

3325.1 General: Accessible urinals shall comply with this section.

3325.2 Heights: Urinals shall be stall type or wall hung with an elongated rim at a maximum of 17 inches above the floor (see Figure 12.1).

3325.3 Clear floor space: A clear floor space 30 inches by 48 inches shall be provided in front of urinals to allow forward approach. This clear space shall adjoin or overlap an accessible route and shall comply with Section 3311.4.

3325.4 Flush controls: Flush controls shall be hand operated, shall comply with Section 3334.4 and shall be mounted no more than 40 inches above the finished floor.

3325.5 Urinal shields: Urinal shields that do not extend beyond the front edge of the urinal rim may be provided with 29 inches clearance between them.

SECTION 3326.0 LAVATORIES AND MIRRORS

3326.1 General: The requirements of this section shall apply to lavatory fixtures, vanities, and built in lavatories.

3326.2 Height and clearances: Lavatories shall be mounted with a clearance of at least 29 inches from the floor to the bottom of the apron. Thirty-four inches is the maximum height of the top of the front lip of the lavatory. Knee and toe clearances shall comply with Figure 12.

3326.3 Clear floor space: A clear floor space 30 inches by 48 inches complying with Section 3311.4 shall be provided in front of a lavatory to allow a forward approach. Such clear floor space shall adjoin or overlap an accessible route and shall extend a maximum of 19 inches underneath the lavatory.

3326.4 Exposed pipes and surfaces: If hot water exceeds 120 degrees Fahrenheit, the hot water and drain pipes under lavatories shall be insulated or otherwise covered. There shall be no sharp or abrasive surfaces under lavatories.

3326.5 Faucets: Faucets shall comply with Section 3334.4. Lever operated, push type and electronically controlled mechanisms are examples of acceptable designs. Self-closing valves are allowed if the faucet remains open for at least ten seconds.

3326.6 Mirrors: Mirrors shall be mounted with the bottom edge no higher than 40 inches from the floor.

SECTION 3327.0 BATHTUBS

3327.1 General: Accessible bathtubs shall comply with this section. For bathtubs in accessible dwelling units, see Section 3342.4.4.

3327.2 Floor space: Clear floor space in front of bathtubs shall be as shown in Figure 13.

3327.3 Seat: An in-tub seat or a seat at the head end of the tub shall be provided as shown in Figures 13 and 14. The structural strength of seats and their attachments shall comply with Section 3333.3. Seats shall be mounted securely and shall not slip during use.

3327.4 Grab bars: Grab bars complying with Section 3333.0 shall be provided as shown in Figures 13 and 14.

3327.5 Controls: Faucets and other controls complying with Section 3334.4 shall be located as shown in Figure 14.

3327.6 Shower unit: A shower spray unit with a hose at least 60 inches long that can be used as a fixed shower head or as a hand held shower shall be provided.

3327.7 Bathtub enclosures: If provided, enclosures for bathtubs shall not obstruct controls or transfer from wheelchairs onto bathtub seats or into tubs. Enclosures on bathtubs shall not have tracks mounted on their rims.

SECTION 3328.0 SHOWER STALLS

3328.1 General: Accessible shower stalls shall comply with this section. For shower stalls in accessible dwelling units, see Section 3342.4.5.

3328.2 Size and clearances: Shower stall size and clear floor space shall comply with Figure 15.

3328.3 Seat: A seat shall be provided in transfer shower stalls as shown in Figure 16. The seat shall be mounted 17 inches to 19 inches from the bathroom floor and shall extend the full depth of the stall. The seat shall be on the wall opposite the controls. The structural strength of the seats and their attachments shall comply with Section 3333.3.

3328.4 Grab bars: Grab bars complying with Section 3333.0 shall be provided as shown in Figure 17.

3328.5 Controls: Faucets and other controls complying with Section 3334.4 shall be located as shown in Figure 17. In transfer shower stalls all controls, faucets, and the shower unit shall be mounted on the side wall opposite the seat.

3328.6 Shower unit: A shower spray unit with a hose at least 60 inches long that can be used as a fixed shower head or as a hand held shower shall be provided.

3328.7 Curbs: If provided, curbs in transfer shower stalls shall be no higher than 4 inches. Roll in shower stalls shall not have curbs.

3328.8 Shower enclosures: If provided enclosures for shower stalls shall not obstruct controls or obstruct transfer from wheelchairs onto shower seats.

SECTION 3329.0 TOILET ROOMS

3329.1 General: All toilet rooms provided for public use or otherwise required by the *Kentucky Building Code* shall be on an accessible route and shall comply with this section.

3329.2 Doors: All doors to accessible toilet rooms shall comply with Section 3320.0. Doors shall not swing into the clear floor space required for any fixture.

3329.3 Clear floor space: The accessible fixtures and controls required in Subsections 3329.4 through 3329.7 shall be on an accessible route. An unobstructed turning space complying with Section 3311.3 shall be provided within an accessible toilet room. The clear floor space at fixtures and controls, the accessible route, and the turning space may overlap.

3329.4 Water closets: If toilet stalls are provided, then a reasonable number, but always at least one, shall comply with Section 3324.0; its water closet shall comply with Section 3322.0. If water closets are not in stalls, then a reasonable number, but always at least one, shall comply with Section 3323.0.

3329.5 Urinals: If urinals are provided, then a reasonable number, but always at least one, shall comply with Section 3325.0.

3329.6 Lavatories and mirrors: If lavatories and mirrors are provided, then a reasonable number, but always at least one of each, shall comply with Section 3326.0.

3329.7 Controls and dispensers: If controls, dispensers, receptacles, or other equipment is provided, at least one of each shall be on an accessible route and shall comply with Section 3334.0.

3329.8 Emergency lighting: Where emergency lighting in a building is required by Section 824.0, the emergency lighting shall be provided in accessible toilet rooms.

SECTION 3330.0 BATHROOMS, BATHING FACILITIES AND SHOWER ROOMS

3330.1 General: Bathrooms, bathing facilities or shower rooms on an accessible route shall comply with this section. For bathrooms in accessible dwelling units, see Section 3342.4.

3330.2 Doors: Doors to accessible bathrooms shall comply with Section 3320.0. Doors shall not swing into the floor space required for any fixture.

3330.3 Clear floor space: The accessible fixtures and controls required in Subsections 3330.4 through 3330.9 shall be on an accessible route. An unobstructed turning space complying with Section 3311.3 shall be provided within an accessible bathroom. The clear floor space at fixtures and controls, the accessible route, and the turning space may overlap.

3330.4 Water closets: If toilet stalls are provided, then a reasonable number, but always at least one, shall comply with Section 3324.0; its water closet shall comply with Section 3323.0. If water closets are not in stalls, then a reasonable number, but always at least one, shall comply with Section 3323.0.

3330.5 Urinals: If urinals are provided, then a reasonable number, but always at least one, shall comply with Section 3325.0.

3330.6 Lavatories and mirrors: If lavatories and mirrors are provided, then a reasonable number, but always at least one, shall comply with Section 3326.0.

3330.7 Controls and dispensers: If controls, dispensers, receptacles or other equipment is provided, at least one of each shall be on an accessible route and shall comply with Section 3334.0.

3330.8 Bathing and shower facilities: If tubs or showers are provided, then at least one accessible tub that complies with Section 3327.0 or at least one accessible shower that complies with Section 3327.0 or at least one accessible shower that complies with Section 3328.0 shall be provided.

3330.9 Medicine cabinets: If medicine cabinets are provided, at least one shall be located with a usable shelf no higher than 40 inches above the floor space. The floor space shall comply with Section 3311.4.

SECTION 3331.0 SINKS

3331.1 General: If accessible sinks are provided, they shall comply with this section. Sinks in kitchens of accessible dwelling units shall comply with Section 3342.5.5.

3331.2 Height: Sinks shall be mounted with the counter or rim no higher than 34 inches from the floor.

3331.3 Knee clearance: Knee clearance that is 27 inches high, 30 inches wide, and 19 inches deep shall be provided underneath sinks.

3331.4 Depth: Each sink shall be a maximum of 6½ inches deep.

3331.5 Clear floor space: A clear floor space at least 30 inches by 48 inches complying with Section 3311.4 shall be provided in front of a sink to allow forward approach. The clear floor space shall be on an accessible route and shall extend a maximum of 19 inches underneath the sink.

3331.6 Exposed pipes and surfaces: If hot water exceeds 120 degrees Fahrenheit, hot water and drain pipes under sinks shall be insulated or otherwise covered. There shall be no sharp or abrasive surfaces under sinks.

3331.7 Faucets: Faucets shall comply with Section 3334.4. Lever operated, push type, touch type, or electronically controlled mechanisms are acceptable designs.

SECTION 3332.0 STORAGE

3332.1 General: Accessible storage facilities such as cabinets, shelves, closets, and drawers shall comply with this section.

3332.2 Clear floor space: A clear floor space at least 30 inches by 48 inches complying with Section 3311.4 that allows either a forward or parallel approach by a person using a wheelchair shall be provided accessible storage facilities.

3332.3 Height: Accessible storage spaces shall be within at least one of the reach ranges specified in Section 3311.5 and 3311.6. Clothes rods shall be a maximum of 48 inches from the floor.

3332.4 Hardware: Hardware for accessible storage facilities shall comply with Section 3334.4. Touch latches and U shaped pulls are acceptable.

SECTION 3333.0 HANDRAILS, GRAB BARS AND TUB AND SHOWER SEATS

3333.1 General: All handrails, grab bars, and tub and shower seats shall comply with this section.

3333.2 Size and spacing of grab bars and handrails: The outside diameter or width of the gripping surfaces of a handrail or grab bar shall be 1¼ inch to 1½ inch or the shape shall provide an equivalent gripping surface. If handrails or grab bars are mounted adjacent to a wall, the space between the wall and the handrail or grab bars shall be 1½ inch (see Figure 18). Handrails may be located in a recess if the recess is a maximum of three inches deep and extends at least 18 inches above the top of the rail (see Figure 18).

3333.3 Structural strength: Handrails, grab bars, tub and shower seats, fasteners, and mounting devices shall support a minimum concentrated load of 250 pounds and shall not rotate in their fittings.

3333.4 Eliminating hazards: A handrail or grab bar and any wall or other surface adjacent to it shall be free of any sharp or abrasive elements. Edges shall have a minimum radius of ⅛ inch.

SECTION 3334.0 CONTROLS AND OPERATING MECHANISMS

3334.1 General: Controls and operating mechanisms in accessible spaces, along accessible routes, or as part of accessible elements (for example, light switches, dispenser controls) shall comply with this section.

3334.2 Clear floor space: Clear floor space complying with Section 3311.4 that allows a forward or parallel approach by a person using a wheelchair shall be provided at controls, dispensers, receptacles, and other operable equipment.

3334.3 Height: The highest operable part of all controls, dispensers, receptacles, and other operable equipment shall be placed within at least one of the reach ranges specified in Section 3311.5 and 3311.6. Except where the use of special equipment dictates otherwise, electrical and communications systems receptacles on walls shall be mounted no less than 15 inches above the floor.

3334.4 Operation: Controls and operating mechanisms shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls shall be no greater than five pounds of force.

SECTION 3335.0 ALARMS

3335.1 General: If emergency warning systems are provided, they shall include both audible alarms complying with Subsection 3335.2 and visual alarms complying with Subsection 3335.3. In facilities with sleeping accommodations, accessible sleeping accommodations shall have an auxiliary visual alarm system complying with Subsection 3335.4.

3335.2 Audible alarms: Audible emergency alarms shall produce a sound that exceeds the ambient room or space noise by at least 15 decibels or exceeds any maximum sound level with a duration of 30 seconds by five decibels, whichever is louder. Sound levels for alarm signals shall not exceed 120 decibels.

3335.3 Visual alarms: Electronically powered internally illuminated emergency exit signs or adjacent devices shall flash as a visual emergency alarm in conjunction with audible emergency alarms. The flashing frequency of visual alarm devices shall be less than five Hz. If such alarms use electricity from the building as a power source, then they shall be installed on the same system as the audible emergency alarms.

3335.4 Auxiliary alarms: Accessible sleeping accommodations shall have a visual alarm connected to the building emergency alarm system or shall have a standard 110 volt electrical receptacle into which such an alarm could be connected. Instructions for use of the auxiliary alarm or connection shall be provided.

3335.5 Alarm activators: Alarm activators shall comply with Section 3334.0, Controls and operating mechanisms.

3335.6 Special alarm systems: Specialized alarm systems utilizing advanced technology will be considered on a case-by-case basis.

SECTION 3336.0 TACTILE WARNINGS

3336.1 General: Where tactile warnings are required, they shall comply with this section.

3336.2 Tactile warnings on walking surfaces: Tactile warning textures on walking surfaces shall contrast with that of the surrounding surface. Raised strips or grooves shall comply with Figure 19. Grooves may be used indoors only.

3336.3 Tactile warnings on doors to hazardous areas: Doors that lead to areas that might prove dangerous to a blind person (for example, doors leading to platforms, mechanical rooms, stages, and the like) shall be made identifiable to the touch by a textured surface on the door handle, knob, pull or other operating hardware. This textured surface may be made by knurling or roughening or by a material applied to the contact surface. Such textured surfaces shall not be provided for emergency exit doors or any doors other than those to hazardous areas.

3336.4 Tactile warnings at stairs: All stairs (except those in dwelling units, in enclosed stair towers, or set to the side of the path of travel) shall have a tactile warning at the top of stair runs.

3336.5 Tactile warnings at hazardous vehicular areas: If a walk crosses or adjoins a frequently used vehicular way, and if there are no curbs, railings, or other elements detectable by a person who has a severe visual impairment separating the pedestrian and vehicular areas, then the boundary between the areas shall be defined by a continuous 36 inch wide tactile warning texture complying with Subsection 3336.2.

3336.6 Tactile warnings at reflecting pools: The edges of reflecting pools shall be protected by railings, walls, curbs, or tactile warnings complying with Subsection 3336.2.

3336.7 Standardization: Textured surfaces for tactile warnings shall be standard within a building, facility, site or complex of buildings.

SECTION 3337.0 SIGNAGE

3337.1 General: All signage that provides emergency information of general circulation directions or identifies rooms and spaces shall comply with this section.

3337.2 Character proportion and contrast: Letters and numbers on sign systems shall:

1. Have a width to height ratio of between 3:5 and 1:1;
2. Have a stroke width to height ratio between 1:5 and 1:10;
3. Contrast in value with their backgrounds, preferably light letters on a dark background; and
4. Have a matte finish on a matte finish background.

3337.3 Raised or incised characters: Provide numbers and letters that are:

1. Raised or incised from the background surface 1/32 inch and also incise or raise symbols and pictographs in this manner;
2. Between 5/8 inch and 2 inches high;
3. Sans serif with sharply defined edges; and
4. If incised, provide with at least 1/4 inch stroke width.

3337.4 Mounting location and height: Signage shall be placed in a standardized location throughout a building or facility as follows:

1. Interior signage shall be located on the door or alongside of the door on the latch side and shall be mounted at between 4'6" and 5'6" above finished floor.
2. Exterior signage shall be installed at entrances and walks to direct individuals to accessible routes and entrances required.
3. Symbols of accessibility. If accessible facilities are identified, then the international sign of accessibility shall be used.

SECTION 3338.0 TELEPHONES

3338.1 General: If public telephones are provided, then they shall comply with this section.

3338.2 Clear floor or ground space: A clear floor or ground space at least 30 inches by 48 inches that allows either a forward or parallel approach by a person using a wheelchair shall be provided at telephones. The clear floor or ground space shall comply with Section 3311.4. Bases, enclosures, and fixed seats shall not impede approaches to telephones by people who use wheelchairs.

3338.3 Mounting height: The highest operable part of the telephone shall be within reach ranges specified in Section 3311.5 or 3311.6. Telephones mounted diagonally shall have the highest operable part no higher than 54 inches above the floor.

3338.4 Enclosures: If telephone enclosures are provided, they may overhang the clear floor space required in Subsection 3338.2 within the following limits:

1. Side reach possible: The overhang shall be no greater than 19 inches; the height of the lowest overhanging part shall be equal to or greater than 27 inches.
2. Full height enclosures: Entrances to full height enclosures shall be 30 inches clear minimum.
3. Forward reach required: If the overhang is greater than 12 inches, then the clear width of the enclosure shall be 30 inches minimum, if the clear width of the enclosure is less than 30 inches, then the height of the lowest overhanging part shall be equal to or greater than 27 inches.
4. Where telephone enclosures protrude into walls, halls, corridors, or aisles, they shall also comply with Section 3312.3.

3338.5 Equipment for hearing impaired people: Telephones shall be equipped with a receiver that generates a magnetic field in the area of the receiver cap. If

anks of public telephones are provided, a minimum of 5 percent, but at least ne in a building or facility shall be equipped with a volume control.

3338.6 Controls: Telephones shall have pushbutton controls where service for uch equipment is available.

3338.7 Telephone books: Telephone books, if provided, shall be located so hat they can be used by a person in a wheelchair.

3338.8 Cord length: The cord from the telephone to the headset shall be at east 29 inches long.

SECTION 3339.0 SEATING, TABLES AND WORK SURFACES

3339.1 General: If fixed or built-in seating, tables, or work surfaces are provided in accessible spaces, the minimum number of spaces for use by persons in wheelchairs shall be in accordance with Table 3340.1.

3339.2 Seating: If seating spaces for people in wheelchairs are provided at tables, counters, or work surfaces, clear floor space complying with Section 3311.4 shall be provided. Such clear floor space shall not overlap knee space by more than 19 inches.

3339.3 Knee clearances: If seating for people in wheelchairs is provided at tables, counters or work surfaces, knee spaces at least 27 inches high, 30 inches wide, and 19 inches deep shall be provided.

3339.4 Height of work surfaces: The tops of tables and work surfaces shall be from 28 inches to 34 inches from the floor to ground.

SECTION 3340.0 ASSEMBLY AREAS

3340.1 Minimum number: Assembly areas shall have designated spaces for wheelchair use in each assembly area that complies with this section and the minimum number of wheelchair spaces shall be in accordance with Table 3340.1. Assembly areas with audio-amplification systems shall have a listening system complying with Subsections 3340.6 and 3340.7 to assist persons with severe hearing loss in the appreciation of audio presentations.

Table 3340.1
ACCESSIBLE LOCATIONS

Total seating capacity of the facility	Minimum number of wheelchair spaces
50 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
over 500	10 plus a reasonable number not to exceed 1% to be determined by Section 3305.1

3340.2 Size of wheelchair locations: Each wheelchair location shall provide minimum clear ground or floor space of 66 inches wide by 48 inches deep for forward or rear access and 66 inches deep for side access and shall accommodate two people in wheelchairs.

3340.3 Placement of wheelchair locations: Wheelchair areas shall be an integral part of any fixed seating plan and shall be dispersed throughout the seating area. They shall adjoin an accessible route that also serves as a means of egress in case of emergency and shall be located to provide lines of sight comparable to those for all viewing areas.

Exception: In alteration work where it is structurally impossible to alter seating location to disperse seating throughout, seating may be located in collected areas, but must adjoin an accessible route.

3340.4 Surfaces: The ground or floor at wheelchair locations shall be level and shall comply with Section 3312.2.

3340.5 Access to performing areas: An accessible route shall be provided to performing areas, including stages, arena floors, dressing rooms, locker rooms, and other spaces used by performers.

3340.6 Placement of listening systems: If the listening system provided serves individual fixed seats, then such seats shall be located within a 50 foot viewing distance of the stage or playing area and shall have a complete view of the stage or playing area.

3340.7 Types of listening systems: Audio loops and radio frequency systems are two acceptables types of listening systems. The department will rely upon the advice of the Kentucky Commission for the Deaf and Hearing Impaired in its interpretation and enforcement of the provisions relating to accessibility for the hearing impaired.

3340.8 Applicability: The provisions of this section are intended to apply to performing arts and movie theaters as well as public meeting places, auditoriums and gymnasiums, among others.

SECTION 3341.0 HOTELS AND MOTELS

3341.1 Minimum requirements: In hotel and motel buildings, lodging houses, boarding houses, and dormitory buildings, providing sleeping accommodations for 20 or more individuals, a minimum of 5 percent of those accommodations shall be accessible to and shall comply with Section 3310.1 and 3310.2.

SECTION 3342.0 DWELLING UNITS

3342.1 General: Where multi-family housing projects are required to be accessible, a minimum of one in 25 dwelling units shall meet the requirements of this section.

3342.2 Minimum requirements: An accessible dwelling unit shall be on an accessible route, and accessible dwelling units shall have the following access-

ible elements and spaces as a minimum.

1. Common spaces: Common spaces and facilities serving individual accessible dwelling units (for example, entry walks, trash disposal facilities, and mail boxes) shall comply with Sections 3310.0 through 3340.0.
2. Accessible spaces: Accessible spaces shall have maneuvering space complying with Section 3311.2 and 3311.3 and surfaces complying with Section 3312.2.
3. Accessible route: At least one accessible route complying with Section 3312.1 shall connect the accessible entrances with all accessible spaces and elements within the dwelling units.
4. Parking: If parking spaces are assigned for use with individual dwelling units, then at least one parking space per accessible dwelling unit shall comply with Section 3313.3.
5. Windows: If windows intended to be operated by occupants are provided, then they shall comply with Section 3319.0.
6. Doors: Doors to and in accessible spaces that are intended for passage shall comply with Section 3320.0.
7. Entrances: All entrances to accessible dwelling units shall comply with Section 3321.0.
8. Storage: Storage in accessible spaces in dwelling units, including cabinets, shelves, closets, and drawers, shall comply with Section 3332.0.
9. Controls: All controls in accessible spaces shall comply with Section 3334.0. Those portions of heating, ventilating, and air conditioning equipment requiring regular, periodic maintenance and adjustment by the resident of a dwelling shall be accessible to people in wheelchairs. If air distribution registers must be placed in or close to ceilings for proper air circulation, this specification shall not apply to registers.
10. Alarms: If emergency alarms are provided, alarm connections complying with Sections 3335.4, 3335.5, and 3335.6 shall be provided in the dwelling unit.
11. Telephone: If telephone connections are installed in the dwelling unit, a reasonable number, but always at least one, shall comply with Sections 3338.2 and 3338.3.
12. Bathroom: A reasonable number, but always at least one, of full bathrooms shall comply with Section 3342.5. A full bathroom shall include a water closet, a lavatory, and a bathtub or shower.
13. Kitchen: The kitchen shall comply with Section 3342.6.
14. Laundry: If laundry facilities are provided, they shall comply with Section 3342.7.
15. Unit spaces: The following spaces shall be accessible and shall be on an accessible route:
    1. The living area;
    2. The dining area;
    3. The sleeping area, or the bedroom in one bedroom dwelling units,

or at least two bedrooms or sleeping spaces in dwelling units with two or more bedrooms; and

4. Patios, terraces, balconies, carports, and garages, if provided with the dwelling unit.

3342.3 Adaptability: The specifications of Subsection 3342.6 are based on the concept of adaptability.

3342.4 Consumer information: To ensure that the existence of adaptable features will be known to the owner or occupant of a dwelling, consumer information shall be provided for each accessible dwelling unit for rent or sale.

3342.5 Bathrooms: Bathrooms shall be on an accessible route and shall comply with the requirements of this subsection.

1. Minimum dimensions: Accessible bathrooms shall accommodate wheelchair turning space in accordance with Section 3311.3. Door operations shall not interfere with maneuverability.
2. Water closets:
   1. Clear floor space: Clear floor space at the water closet shall be as shown in Figure 9. The water closet may be located with the clear area at either the right or left side of the toilet.
   2. Height: The height of the water closet shall be at least 17 to 19 inches measured to the top of the toilet seat.
   3. Grab bars: Grab bars shall be installed as shown in Figure 10 and shall comply with Section 3333.0.
   4. Dispenser: The toilet paper dispenser shall be installed within reach as shown in Figure 10.
3. Lavatory, mirrors, and medicine cabinets:
   1. Lavatory and mirror: The lavatory and mirrors shall comply with Section 3326.0.
   2. Medicine cabinet: If a medicine cabinet is provided above the lavatory, then the bottom of the medicine cabinet shall be located with a usable shelf no higher than 44 inches above the floor.
4. Bathtubs: If a bathtub is provided, then it shall have the following features:
   1. Floor space: Clear floor space at bathtubs shall be as shown in Figure 13.
   2. Seat: An in-tub seat or a seat at the head end of the tub shall be provided as shown in Figures 13 and 14. The structural strength of seats and their attachments shall comply with Section 3333.3. Seats shall be mounted securely and shall not slip during use.
   3. Grab bars: Grab bars shall be installed as shown in Figure 14 and shall comply with Section 3333.0.
   4. Controls: Faucets and other controls shall be located as shown in Figure 14 and shall comply with Section 3334.4. Single lever and mixing devices are acceptable designs.
   5. Shower unit: A shower spray unit with a hose at least 60 inches long that can be used as a fixed shower head at various heights or as a

hand held shower shall be provided.

5. Showers: If a shower is provided, it shall have the following features:
   1. Size and clearances: Shower stall size and clear floor space shall comply with Figure 15.
   2. Seat: A seat shall be provided in the transfer shower stalls as shown in Figure 16. The seat shall be 17 inches to 19 inches high, measured from the bathroom floor and shall extend the full depth of the stall. The seat shall be on the wall opposite the controls. The structural strength of seats and their attachments shall comply with Section 3333.3. Seats shall be mounted securely and shall not slip during use.
   3. Grab bars: Grab bars complying with Section 3333.0 shall be provided as shown in Figure 17.
   4. Controls: Faucets and other controls shall be located as shown in Figure 17 and shall comply with Section 3334.4. In transfer shower stalls, all controls, faucets, and the shower unit shall be mounted on the side wall opposite the seat.
   5. Shower unit: A shower spray unit with a hose at least 60 inches long that can be used as a fixed shower head at various heights or as a hand held shower shall be provided.
6. Bathtub and shower enclosure: Enclosures for bathtubs or shower stalls shall not obstruct controls or transfer from wheelchairs onto shower or bathtub seats. Enclosures on bathtubs shall not have tracks mounted on their rims.
7. Clear floor space: Clear floor space at fixtures may overlap.

3342.6 Kitchens: Kitchens and their components shall be on an accessible route and shall comply with the requirements of this subsection.

1. Clearance: Clearances between all opposite base cabinets, counter tops, appliances or walls shall accommodate wheelchair turning space in accordance with Section 3311.3.
2. Clear floor space: A clear floor space at least 30 inches by 48 inches complying with Section 3311.4 that allows either a forward or a parallel approach by a person in a wheelchair shall be provided at all appliances in the kitchen, including the range or cooktop oven, refrigerator/freezer, dishwasher, and trash compactor. Laundry equipment located in the kitchen shall comply with Section 3342.7.
3. Controls: All controls in kitchens shall comply with Section 3334.0.
4. Work surfaces: At least one 30-inch section of counter shall provide a work surface that complies with the following requirements:
   1. The counter either shall be adjustable (or replaceable as a unit) to provide alternative heights of 28 inches to 36 inches, or shall be fixed at 30 inches measured from the floor to the top of the counter surface.
   2. Base cabinets, if provided, shall be removable under the full 30-inch minimum frontage of the counter. The finished floor shall extend under the counter to the wall.

3. Counter thickness and supporting structure shall be two inches maximum over the required clear area.
4. A clear floor space 30 inches by 48 inches shall allow a forward approach to the counter. Nineteen inches maximum of the clear floor space may extend underneath the counter. The knee space shall have a minimum clear width of 30 inches and a minimum clear depth of 19 inches.
5. There shall be no sharp or abrasive surfaces under the counters.

5. Sink: The sink and surrounding counter shall comply with the following requirements:
   1. The sink and surrounding counter either shall be adjustable (or replaceable as a unit) to provide alternative heights of 28 inches to 36 inches, or shall be fixed at 30 inches measured from the floor to the top of the counter surface or sink rim. The total width of sink and counter area shall be 30 inches minimum.
   2. Where the sink is adjustable, rough-in plumbing shall be located to accept conditions of supply and drain pipes for sinks mounted at the height of 28 inches.
   3. The depth of a sink bowl shall be no greater than 6½ inches.
   4. Faucets shall comply with Section 3334.4. Lever operated or push type mechanisms are two acceptable designs.
   5. Base cabinets, where provided, shall be removable under the full 30 inch minimum frontage of the sink and surrounding counter. The finished flooring shall extend under the counter to the wall.
   6. Counter thickness and supporting structure shall be two inches maximum over the required clear space.
   7. A clear floor space 30 inches by 48 inches shall allow forward approach to the sink. Nineteen inches maximum of the clear floor space may extend underneath the sink. The knee space shall have a minimum clear width of 30 inches and a clear depth of 19 inches.
   8. There shall be no sharp or abrasive surfaces under sinks. If hot water exceeds 120 degres Fahrenheit, hot water and drain pipes under sinks shall be insulated or otherwise covered.
6. Ranges and cooktops: Ranges and cooktops comply with item 2 of Section 3342.6 and Section 3334.0. If ovens or cooktops have knee spaces underneath, then they shall be insulated or otherwise protected on the exposed contact surfaces to prevent burns, abrasions, or electrical shock. The clear floor space may overlap the knee space, if provided, by 19 inches maximum. The location of controls for ranges and cooktops shall not require reaching across burners.
7. Ovens: Ovens shall comply with item 2 of Section 3342.6 and Section 3334.0. Ovens shall be of the self-cleaning type or be located adjacent to a counter with knee space below. For side opening ovens, the door latch side shall be next to the open counter space, and there shall be a pull-out shelf under the oven extending the full width of the oven and pulling out not less than 10 inches when fully extended. Ovens shall

have controls on front panels; they may be located on either side of the door.

8. Refrigerator/freezers: Refrigerator/freezer type shall comply with Section 3334.0. Refrigerators shall be:
   1. Of the vertical side-by-side refrigerator/freezer type; or
   2. Of the over and under type and meet the following requirements:
      a. Have at least 50 percent of the freezer space below 54 inches above the floor.
      b. Have 100 percent of the refrigerator space and controls below 54 inches. Freezers with less than 100 percent of the storage volume within the limits specified in Section 3342.6 or 3342.7 shall be the self-defrosting type.
9. Dishwashers: Dishwashers shall comply with item 2 of Section 3342.6 and Section 3334.0. Dishwashers shall have all rack space accessible from the front of the machine for loading and unloading dishes.
10. Kitchen storage: At least 50 percent of kitchen storage areas shall comply with Section 3332.0. Door pulls or handles for wall cabinets shall be mounted as close to the bottom of cabinet doors as possible. Door pulls or handles for base cabinets shall be mounted as close to the top of cabinet doors as possible.

3342.7 Laundry facilities: If laundry equipment is provided within individual accessible dwelling units, or if separate laundry facilities serve one or more accessible dwelling units, then they shall meet the requirements of this subsection.

1. Location: Laundry facilities and laundry equipment shall be on an accessible route.
2. Washing machines and clothes dryers: Washing machines and clothes dryers in common use laundry rooms shall be front loading.
3. Controls: Laundry equipment shall comply with Section 3334.0.

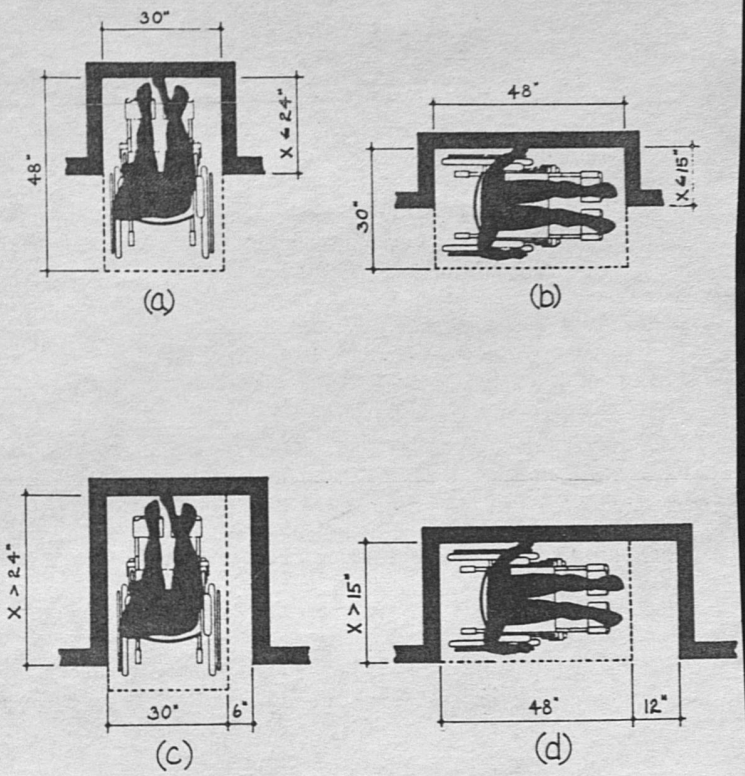


Figure 1
CLEAR FLOOR SPACE IN ALCOVES

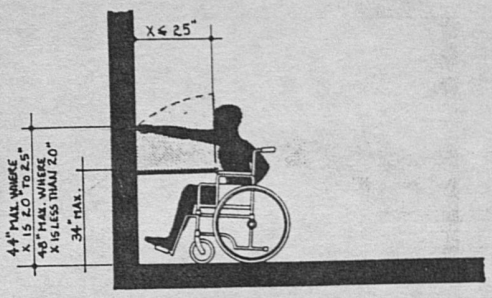


Figure 2
MAXIMUM FORWARD REACH
OVER AN OBSTRUCTION

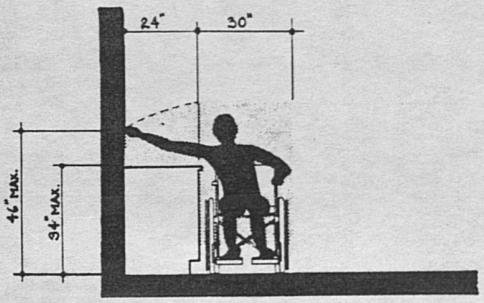
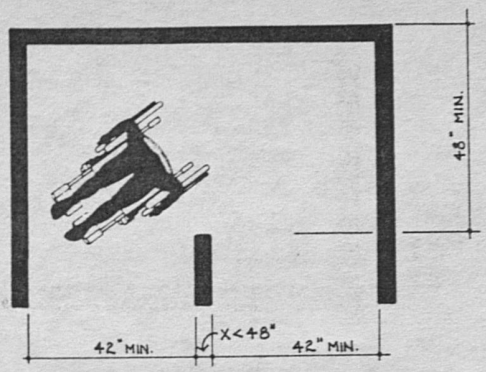
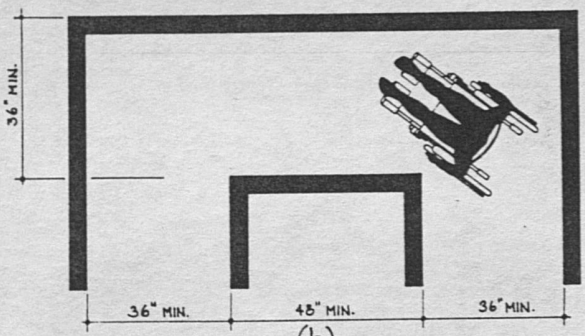


Figure 3
MAXIMUM SIDE REACH
OVER AN OBSTRUCTION



(a)
TURNS AROUND AN OBSTRUCTION



(b)
90° TURN

Figure 4
WIDTH OF ACCESSIBLE ROUTE

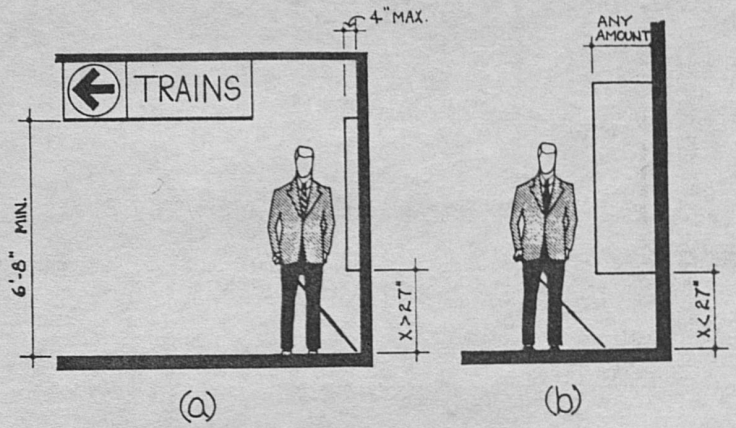


Figure 5
PROTRUDING OBJECTS

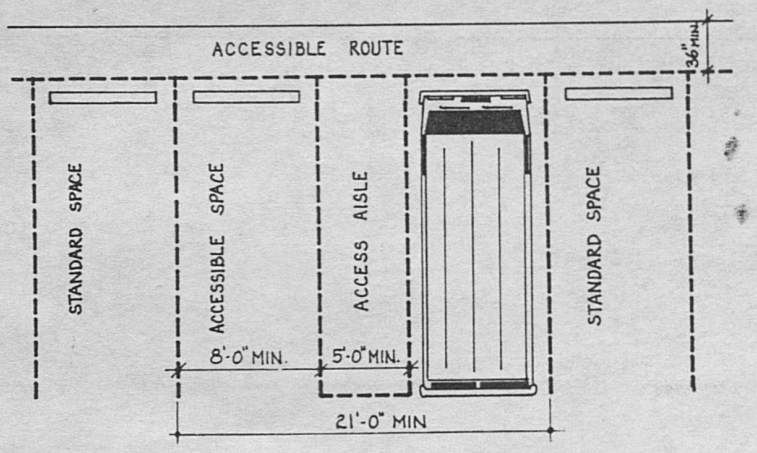


Figure 6
DIMENSIONS OF PARKING SPACES

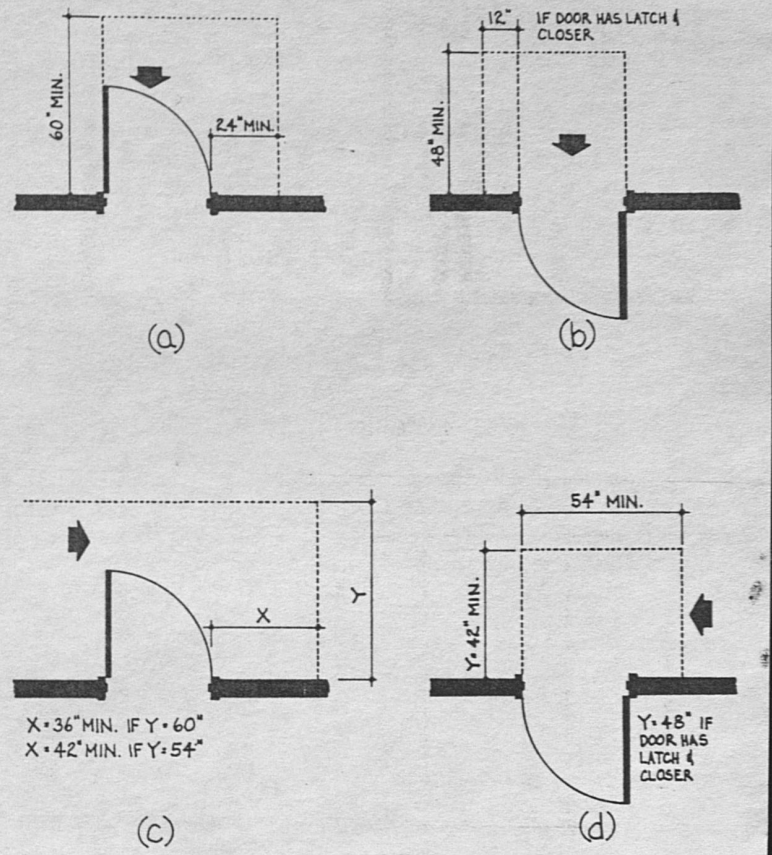


Figure 7
MANEUVERING CLEARANCES AT DOORS

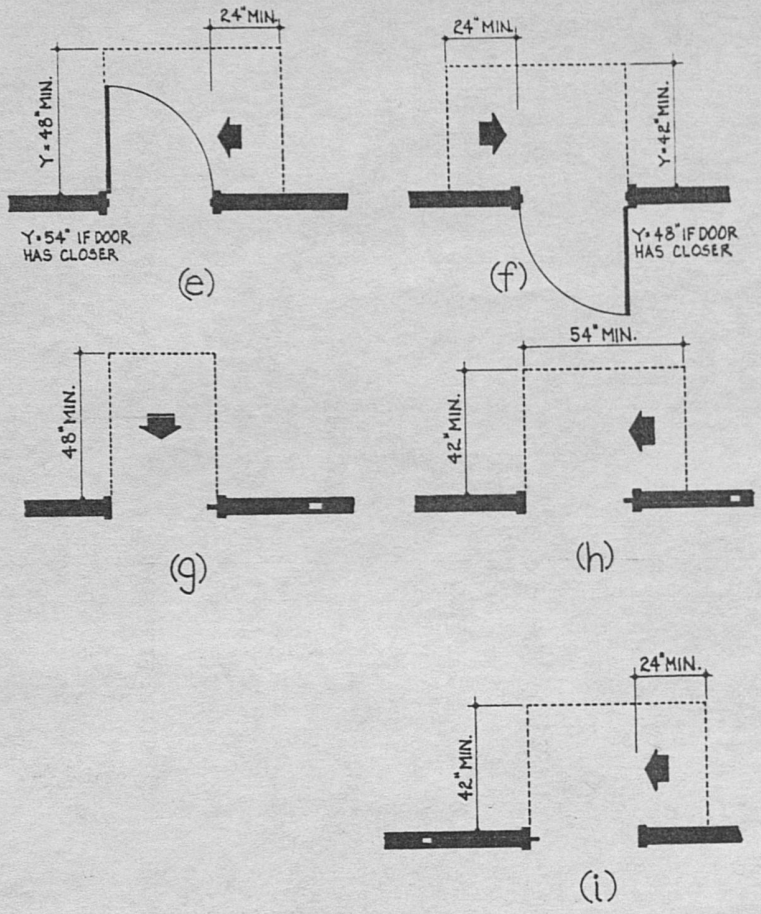


Figure 7
MANEUVERING CLEARANCES AT DOORS

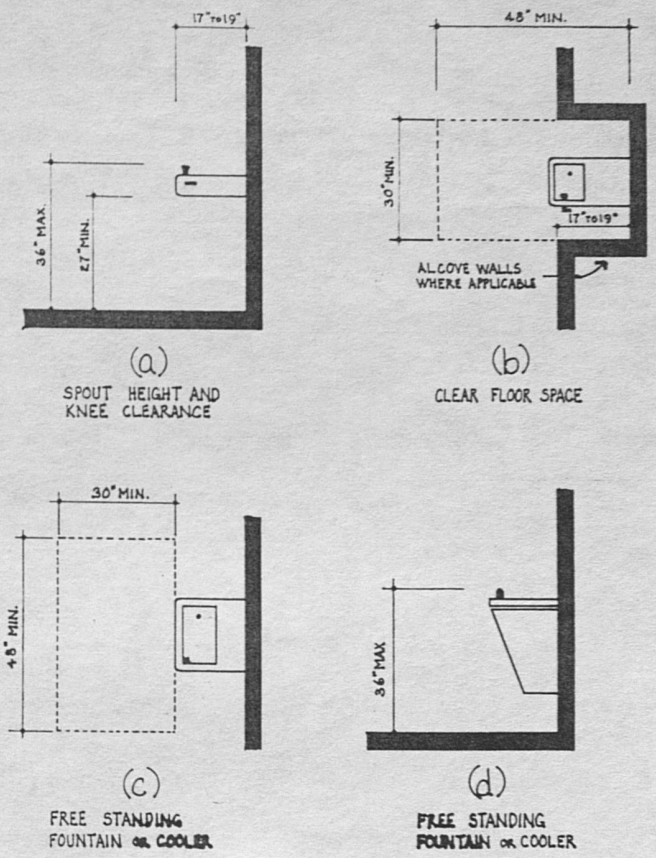


Figure 8
DRINKING FOUNTAINS AND WATER COOLERS

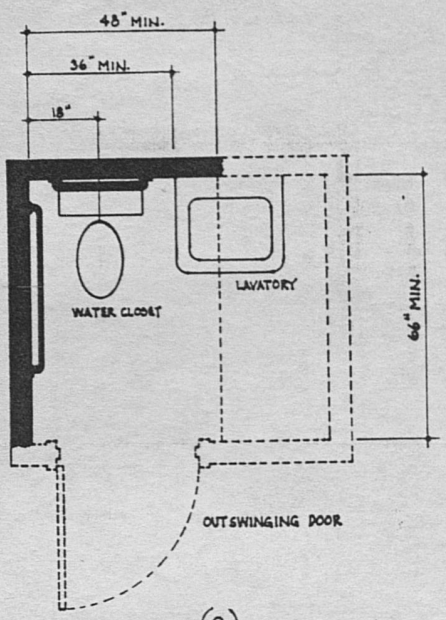


Figure 9
CLEAR FLOOR SPACE AT WATER CLOSETS

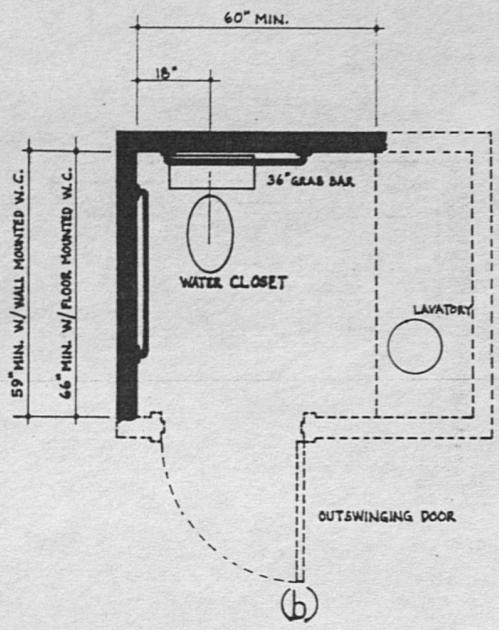
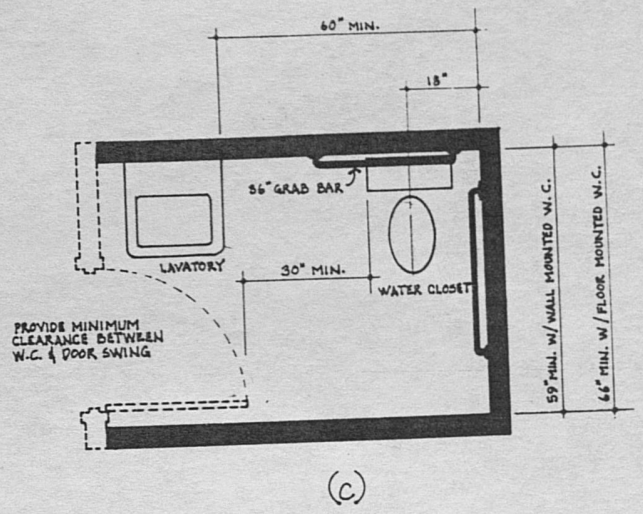


Figure 9
CLEAR FLOOR SPACE AT WATER CLOSETS



(c)

Figure 9
CLEAR FLOOR SPACE AT WATER CLOSETS

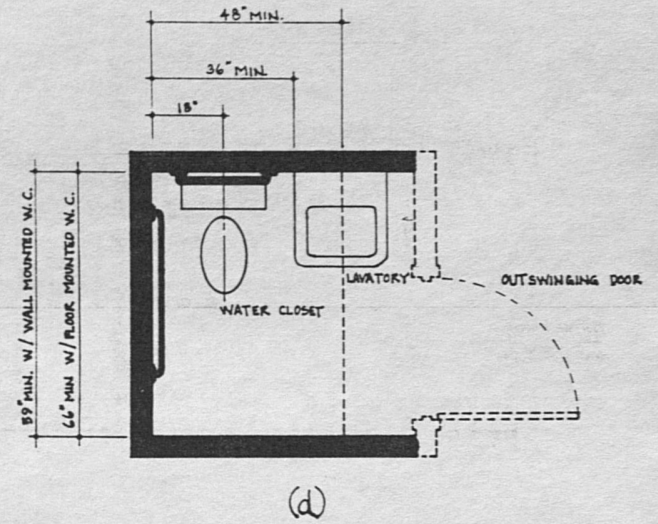


Figure 9
CLEAR FLOOR SPACE AT WATER CLOSETS

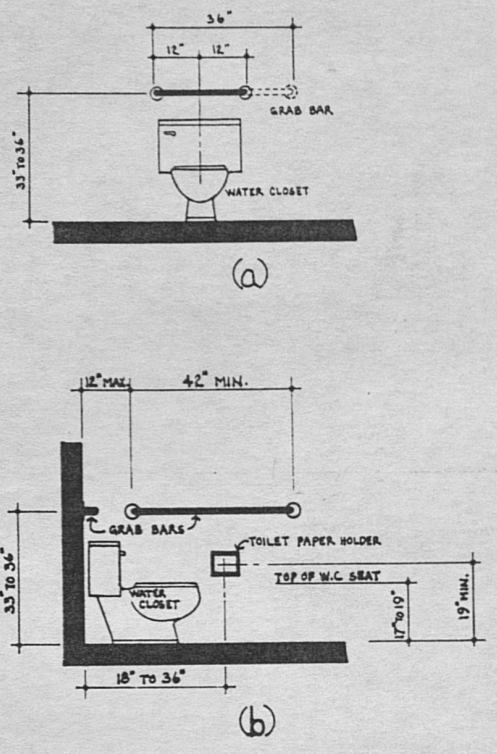


Figure 10
GRAB BARS AT WATER CLOSETS

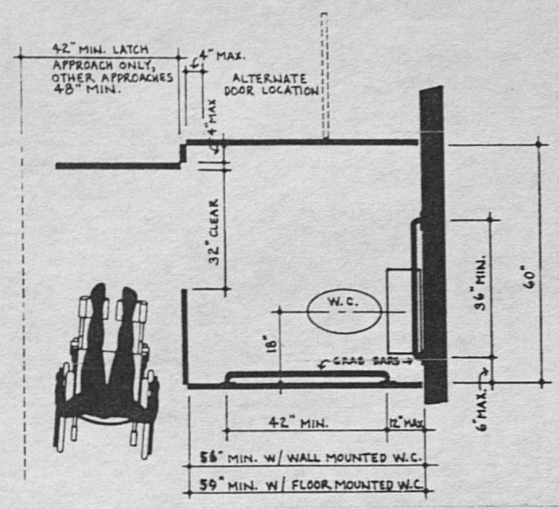


Figure 11
TOILET STALLS

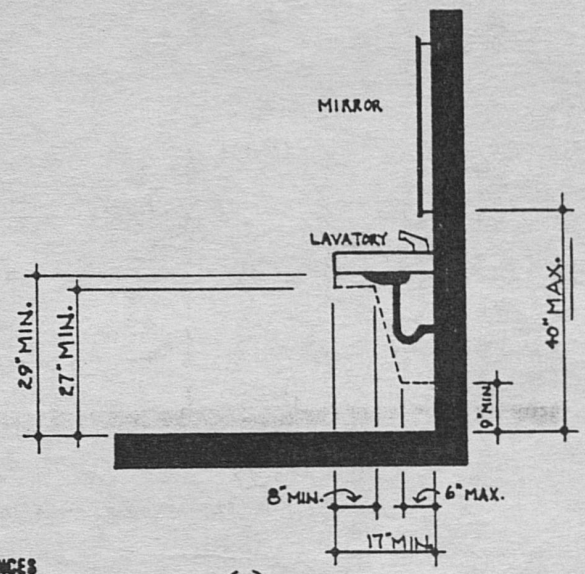
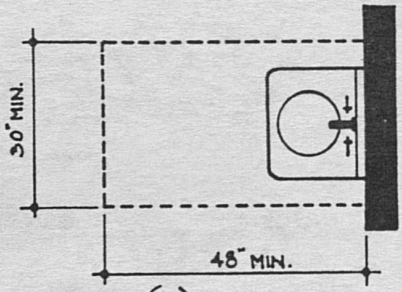
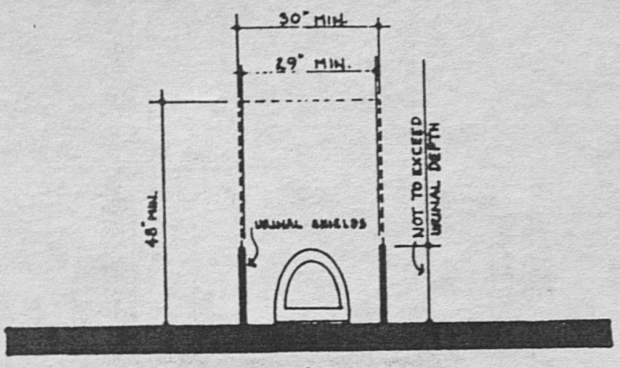


Figure 12
LAVATORY CLEARANCES

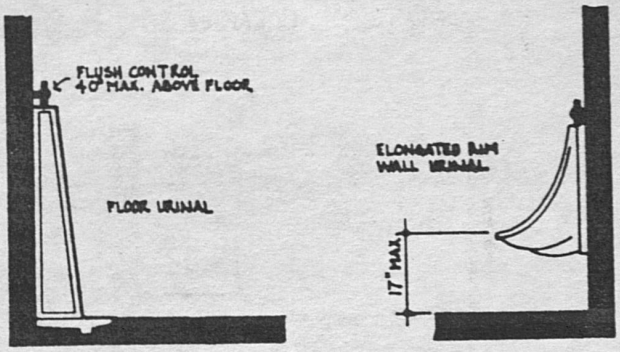
(a)
LAVATORY CLEARANCES



(b)
CLEAR FLOOR SPACE

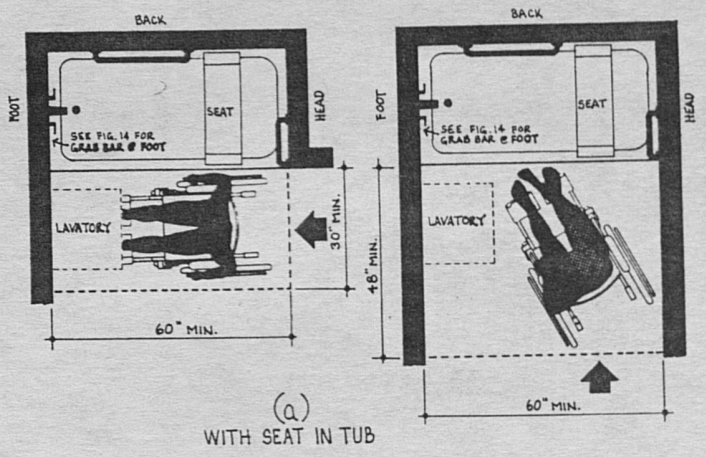


(a)
CLEAR FLOOR SPACE & URINAL SHIELDS

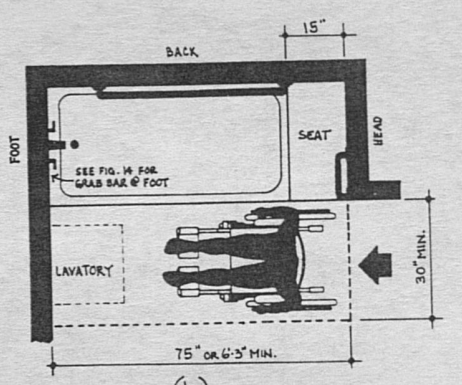


(b)
URINAL TYPE & MOUNTING HEIGHTS

Figure 12.1
URINALS



(a)
WITH SEAT IN TUB



(b)
WITH SEAT AT HEAD OF TUB

Figure 13
CLEAR FLOOR SPACE AT BATHTUBS

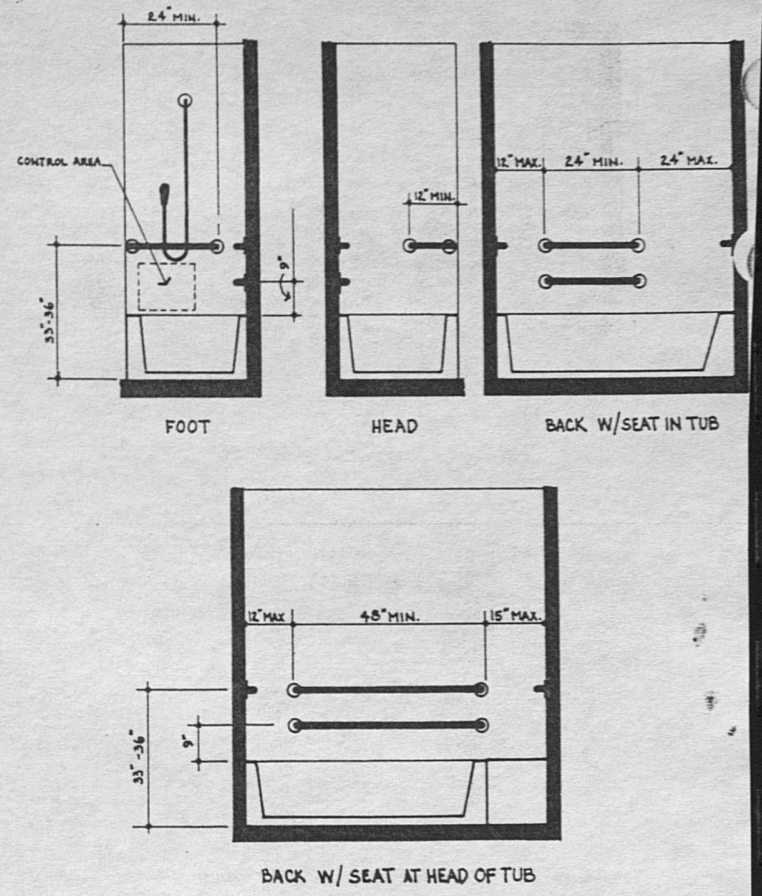


Figure 14
GRAB BARS AT BATHTUBS

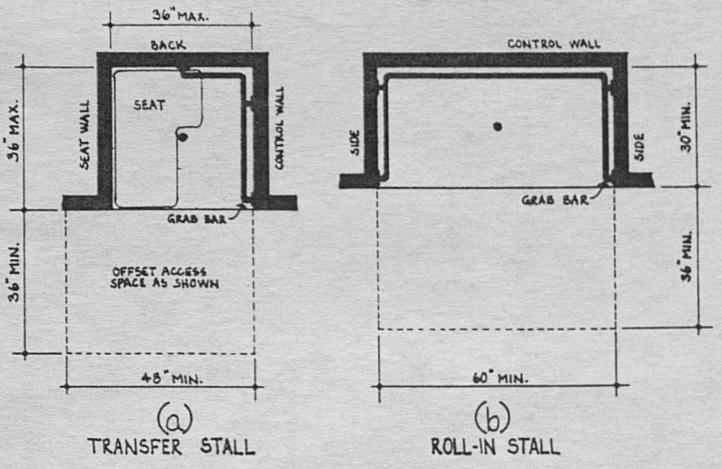


Figure 15
SHOWER SIZE AND CLEARANCES

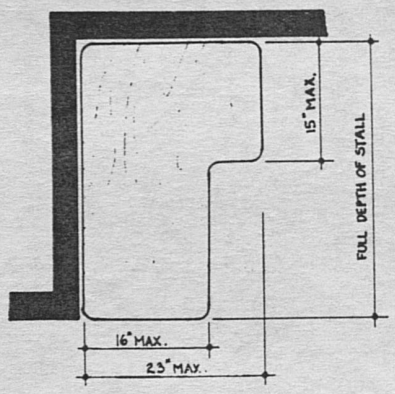


Figure 16
SHOWER SEAT DESIGN

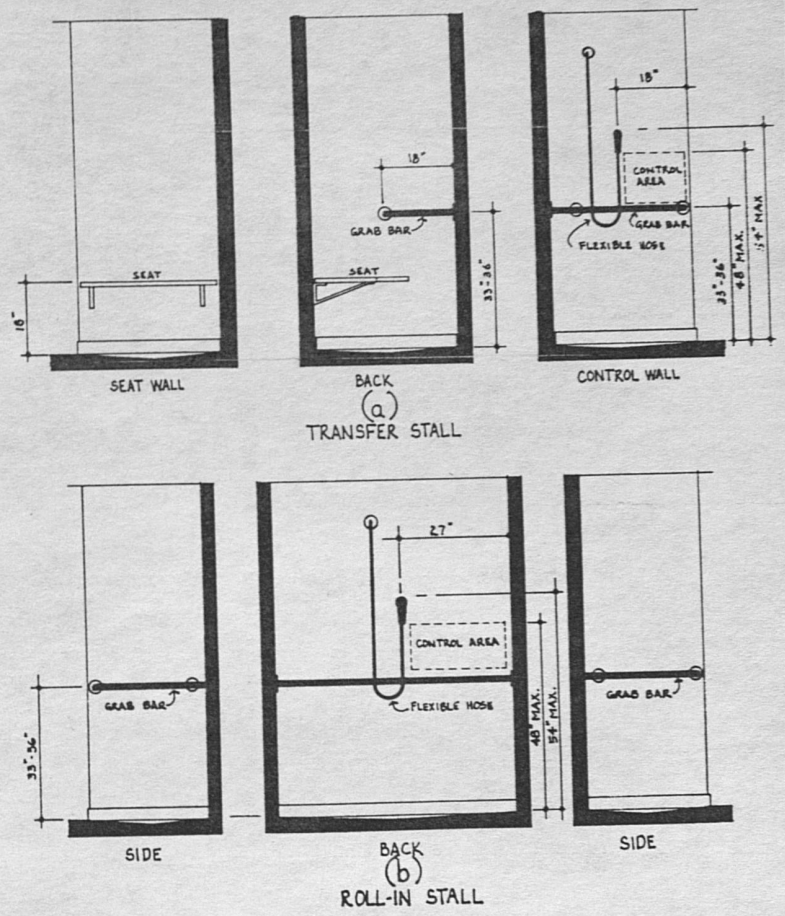


Figure 17
GRAB BARS AT SHOWER STALLS

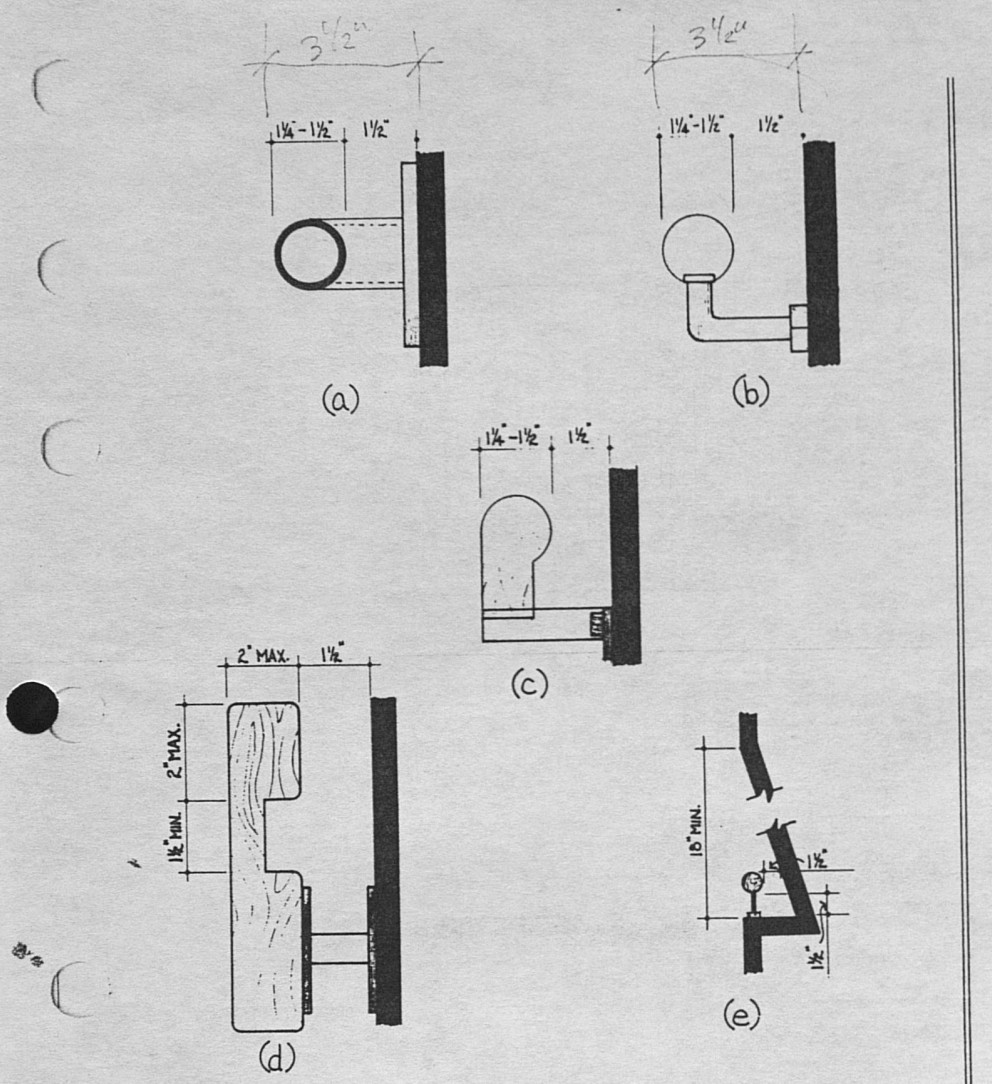


Figure 18
GRAB BARS AND HANDRAILS

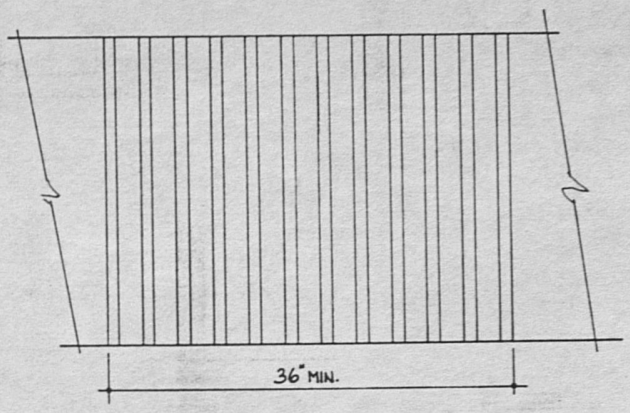
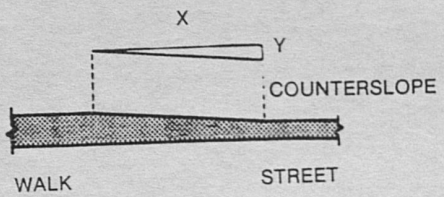


Figure 19
TACTILE WARNINGS ON WALKING SURFACES



Notes:
(1) Slope = y : x where x is a level plane.
(2) Counterslope shall not exceed 1:20.

Figure 20(a)
MEASUREMENT OF CURB RAMP SLOPES

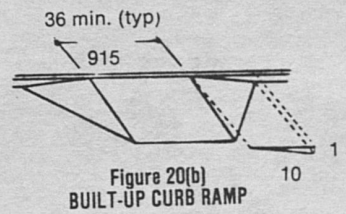
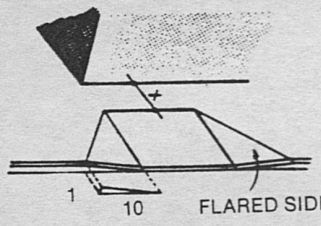


Figure 20(b)
BUILT-UP CURB RAMP



Notes:
(1) If $x < 4k$ in. (1220 mm) then the slope of the flared sides shall not exceed 1:12.

Figure 20(c)
FLARED SIDES

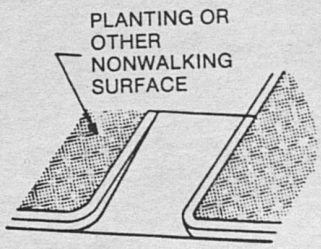


Figure 20(d)
RETURNED CURB

Figure 20
SIDES OF CURB RAMPS

GENERAL NOTES CONCERNING STANDARDS CITED IN THE NATIONAL BUILDING CODE

The appendices of the BOCA *National Building Code* contain listings of the many standards which are referenced in the text and other sources of information which are useful in the compliance process.

Appendix A contains a listing of standards which are directly referenced in the code text. The listing of the standards includes the standard title and number, the issuing agency as well as the effective date of the standard. In addition, each section of the code which references the standard is identified. These standards are intended to serve as criteria for compliance with the *National Building Code* and the text of the code specifically indicates their applicability.

Appendices B, C and D contain information that is potentially useful to a designer, engineer or building official seeking information related to dead loads of various building materials and systems, recommended fastening methods and metric unit conversion factors.

Wherever possible, the standards in Appendix A have been listed under the designation of the principal authoring agency. Many of these standards are reissued by one or more agencies, in addition to the authoring agency, under their own designations. While there may be some variation in details in the various versions of the same standard issued by several agencies, these differences are generally of such minor nature that any of the versions is acceptable even though not specifically listed herein.

For example, the standard fire test procedure for building construction and materials originating in a committee of the American Society for Testing Materials and issued as ASTM E119 *Methods of Fire Tests of Building Construction and Materials,* is also published by the National Fire Protection Association and issued as NFiPA 251 *Standard Methods of Fire Tests of Building Construction and Materials,* and by Underwriters' Laboratories, Incorporated, which issues it as UL 263 *Standards for Fire Tests of Building Construction and Materials.*

APPENDIX A
REFERENCED STANDARDS

The following is a listing of the standards referenced in this code, the effective date of the standard, the promulgating agency of the standard and the section(s) of this code that refer to the standard.

AA

Aluminum Association
900 19th Street, N.W.
Suite 300
Washington, D.C. 20006

Standard reference number	Title	Referenced in code Section number
ASM 35—80	Aluminum Sheet Metal Work in Building Construction — Specifications for	1901.1
SAS 30—86	Aluminum Structures — Specifications for	1901.1

AAMA

American Architectural Manufacturers Association
2700 River Road, Suite 118
Des Plaines, Illinois 60018

Standard reference number	Title	Referenced in code Section number
1402—86	Standard Specifications for Aluminum Siding, Soffit and Fascia	Table 2104.1
1602.1—77	Calculating Skylight Manual Energy Balance — Voluntary Standard Procedure for	3102.2.2 3102.3.2, 3102.3.6.1

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W.
Suite 225
Washington, D.C. 20001

Standard reference number	Title	Referenced in code Section number
HB-13—83	Highway Bridges, Standard Specifications for — 1984, 1985 & 1986 Supplements	1106.1.1

ACI

American Concrete Institute
P.O. Box 19150
Detroit, Michigan 48219

Standard reference number	Title	Referenced in code Section number
318—83	Reinforced Concrete — Building Code Requirements for — 1986 Revision	1113.9, 1113.9.2, 1113.9.3.3, 1113.9.3.4, 1209.2, 1209.6, 1212.3, 1212.4, 1500.1, 1500.2, 1501.1, Table 1501.1, 1502.1, 1502.2, 1502.4.2, 1502.5.1, 1502.6.1, 1502.7, 1503.1, 1503.2, 1503.2.1, 1503.2.1, 1503.3.3, 1503.3.4, 1503.4.1, 1503.4.4, 1504.3.2, 1504.6.2, 1506.1, 1506.3.1, 1506.5, 1506.6.2, 1506.6.5
318.1—83	Structural Plain Concrete — Building Code Requirements for	1500.2
506.2—77	Shotcrete, Specification for Materials, Proportioning, and Application of — 1983 Revision	1508.9
531—79	Concrete Masonry Structures — Building Code Requirements for — 1983 Revision	908.3, 1410.1, 1411.1, 1412.1, 1417.3, 1418.1, 1422.3, 1804.1

AHA

American Hardboard Association
520 N. Hicks Road
Palatine, Illinois 60067

Standard reference number	Title	Referenced in code Section number
A135.6—84	Hardboard Siding	1709.7, 2104.2
A194.1—85	Cellulosic Fiber Insulation Board	1709.1

AISC

American Institute of Steel Construction, Inc.
400 N. Michigan Avenue
Chicago, Illinois 60611

Standard reference number	Title	Referenced in code Section number
AISC—78	Design, Fabrication and Erection of Structural Steel for Buildings — Specification for the — 1986 Supplement #1	1113.9.2, 1113.9.3.2, 1113.9.3.3, 1801.1
AISC-LF-86	Load and Resistance Factor Design Specifications for Structural Steel Buildings	1801.1

AISE

Association of Iron and Steel Engineers
Three Gateway Center
Suite 2350
Pittsburgh, Pennsylvania 15222

Standard reference number	Title	Referenced in code Section number
Technical Report #13	Guide for the Design and Construction of Mill Buildings	1108.4

AISI

American Iron and Steel Institute
1000 Sixteenth Street, N.W.
Washington, D.C. 20036

Standard reference number	Title	Referenced in code Section number
AISI—73	Structural Applications of Steel Cables for Buildings — Manual for	1807.2
AISI—74	Design of Cold Formed Stainless Steel Structural Members — Specification for	1802.1
AISI—80	Designing Fire Protection for Steel Columns	903.1.1
AISI—81	Designing Fire Protection for Steel Trusses	903.1.1
AISI—84	Designing Fire Protection for Steel Beams	903.1.1
AISI—86	Design of Cold Formed Steel Structural Members — Specification for	1802.1

AITC

American Institute of Timber Construction
333 W. Hampden Avenue
Suite 712
Englewood, Colorado 80110

Standard reference number	Title	Referenced in code Section number
108—86	Heavy Timber Construction — Standard for	1702.1
109—84	Structural Glued Laminated Timber — Treating Standard for	1708.2
112—81	Tongue and Groove Heavy Timber Roof Decking — Standard for	1702.1
117—85	Structural Glued Laminated Timber of Softwood Species — Design Standard Specifications for — Addendum 1985	1702.1
119—85	Hardwood Glued Laminated Timber — Standard Specifications for	1702.1
A190.1—83	Structural Glued Laminated Timber	1702.1

ANSI

American National Standards Institute, Inc.
1430 Broadway
New York, New York 10018

Standard reference number	Title	Referenced in code Section number
A10.5—81	Material Hoists — Safety Requirements for	2614.5
A12.1—73	Floor and Wall Openings, Railings, and Toeboards — Safety Requirements for	3013.4
A13.1—81	Scheme for the Identification of Piping Systems	603.5.3
A58.1—82	Loads, Minimum Design in Buildings and other Structures — Building Code Requirements for	623.4 1102.2, 1104.1, 1112.3.1, Table 1112.3.3a, Table 1112.3.3b, 1112.3.4.1, 1112.3.4.2, 1112.3.6
A108.4—85	Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesives — Installation of	1409.6
A108.5—85	Tile, Ceramic, Installed with Dry Set Portland Cement Mortar	1409.5.1 1409.5.2
A108.6—85	Tile, Ceramic, Installed with Grouting Epoxy	1409.7
A108.7—85	Tile, Electrically Conductive Ceramic, Installed with Conductive Dry Set Portland Cement Mortar	1409.5.1 1409.5.2
A117.1—86	Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped People — Specifications for	512.4 2607.4
A118.1—85	Dry Set Portland Cement Mortar — (For Ceramic Tile)	1409.5.1
A118.2—85	Conductive Dry Set Portland Cement Mortar, Standard Specification for (Ceramic Tile)	1409.5.1
A118.3—85	Epoxy, Chemical Resistant, Water Cleanable Tile Setting and Grouting — Standard Specifications for	1409.7
A118.4—85	Latex Portland Cement Mortar — Standard Specification for (Ceramic Tile)	1409.5.2
A136.1—85	Organic Adhesives for Installation of Ceramic Tile	1409.6
A208.1—79	Mat Formed Wood Particle Board	1711.1 1711.2
B153.1—81	Construction, Care and Use of Automotive Lifts — Safety Requirements for	2615.1
Z49.1—83	Safety in Welding and Cutting	3018.5
Z97.1—84	Safety Glazing Material Used in Buildings — Performance Specifications and Methods of Test for	2203.1 2206.1

APA

American Plywood Association
7011 S. 19th Street
Tacoma, Washington, 98466

Standard reference number	Title	Referenced in code Section Number
E30—86	Design/Construction Guide Residential and Commercial	1710.1
E315C—86	Plywood Diaphrams, Report No. 138	1707.1 1708.3
H815—85	Design and Fabrication of All-Plywood Beams	1708.3
S811—85	Plywood Curved Panels—Design and Fabrication of	1707.1 1708.3
S812—86	Plywood Lumber Beams—Design and Fabrication of	1707.1 1708.3
U813—84	Plywood Stressed-Skin Panels—Design and Fabrication of	1707.1 1708.3
U814—82	Plywood Sandwich Panels—Design and Fabrication of	1707.1 1708.3
Y510—86	Plywood Design Specification	1710.1

ASHRAE

American Society of Heating,
Refrigerating and Air Conditioning Engineers
1791 Tullie Circle, N.E.
Atlanta, Georgia 30329

Standard reference number	Title	Referenced in code Section Number
90A—80	Energy Conservation in New Building Design	3100.2 3102.1
90B—80	Energy Conservation in New Building Design	3100.2 3106.2

ASME

American Society of Mechanical Engineers
United Engineering Center
345 East 47th Street
New York, New York 10017

Standard reference number	Title	Referenced in code Section Number
ASME—86	Boiler and Pressure Vessel Code, Section VIII, Divisions 1 & 2, Summer 86 Addenda	2614.4
A17.1—87	Elevators, Dumbwaiters, Escalators and Moving Walks Safety Code with the Exception of Rules	

ASME (cont'd.)

	102.2(c)(4) and 700.4b, 700.5, 700.7b, 700.10b, 707.4	820.2
		1108.2, 2600.2, 2602.4.1, 2602.4.2, 2602.5.1, 2603.3.2, 2604.3, 2605.8.2, 2605.8.3, 2605.8.5, 2605.9.2, 2605.9.3, 2605.9.5 2606.1, 2607.2, 2607.3.2, 2609.1, 2610.1, 2611.4, 2612.1, 2617.1, 3204.2.14
0.1—85	Belt Manlifts—Safety Standard for	2600.1 2602.5.3
B20.1—84	Conveyors and Related Equipment —Safety Standard for	2616.3
B31.3—84	Power Piping	603.5

ASTM

American Society for Testing and Materials
1916 Race Street
Philadelphia, Pennsylvania 19103

Standard Reference Number	Title	Referenced in code Section Number
A36—84A	Structural Steel — Specifications for	1215.1
A48—83	Gray Iron Castings — Specifications for	1806.1
A252—82	Welded and Seamless Steel Pipe Piles — Specifications for	1215.1 1216.1
A256—82	Cast Iron — Compression Testing of	1806.1
A283—85	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars — Specifications for	1215.1 1216.1
A416—85	Uncoated Seven Wire Stress Relieved Strand for Prestressed Concrete — Specifications for	1218.3.2
A572—85	High Strength Low Alloy Columbium Vanadium Steels of Structural Quality — Specifications for	1215.1
A588—85	High Strength Low Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4 in. Thick — Specifications for	1215.1
A706—84	Low-Alloy Steel Deformed Bars for Concrete Reinforcement — Specifications for	1502.5.2
C5—84	Quicklime for Structural Purposes — Specifications for	Table 1601
C28—86	Gypsum Plasters — Specifications for	Table 1601
C31—84	Making and Curing Concrete Test Specimens in the Field — Practice for	1503.4.2 1503.4.3
C33—86	Concrete Aggregates — Specifications for	1502.3 Table 1503.3.1
C34—84	Structural Clay Loadbearing Wall Tile — Specifications for	1403.1
C35—81	Inorganic Aggregates for Use in Gypsum Plaster — Specifications for	Table 1601
C36—85	Gypsum Wallboard — Specifications for	Table 1603
C37—84	Gypsum Lath — Specifications for	Table 1601
C39—84	Compressive Strength of Cylindrical Concrete Specimens — Method for	1503.4.2
C56—86	Structural Clay Nonloadbearing Tile — Specifications for	1403.1

ASTM (cont'd.)

C59—83	Gypsum Casting and Molding Plaster — Specifications for	Table 1601
C61—81	Gypsum Keene's Cement — Specifications for	Table 1601
C62—85	Building Brick (Solid Masonry Units made from Clay or Shale) — Specifications for	1402.1
C64—85	Refractories for Incinerators and Boilers — Specifications for	2402.2
C67—86	Brick and Structural Clay Tile— Sampling and Testing	1410.2
C73—85	Calcium Silicate Face Brick (Sand Lime Brick) — Specifications for	1402.1
C79—84	Gypsum Sheathing Board — Specifications for	Table 1603
C94—86A	Ready-Mixed Concrete — Specification for	1504.3.1
C105—81	Ground Fire Clay as a Refractory Mortar for Laying Up Fireclay Brick — Specifications for	2402.2
C126—84	Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units — Specifications for	1404.1
C144—84	Aggregate for Masonry Mortar — Specifications for	1409.2.1
C150—86	Portland Cement — Standard Specification for	1502.2 1503.2.1, 1503.2.2, Table 1601
C172—82	Sampling Freshly Mixed Concrete — Method of	1503.4.2
C206—84	Finishing Hydrated Lime — Specification for	Table 1601
C208—82	Insulating Board (Cellulosic Fiber) Structural and Decorative — Specifications for	1709.1
C212—86	Structural Clay Facing Tile—Specification for	1403.1
C216—86	Facing Brick (Solid Masonry Units Made from Clay or Shale) — Specification for	1402.1
C231—82	Air Content of Freshly Mixed Concrete by the Pressure Method — Test Method for	1503.3.1
C260—86	Air-Entraining Admixtures for Concrete — Specification for	1502.6.2
C270—86B	Mortar for Unit Masonry — Specification for	1409.1 1409.2.1
C330—82	Lightweight Aggregates for Structural Concrete — Specification for	1502.3
C404—85	Aggregates for Masonry Grout — Specification for	1409.2.2
C474—85	Joint Treatment Materials for Gypsum Wallboard Construction — Standard Methods of Testing	Table 1603
C475—81	Joint Treatment Materials for Gypsum Wallboard Construction — Standard Methods of Testing	Table 1603
C476—83	Grout for Masonry — Specification for	1409.1
C494—86	Chemical Admixtures for Concrete — Specification for	1502.6.2
C514—84	Nails for the Application of Gypsum Wallboard — Standard Specification for	Table 1603
C532—79	Structural Insulating Formboard (Cellulosic Fiber) — Specification for	1709.1
C587—83	Gypsum Veneer Plaster — Specification for	Table 1601
C588—84A	Gypsum Base for Veneer Plasters — Specification for	Table 1601
C595—85	Blended Hyudraulic Cements — Specification for	1503.2.2
C618—85	Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete — Specification for	1502.6.3
C630—85	Water Resistant Gypsum Backing Board — Specification for	Table 1603 1603.4

ASTM (cont'd.)

C631—81	Bonding Compounds for Interior Plastering — Standard Specification for ..... Table 1601
C645—83	Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board — Standard Specification for ..... Table 1601 Table 1603
C652—85	Hollow Brick (Hollow Masonry Units Made from Clay or Shale) — Specification for 1402.1
C685—86A	Concrete Made by Volumetric Batching and Continuous Mixing — Specification for..... 1504.3.1
C754—82	Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board — Standard Specification for Installation of ..... Table 1604
C841—81	Installation of Interior Lathing and Furring — Specification for..... Table 1604
C842—85	Application of Interior Gypsum Plaster — Specification for..... Table 1604
C843—85	Application of Gypsum Veneer Plaster — Specification for..... Table 1604
C844—85	Application of Gypsum Base to Receive Gypsum Veneer Plaster — Specification for ..... Table 1604
C847—83	Metal Lath — Specification for ..... Table 1601
C887—84	Surface Bonding Mortar — Specification for Packaged, Dry, Combined Materials for..... 1422.2
C897—83	Aggregate for Job-Mixed Portland Cement-Based Plasters — Standard Specification for..... Table 1601
C926—86	Portland Cement Based-Plaster — Specification for Application of 1602.3
C932—85	Surface-Applied Bonding Agents for Exterior Plastering — Standard Specification for ..... Table 1601
C933—85	Welded Wire Lath — Standard Specification for ..... Table 1601
C946—84	Dry-stacked, Surface-Bonded Walls — Practice for Construction of 1422.2 1422.4
C954—86	Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness — Standard Specification for ..... Table 1601 Table 1603
C955—86	Load-Bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases — Standard Specification for ..... Table 1601
C1002—83	Specification for Drill Screws for the Application of Gypsum Board ..... Table 1601 Table 1603
C1007—83	Installation of Load Bearing (Transverse and Axial) Steel Studs and Accessories — Standard Specification for..... Table 1604
D25—86	Round Timber Piles — Specification for 1219.1
D56—82	Flash Point by Tag Closed Tester — Test for.....Table 306.2
D92—85	Flash and Fire Points by Cleveland Open Cup — Method of Test for .....Table 306.2
D93—85	Flash Point by Pensky-Martens Closed Tester — Method of Test for .....Table 306.2
D568—85	Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position, Test Method for 2907.4.2

ASTM (cont'd.)

D635—81	Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position — Test Method for	2000.2, 2001.1
D1143—81	Piles under Axial Compressive Load — Testing	1214.4
D1929—85	Ignition Properties of Plastics — Test Method for	2000.2, 2001.1, 2002.4
D2277—80	Fiberboard Nail Base Sheathing — Specification for	1709.1
D2843—77	Density of Smoke from the Burning or Decomposition of Plastics — Test Method for	2000.2, 2001.1
D2898—86	Accelerated Weathering of Fire-Retardant Treated Wood for Fire Testing	903.5.2
D3201—86	Fire-Retardant Wood and Wood-Base Products — Test Method for Hygroscopic Properties of	903.5.2
D3679—86	Rigid Poly (Vinyl Chloride) (PVC) Siding — Specification for	Table 2104.1
D3689—83	Individual Piles under Static Axial Tensile Load — Testing	1214.7
E72—80	Strength Tests of Panels for Building Construction — Conducting	1418.2, 1419.2, 1704.3
E84—84	Surface Burning Characteristics of Building Materials — Test Method for	903.4.1.2, 903.5.1, 904.2, 922.3, 922.5.3, 928.2, 928.3, 929.2.1, 929.2.2, 2000.2, 2001.1, 2002.1.1, 2002.3.8.4, 2002.3.10.3, 2002.4
E90—85	Airborne Sound Transmission Loss of Building Partitions — Laboratory Measurements of	714.2
E108—83	Fire Tests of Roof Coverings	2204.6.1, 2204.6.2, 2301.1
E119—83	Fire Test of Building Construction and Materials — Methods of	903.1.1, 903.5.2, 906.2.4, 906.4, 915.7.1, 2002.2
E136—82	Behavior of Materials in a Vertical Tube Furnace at 750° C. — Standard Test Method for	903.4.1.1
E152—81A	Fire Test of Door Assemblies	911.4, 916.1, 916.1.1
E163—84	Fire Test of Window Assemblies	917.1
E283—84	Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors	3102.4.1
E447—84	Compressive Strength of Masonry Prisms — Test Method for	1418.2, 1419.2
E492—86	Impact Sound Transmission Through Floor/Ceiling Assemblies Using the Tapping Machine — Laboratory Measurement of	714.3
E518—80	Flexural Bond Strength of Masonry — Test for	1418.2, 1419.2
E519—81	Diagonal Tension (Shear) in Masonry Assemblages — Test for	1418.2, 1419.2
E648—86	Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source — Test for	904.3, 922.7.5
E814—83	Fire Tests of Through-Penetration Fire Stops — Test Method for	915.4.1, 915.7.1

AWPA

American Wood Preservers Association
P.O. Box 849
Stevensville, Maryland 21666

Standard reference number	Title	Referenced in code Section number
C1—86	Pressure Treatment (General Requirements) — All Timber Products	1712.2.2
C2—85	Pressure Treatment — Lumber, Timber, Bridge Ties and Mine Ties	1207.1, 1207.2, 1712.2.2
C3—86	Pressure Treatment — Piles	1207.1, 1219.2
C4—86	Pressure Treatment — Poles	1207.2
C9—85	Pressure Treatment — Plywood	1712.2.2
C20—84	Fire-Retardant Pressure Treatment — Structural Lumber	903.5.2
C27—84	Fire-Retardant Pressure Treatment — Plywood	903.5.2
M4—84	Preservative Treated Wood Products — Care of	1219.2
P1—78	Creosote — Standard for	1712.2.2
P2—85	Creosote — Coal Tar Solutions	1712.2.2
P5—86	Water Borne Preservatives	1712.2.2
P8—77	Oil Borne Preservatives	1712.2.2
P9—84	Organic Preservatives Systems — Standard for Solvents for	1712.2.2

AWPB

American Wood Preservers Bureau
P.O. Box 5283
Springfield, Virginia 22150

Standard reference number	Title	Referenced in code Section number
FDN—80	Softwood Lumber, Timber and Plywood Pressure Treated with Water Borne Preservatives for Ground Contact Use in Residential and Light Commercial Foundations — Quality Control Program for	1207.3
LP-2—80	Softwood Lumber, Timber and Plywood Pressure Treated with Water Borne Preservatives for Above Ground Use — Standard for	1712.2.2, 1712.3.1
LP-22—80	Softwood Lumber, Timber and Plywood Pressure Treated with Water Borne Preservatives for Ground Contact Use — Standard for	1712.2.2, 1712.3.2, 1712.3.3
LP-33—78	Pressure Treated Lumber and Plywood with Light Petroleum Solvent Penta Solution (for Ground Contact) — Quality Control Standards for	1712.2.2, 1712.3.3
LP-44—78	Pressure Treated Lumber and Plywood with Volatile Petroleum Solvent (LPG) Penta Solution (for Ground Contact) — Quality Control Standards for	1712.2.2, 1712.3.3

AWPB (cont'd.)

LP-55—78	Pressure Treated Lumber and Plywood with Creosote or Creosote Coal Tar Solution (for Ground Contact) — Quality Control Standards for	1712.2.2 1712.3.3
LP-77—78	Pressure Treated Lumber and Plywood with Heavy Petroleum Solvent Penta Solution (for Ground Contact) — Quality Control Standards for	1712.2.2 1712.3.3
MP-1—79	Dual Treatment of Marine Piling Pressure Treated with Water Borne Preservatives and Creosote for Use in Marine Waters — Standards for	1219.2
MP-2—79	Marine Piling Pressure Treated with Creosote for Use in Marine Waters — Standard for	1219.2
MP-4—75	Marine Piling Pressure Treated with Water Borne Preservatives for Use in Marine Waters — Standard for	1219.2

AWPI

American Wood Preservers Institute
Mail Order Section
1043 Amory Avenue
Kensington, Maryland 20895

Standard reference number	Title	Referenced in code Section Number
AWPI-PBA—69	Pole Building Design	1207.2

AWS

American Welding Society
P.O. Box 351040
Miami, Florida 33135

Standard reference number	Title	Referenced in code Section Number
D1.4—79	Structural Welding Code Reinforcing Steel	1502.5.2

BIA

Brick Institute of America
11490 Commerice Park Drive
Suite 300
Reston, Virginia 22091

Standard reference number	Title	Referenced in code Section Number
BIA—69	Engineered Brick Masonry — Building Code Requirements for	908.3 1410.1, 1412.1, 1417.2, 1418.1, 1804.1
TN5A—83	Sound Insulation — Clay Masonry Walls	714.4

BOCA

Building Officials and Code Administrators International
4051 West Flossmoor Road
Country Club Hills, Illinois 60477-5795

Standard reference number	Title	Referenced in code Section Number
NESC—87	National Existing Structures Code	103.1
NFPC—87	The Kentucky Fire Safety Standards (BOCA Fire Prevention Code as amended in Chapter 10, Title 815 of the Kentucky Administrative Regulations) shall be used as the fire prevention code	103.1 200.3, 306.2.1, Table 306.2.1, 600.8, 600.8.1, 602.2, 604.1, 617.1, 619.1, 620.1, 622.2, 1000.2, 1012.7, 1019.1.3, 3018.1
NMC—87	National Mechanical Code	200.3 401.4.2, 401.4.3, 600.4, 600.5, 603.1.7, 607.3, 609.3.1, 609.4, 613.3, 617.3, 619.4, 620.1, 622.3, 622.3.1, 701.1, 706.3, 707.1, 709.3, 918.2, 928.2, 929.2.3, 929.2.4, 1002.20, 1002.21, 1008.6, 1010.6, 1303.6, 1605, 2400.2, 2500.2, 2501.1, 2501.3, 2502.1, 2503.1, 2507.3, 2508.3, 2608.5, 2701.2.3, 3005.2, 3018.3, 3101.1, 3104.1, 3204.2.8
NPC—87	The Kentucky State Plumbing Code (815 KAR Chapter 20) shall be used as the plumbing code	200.3 401.4.3, 609.2.4, 609.3, 619.4, 710.7, 927.7.2, 1224.5.3, 1303.6, 2800.1, 2801.3, 2803.3, 2805.1, 2805.3, 3021.1, 3101.1, 3105.1
NPSDC—84	Basic/National Private Sewage Disposal Code	111.6.1 2807.1

CABO

Council of American Building Officials
5205 Leesburg Pike
Suite 201
Falls Church, Virginia 22041

Standard reference number	Title	Referenced in code Section Number
CABO—86	One and Two Family Dwelling Code* — 1987 Supplement	309.5 3100.1
CABO—86	Model Energy Code*	

*Publications available from BOCA

CMAA

Crane Manufacturers Association of America
8720 Red Oak Blvd.
Suite 201
Charlotte, North Carolina 28210

Standard reference number	Title	Referenced in code Section Number
70—83	Electric Overhead Traveling Cranes — Specifications for	1108.4

MBMA

Metal Building Manufacturers Association
1230 Keith Building
Cleveland, Ohio 44115

Standard reference number	Title	Referenced in code Section Number
MBMA—86	Low Rise Building Systems Manual	1108.4 1802.1

NBS

National Bureau of Standards
Gaithersburg, Maryland 20760

Standard reference number	Title	Referenced in code Section Number
211—54(A41.1)	Masonry — Building Code Requirements for	908.3 1212.3, 1412.1, 1419.1
H74—60(A41.2)	Reinforced Masonry — Building Code Requirements for	908.3 1410.1, 1411.1, 1412.1, 1418.1, 1804.1

NCMA

National Concrete Masonry Association
2302 Horse Pen Road
Herndon, Virginia 22070

Standard reference number	Title	Referenced in code Section Number
TEK69 A-78	STC Values of Concrete Masonry Walls	714.4
TR 75-B—85	Design and Construction of Load Bearing Concrete Masonry — Specifications for	908.3 1410.1, 1411.1, 1412.1, 1418.1, 1422.3, 1804.1

NFiPA

National Fire Protection Association
Batterymarch Park
Quincy, Massachusetts 02269

Standard reference number	Title	Referenced in code Section Number
10—84	Installation, Maintenance and Use of Portable Fire Extinguishers	1021.2
11—83	Foam Extinguishing Systems	1007.1
11A—83	High Expansion Foam Systems	1007.1
12—85	Carbon Dioxide Extinguishing Systems	1008.1 1008.5
12A—85	Halogenated Extinguishing Agent Systems — Halon 1301	1009.1 1009.5
12B—85	Halogenated Fire Extinguishing Agent Systems — Halon 1211	1009.1 1009.5

NFiPA (cont'd.)

13—87	Installation of Sprinkler Systems	606.3, 907.1.1, 1004.1, 1004.3
14—86	Standpipe and Hose Systems	1012.1
15—85	Water Spray Fixed Systems	1006.1, 1006.4
16—86	Foam Water Sprinkler and Spray Systems	1007.1
17—85	Dry Chemical Extinguishing System	1010.1, 1010.5
17A-86	Liquid Agent Extinguishing Systems — Standard for the Installation of	1011.1, 1011.2
26—83	Supervision of Water Supply Valves	1004.6
30—84	Flammable and Combustible Liquids Code	603.4, 619.1
32—85	Dry Cleaning Plants	619.4
33—85	Spray Application Using Flammable and Combustible Liquids	622.1
34—82	Dipping and Coating Processes Using Flammable or Combustible Liquids	622.1
40—82	Cellulose Nitrate Motion Picture Film	613.1
50—85	Bulk Oxygen Systems at Consumer Sites	2510.1
51—83	Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes	2510.1
56F-83	Nonflammable Medical Gas Systems	2509.1
61A—84	Manufacturing and Handling Starch	617.1
61B—80	Prevention of Fire and Dust Explosions in Grain Elevators and Bulk Grain Handling Facilities	617.1
61C-84	Prevention of Fire and Dust Explosives in Feed Mills	617.1
61D—84	Milling of Agricultural Commodities for Human Consumption	617.1
65—80	Processing and Finishing of Aluminum	617.1
70—90	National Electrical Code	401.4.4, 603.1.9, 603.4.6, 603.5.2, 622.2, 2102.6, 2106.4, 2109.4, 2112.6, 2700.1, 2700.3, 2703.1, 2705.3, 2706.1, 2707.1, 2907.3, 2914.1
71—85	Central Station Signaling Systems	1020.1
72A—87	Local Protective Signaling Systems	1017.1, 1017.5, 1017.7.1, 1020.1
72C—86	Remote Station Protective Signaling Systems	1020.1
72D—86	Proprietary Protective Signaling Systems	1020.1
72E—84	Automatic Fire Detectors	1018.1, 1019.4.1, 2611.4
80—86	Fire Doors and Windows	909.3.1, 916.2
82—83	Incinerators, Waste and Linen Handling Systems and Equipment, Standard on	2506.1
85F—82	Pulverized Fuel Systems — Installation and Operation	617.1
99—84	Health Care Facilities	2509.2
102—86	Assembly Seating, Tents and Air Supported Structures	612.1, 626.4
231C—86	Rack Storage of Materials, Standard for	504.1, Table 930
418—79	Roof-top Heliport Construction and Protection	614.3
495—85	Code for Explosive Materials	Table 306.2.1
651—80	Manufacture of Aluminum or Magnesium Powder — Standard for the	617.1

NFiPA (cont'd.)

653—71	Dust Explosions in Coal Preparation Plants, — Prevention of	617.1
654—82	Dust Explosions in the Plastics Industry — Prevention of	617.1
655—82	Sulfur Fires and Explosions — Prevention of	617.1
664—81	Dust Explosions in Woodworking and Wood Floor Manufacturing Plants — Prevention of	617.1
701—77	Fire Tests for Flame Resistant Textile and Film — Standard Methods of	604.2.2 626.5, 904.4.1, 904.4.3, 2907.4.2
704—85	Identification of the Fire Hazard of Materials	201.0 (Hazardous production material — HPM) 603.5.1

These NFiPA standards are to be used for fire suppression requirements and design only, where referenced in a specific code required in the body of the code.

NFPA 43C	Gaseous Oxidizing Materials
NFPA 58	LP Gas Storage
NFPA 231	High Piles Storage in Excess of 12 Ft. in Height
NFPA 231D	Rubber Tire Storage
NFPA 231E	Baled Cotton Storage
NFPA 231F	Rolled Paper Storage
NFPA 96	Rangehoods
NFPA 75	Computer Rooms
NFPA 232AM	Archieves and Record Centers
NFPA 59A	L.N. Gas Storage and Handling
NFPA 69	Explosion Prevention Systems
NFPA 81	Fur Storage
NFPA 214	Cooling Towers
NFPA 303	Marinas and Boatyards
NFPA 910	Library Stacks
NFPA 409	Aircraft Hangars
NFPA 40C	Pyroxylin Plastics
NFPA 30, NFPA 36	Flammable Liquids
NFPA 45	Laboratories
NFPA 44A	Fireworks

NFoPA

National Forest Products Association
1250 Connecticut Avenue, N.W.
Washington, D.C. 20036

Standard reference number	Title	Referenced in code Section number
NFoPA—81	Design Values for Joists and Rafters	1705.2 1706.1
NFoPA—77	Span Tables for Joists and Rafters	1705.2 1706.1
NFoPA—86	National Design Specification for Wood Construction — 86 Supplement — Design Values for Wood Construction	1207.1 1701.1, 1702.1, 1705.2, 1706.1
TR7—82	All Weather Wood Foundation System — Basic Requirements, 1983 Supplement	1207.3 1224.3

PCI

Prestressed Concrete Institute
175 West Jackson Blvd.
Chicago, Illinois 60604

Standard reference number	Title	Referenced in code Section number
MNL 124—82	Fire Resistance of Precast Prestressed Concrete — Design for	903.1.1

RCSHSB

Red Cedar Shingle and Handsplit Shake Bureau
515 116th Avenue, N.E., Suite 275
Bellevue, Washington 98004

Standard reference number	Title	Referenced in code Section number
RCSHSB—84	Certigrade Red Cedar Shingles — Grading rules for	2302.1

SFES

Southeastern Forest Experiment Station
U.S. Dept. of Agriculture
Forest Service
200 Weaver Blvd., P.O. Box 2680
Asheville, North Carolina 28804

Standard reference number	Title	Referenced in code Section number
General Technical Report No. SE-33—85	Performance and Quality Control Standards for Composite Floor, Wall and Truss Framing	1708.4

SJI

Steel Joist Institute
1205 48th Avenue North
Suite A
Myrtle Beach, South Carolina 29577

Standard reference number	Title	Referenced in code Section number
SJI—86	Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders	1803.1

TFS

Texas Forest Service
P.O. Box 310
Lufkin, Texas 75901

Standard reference number	Title	Referenced in code Section number
TFS—85	Preservative Treated Southern Yellow Pine Taper Sawn Shakes — Grading Rules for	2302.1

TPI

Truss Plate Institute, Inc.
583 D'Onofrio Drive
Suite 200
Madison, Wisconsin 53719

Standard reference number	Title	Referenced in code Section number
TPI—85	Trusses — Design Specifications for Metal Plate Connected Wood — 1985 Supplement	1706.1
PCT—80	Design Specification for Metal Plate Connected Parallel Chord Trusses —1980 Supplement	1705.2

UL

Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, Illinois 60062

Standard reference number	Title	Referenced in code Section number
10A—80	Doors — Tin Clad Fire Doors — 1985 Supplement	916.2
14B—79	Sliding Hardware for Standard Horizontally Mounted Tin-Clad Fire Doors — 1984 Supplement	916.2
14C—79	Swinging Hardware for Standard Tin-Clad Fire Doors — 1984 Supplement	916.2
217—85	Single and Multiple Station Smoke Detectors — 1986 Supplement	610.6.1
268—81	Smoke Detectors for Fire Protective Singaling Systems — 1985 Supplement	610.6.1
555—79	Fire Dampers, and Ceiling Dampers — 1986 Supplement	918.1
910—85	Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables used in Air-Handling Spaces — Test Method for	929.2.5
1256—85	Fire Test of Roof Deck Construction	2002.3.4
1715—83	Test Method for the Classification of Interior Finish Material Assemblies Using A Room Fire Test	2002.4
Subject 1040—85	Outline of Investigation for Insulated Wall Construction	2002.4
UL—86	Fire Resistance Directory	903.1.2

USD

United States Diving, Inc.
901 W. New York Street
Indianapolis, Indiana 46202

Standard reference number	Title	Referenced in code Section number
USD—85	1985-86 Rules and Regulations of United States Diving, Inc.	625.9.1

APPENDIX B

UNIT DEAD LOADS FOR DESIGN PURPOSES

The intent of this appendix is to assist the designer and building official in establishing the minimum weights for materials commmonly used in building construction. Some material assemblies have a range in weight. A typical figure is indicated, but when there is reason to suspect a considerable deviation, the actual weight should be determined.

Note on use of Appendix B tables: When making calculations based on the tables in this appendix, the weights of masonry include mortar but not plaster. For plaster, add 5 psf for each face plastered. Values given represent averages. In some cases there is a considerable range of weight for the same construction. For metric conversion, 1 psf equals 4.882 kg/m^2 and 1 pcf equals 16.02 kg/m^3.

Table B-1
UNIT DESIGN DEAD LOADS FOR CONCRETE SLABS

Concrete slabs	Pounds per square foot
Concrete, reinforced stone, per inch of thickness	12½
Concrete, reinforced lightweight sand, per inch of thickness	9½
Concrete, reinforced, lightweight, per inch of thickness	9
Concrete, plain stone, per inch of thickness	12
Concrete, plain, lightweight, per inch of thickness	8½

Table B-2
UNIT DESIGN DEAD LOADS FOR RIBBED SLABS

Ribbed slabs Depth, in inches (rib depth plus slab thickness)*	Pounds per square foot					
	Width of rib, in inches					
	4	5	6	7	8	9
12-inch clay tile fillers (normal weight concrete):						
4 plus 2	49	51	52	54	—	—
6 plus 2	60	63	65	67	—	—
8 plus 2½	79	82	85	87	—	—
10 plus 3	96	100	103	106	—	—
12 plus 3	108	112	116	120	—	—
20-inch wide forms:						
6 plus 2½	45	48	50	50	—	—
8 plus 2½	51	54	57	60	—	—
10 plus 2½	57	60	64	68	—	—
12 plus 2½	63	67	72	76	—	—
14 plus 2½	—	74	79	84	—	—
16 plus 2½	—	—	88	93	98	—
20 plus 2½	—	—	—	111	118	—

* Make appropriate allowances for tapered ends.

Table B-2 (cont'd.)
UNIT DESIGN DEAD LOADS FOR RIBBED SLABS

Ribbed slabs Depth, in inches (rib depth plus slab thickness)*	Pounds per square foot					
	Width of rib, in inches					
	4	5	6	7	8	9
30-inch wide forms:						
6 plus 2½	41	43	45	47	—	—
8 plus 2½	45	47	50	53	—	—
10 plus 2½	49	52	55	58	—	—
12 plus 2½	53	57	60	64	—	—
14 plus 2½	—	62	66	70	—	—
16 plus 2½	—	—	72	76	80	—
20 plus 2½	—	—	—	90	95	101
Two-way clay tile fillers (12x12):						
4 plus 2	61	62	64	—	—	—
6 plus 2	87	89	90	—	—	—
8 plus 2½	100	103	107	—	—	—
10 plus 3	121	126	131	—	—	—
12 plus 3	136	141	146	—	—	—

* Make appropriate allowances for tapered ends.

Table B-3
UNIT DESIGN DEAD LOADS FOR WAFFLE SLABS

Waffle slabs Depth, in inches (Rib depth plus slab thickness)	Pounds per square foot
19 x 19, 5 @ 24	
6 plus 2½	66
8 plus 2½	78
10 plus 2½	85
12 plus 2½	101
30 x 30, 6 @ 36	
8 plus 3	73
10 plus 3	83
12 plus 3	95
14 plus 3	106
16 plus 3	114
20 plus 3	135

Table B-4
UNIT DESIGN DEAD LOADS FOR FLOOR FINISH

Floor finish	Pounds per square foot
Double ⅞-inch wood on sleepers, light concrete fill	19
Double ⅞-inch wood on sleepers, stone concrete fill	28
Single ⅞-inch wood on sleepers, light concrete fill	16
Single ⅞-inch wood on sleepers, stone concrete fill	25
3-inch wood block on mastic, no fill	10

Table B-4 (cont'd.)
UNIT DESIGN DEAD LOADS FOR FLOOR FINISH

Floor finish	Pounds per square foot
1-inch cement finish on stone concrete fill	32
1-inch terrazzo on stone concrete fill	32
Marble and mortar on stone concrete fill	33
Linoleum on stone concrete fill	32
Linoleum on light concrete fill	22
1½-inch asphalt mastic flooring	18
3-inch wood block on ½-inch mortar base	16
Solid flat tile on 1-inch mortar base	23
2-inch asphalt block, ½-inch mortar	30
1-inch terrazzo, 2-inch stone concrete	32
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
Brick pavers per inch thickness	10

Table B-5
UNIT DESIGN DEAD LOADS FOR WATERPROOFING

Waterproofing	Pounds per square foot
Five-ply membrane	5

Table B-6
UNIT DESIGN DEAD LOADS FOR FLOOR FILL

Floor fill	Pounds per square foot
Cinder fill, per inch	5
Cinder concrete, per inch	9
Lightweight concrete, per inch	7
Sand, per inch	8
Stone, concrete, per inch	12

Table B-7
UNIT DESIGN DEAD LOADS FOR WOOD JOIST FLOORS

Wood joist floors (no plaster) — double wood floor joist sizes in inches	Pounds per square foot	
	12-in. spacing	16-in. spacing
2 x 6	6	5
2 x 8	6	6
2 x 10	7	6
2 x 12	8	7
3 x 6	7	6
3 x 8	8	7
3 x 10	9	8
3 x 12	11	9
3 x 14	12	10

Table B-8
UNIT DESIGN DEAD LOADS FOR MATERIALS

Materials	Pounds per cubic foot
Cast stone masonry (cement, stone, sand)	144
Cinder fill	57
Concrete, plain:	
Cinder	108
Expanded slag aggregate	100
Haydite (burned clay aggregate)	90
Slag	132
Stone (including gravel)	144
Vermiculite and perlite aggregate, nonloadbearing	25-50
Other light aggregate, loadbearing	70-105
Concrete, reinforced:	
Cinder	111
Slag	138
Stone (including gravel)	150
Earth (dry)	96
Earth (damp)	108
Earth (wet)	120
Cork	15
Masonry, ashlar:	
Granite	168
Limestone, crystalline	168
Limestone, oolitic	135
Marble	173
Sandstone	144
Masonry, rubble mortar:	
Granite	153
Limestone, crystalline	147
Limestone, oolitic	138
Marble	156
Sandstone	137
Rubble stone masonry	156
Terra cotta, architectural:	
Voids filled	120
Voids unfilled	72
Timber, seasoned:	
Ash, commercial white	41
Cypress, southern	32
Fir, Douglas, Coast region	34
Oak, commercial reds and whites	45
Redwood	28
Spruce, red, white, and Sitka	28
Southern pine, short leaf	39
Southern pine, long leaf	48
Timber, hemlock	30

Table B-9
UNIT DESIGN DEAD LOADS FOR ROOF AND WALL COVERINGS

Roof and wall coverings	Pounds per square foot
Asphalt shingles	2
Cement asbestos shingles	4
Cement tile	16

Table B-9 (cont'd.)
UNIT DESIGN DEAD LOADS FOR ROOF AND WALL COVERINGS

Roof and wall coverings	Pounds per square foot
Clay tile (for mortar add 10 lb):	
2-inch book tile	12
3-inch book tile	20
Roman	12
Spanish	19
Ludowici	10
Composition:	
Three-ply ready roofing	1
Four-ply felt and gravel	5½
Five-ply felt and gravel	6
Copper or tin	1
Corrugated asbestos cement roofing	4
Fiber board, ½ inch	¾
Formed sheet steel	1-3
Formed steel decking	(see manufacturer)
Gypsum sheathing, ½-inch	2
Rigid insulation, ½-inch	¾
Sheet lead	3
Skylight, metal frame, ⅜-inch wired glass	8
Slate, 3/16-inch	7
Slate, ¼-inch	10
Spanish tile	20
Wood sheathing, per inch thickness	3
Wood shingles	3

Table B-10
UNIT DESIGN DEAD LOADS FOR SUSPENDED CEILINGS

Suspended ceilings	Pounds per square foot
Cement on wood lath	12
Cement on metal lath	15
Gypsum on wood or metal lath	10
Plaster on tile or concrete	5
Suspended metal lath and gypsum plaster	10
Suspended metal lath and cement plaster	15
Plaster on wood lath	8

Table B-11
UNIT DESIGN DEAD LOADS FOR UNPLASTERED WALLS AND PARTITIONS

Walls and partitions (unplastered)	Pounds per square foot
4 -inch clay brick, high absorption	34
4 -inch clay brick, medium absorption	39
4 -inch clay brick, low absorption	46
4 -inch sand/lime brick	38
4 -inch concrete brick, heavy aggregate	46
4 -inch concrete brick, light aggregate	33
8 -inch clay brick, high absorption	69
8 -inch clay brick, medium absorption	79
8 -inch clay brick, low absorption	89
8 -inch sand/lime brick	74
8 -inch concrete brick, heavy aggregate	89

Table B-11 (cont'd.)
UNIT DESIGN DEAD LOADS FOR UNPLASTERED WALLS AND PARTITIONS

Walls and partitions (unplastered)	Pounds per square foot
8 -inch concrete brick, light aggregate	68
12 -inch common brick	120
12 -inch pressed brick	130
12 -inch sand/lime brick	105
12½-inch concrete brick, heavy aggregate	130
12½-inch concrete brick, light aggregate	98
17 -inch clay brick, high absorption	134
17 -inch clay brick, medium absorption	155
17 -inch clay brick, low absorption	173
17 -inch sand/lime brick	138
17 -inch concrete brick, heavy aggregate	174
17 -inch concrete brick, light aggregate	130
22 -inch clay brick, high absorption	168
22 -inch clay brick, medium absorption	194
22 -inch clay brick, low absorption	216
22 -inch sand/lime brick	173
22 -inch concrete brick, heavy aggregate	216
22 -inch concrete brick, light aggregate	160
4 -inch brick, 4 inch loadbearing structural clay tile -backing	60
4 -inch brick, 8 inch loadbearing structural clay tile -backing	75
8 -inch brick, 4 inch loadbearing structural clay tile -backing	102
8 -inch combination brick and concrete block	72
12 -inch combination brick and concrete block	90
8 -inch loadbearing structural clay tile	42
12 -inch loadbearing structural clay tile	58
8 -inch concrete block, heavy aggregate	55
12 -inch concrete block, heavy aggregate	85
8 -inch concrete block, light aggregate	38
12 -inch concrete block, light aggregate	55
2 -inch furring tile, one side of masonry wall, add -to above figures	12
4 -inch hollow concrete block—stone aggregate	30
—lightweight	20
6 -inch hollow concrete block—stone aggregate	42
—lightweight	30
8 -inch hollow concrete block—stone aggregate	55
—lightweight	38
10 -inch hollow concrete block—stone aggregate	62
—lightweight	46
12 -inch hollow concrete block—stone aggregate	85
—lightweight	55
4 -inch solid concrete block—stone aggregate	45
—lightweight	34
6 -inch solid concrete block—stone aggregate	50
—lightweight	37
8 -inch solid concrete block—stone aggregate	67
—lightweight	48
10 -inch solid concrete block—stone aggregate	84
—lightweight	62

Table B-11 (cont'd.)
UNIT DESIGN DEAD LOADS FOR UNPLASTERED WALLS AND PARTITIONS

Walls and partitions (unplastered)	Pounds per square foot
12 -inch solid concrete block—stone aggregate	108
—lightweight	72
4 -inch loadbearing clay tile	24
6 -inch loadbearing clay tile	36
2 -inch nonloadbearing clay tile	11
3 -inch nonloadbearing clay tile	18
4 -inch nonloadbearing clay tile	20
6 -inch nonloadbearing clay tile	30
8 -inch nonloadbearing clay tile	36
10 -inch nonloadbearing clay tile	40
4 -inch nonloadbearing hollow concrete block	20
6 -inch nonloadbearing hollow concrete block	30
8 -inch nonloadbearing hollow concrete block	40
T.C. 1½-inch split terra cotta furring	8
2 -inch split terra cotta furring	10
3 -inch split terra cotta furring	12
2 -inch hollow gypsum block	9½
3 -inch hollow gypsum block	10
4 -inch hollow gypsum block	15
5 -inch hollow gypsum block	18
6 -inch hollow gypsum block	24
2 -inch solid gypsum block	12
3 -inch solid gypsum block	18
4 -inch solid gypsum block	24
2 -inch facing tile	15
4 -inch facing tile	25
6 -inch facing tile	38
2 -inch solid plaster	20
4 -inch solid plaster	32
4 -inch hollow plaster	22
Wood studs 2 x 4, unplastered	4
Wood studs 2 x 4, plastered one side	12
Wood studs 2 x 4, plastered two sides	20
4 -inch glass block	18

Table B-12
UNIT DESIGN DEAD LOADS FOR LATH AND PLASTER PARTITIONS

Lath and plaster partitions	Pounds per square foot
2 -inch solid cement on metal lath	25
2 -inch solid gypsum on metal lath	18
2 -inch solid gypsum on gypsum lath	18
2 -inch metal studs, gypsum and metal lath both sides	18
3 -inch metal studs, gypsum and metal lath both sides	19
4 -inch metal studs, gypsum and metal lath both sides	20
6 -inch wood studs, plaster and wood lath both sides	18
6 -inch wood studs, plaster and metal lath both sides	18
6 -inch wood studs, plaster and plaster boards both sides	18
6 -inch wood studs, unplastered gypsum board both sides (dry wall)	10

Table B-13
UNIT DESIGN DEAD LOADS FOR PLASTER WORK

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

APPENDIX C

RECOMMENDED FASTENING SCHEDULE

Building element	Nail size and type	Number and location
Stud to sole plate	8d common	4 toe nail or
	16d common	2 direct nail
Stud to cap plate	16d common	2 toe nail or 2 direct 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	10d common	16″ o.c. direct nail
Cap plate laps	10d common	2 direct nail
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 or direct nail
Jack rafter to hip	10d common	3 toe nail or
	16d common	2 direct 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 (laps over partition)	10d common	3 direct nail
Ceiling joists (parallel to rafter)	10d common	3 direct nail
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 (when nailing permitted)	20d common	1 each end 4 sq. ft. floor area
Header beams to trimmers (when nailing permitted)	20d common	1 each end 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

Building element	Nail size and type	Number and location
1″ subflooring (6″ or less)	8d common	2 each direct joist
1″ subflooring (8″ or more)	8d common	3 each direct joist
2″ subflooring	16d common	2 each direct joist
1″ wall sheathing (8″ or less in width)	8d common	2 each direct stud
1″ wall sheathing (over 8″ in width)	8d common	3 each direct stud
Plywood roof and wall sheathing (½″ or less)	6d common	6″ o.c. direct edges and 12″ o.c. intermediate
(⅝″ or greater)	8d common	6″ o.c. direct edges and 12″ o.c. intermediate
(5/16″, ⅜″, or ½″)	16 gage galvanized wire staples, ⅜″ minimum crown; length of 1″ plus plywood thickness	4″ o.c. edges and 8″ o.c. intermediate
(⅝″)	Same as immediately above	2½″ o.c. edges and 5″ o.c. intermediate
Plywood subflooring:		
(½″)	6d common *or* 6d annular or spiral thread	6″ o.c. direct edges and 10″ o.c. intermediate
(⅝″, ¾″)	8d common *or* 6d annular or spiral thread	6″ o.c. direct edges and 10″ o.c. intermediate
(1″, 1⅛″)	10d common *or* 8d ring shank *or* 8d annular or spiral thread	6″ o.c. direct edges and 6″ o.c. intermediate
(½″)	16 gage galvanized wire staples	4″ o.c. edges and 7″ o.c. intermediate
(⅝″)	⅜″ minimum crown, 1⅝″ length	2½″ o.c. edges and 4″ o.c. intermediate

Building element	Nail size and type	Number and location
Built-up girders and beams	20d common	32″ o.c. direct
Continuous header to stud	8d common	4 toe nail
Continuous header, two pieces	16d common	16″ o.c. direct
½″ fiber board sheathing	1½″ galvanized roofing nail *or* 6d common nail *or* 16 gage staple, 1⅛″ long with minimum crown of 7/16″	3″ o.c. exterior edge, 6″ o.c. intermediate
25/32″ fiber board sheathing	1¾″ galvanized roofing nail *or* 8d common nail *or* 16 gage staple, 1½″ long with minimum crown of 7/16″	3″ o.c. exterior edge, 6″ o.c. intermediate
Gypsum sheathing	12 gage 1¼″ large head corrosion resistive	4″ o.c. on edge, 8″ o.c. intermediate
Particle board underlayment (¼″-¾″)	6d annular threaded	6″ o.c. direct edges and 10″ o.c. intermediate
Particle board roof and wall sheathing		
½″ or less	6d common	6″ o.c. direct edges and 12″ o.c. intermediate
⅝″ or greater	8d common	6″ o.c. direct edges and 12″ o.c. intermediate
Particle board subflooring (⅝″ or greater)	8d common	6″ o.c. direct edges and 10″ o.c. intermediate
Shingles, wood[a]	No. 14 B&S Gage corrosion resistive	2 each bearing
Weather boarding	8d corrosion resistive	2 each bearing

Note a. Shingle nails shall penetrate not less than ¾ inch into nailing strips, sheathing or supporting construction except as otherwise provided in Section 1225.4.4.

Table C-1
MAXIMUM SPACING OF GYPSUM WALLBOARD FASTENERS
(For nonfireresistance rated construction assemblies)[e]

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[a] to wood[d]
				Nails[a,b]	Screws[c]	
½	Horizontal	Either direction	16	7	12	No. 13 gage, 1⅜" long, 15/64" head
	Horizontal	Perpendicular	24	7	12	No. .098 gage, 1¼" long, Annular ringed 5d, cooler nail
	Vertical	Either direction	24	8	12	
⅝	Horizontal	Either direction	16	7	12	No. 13 gage, 1⅝" long, 15/64" head
	Horizontal	Perpendicular	24	7	12	No. .098 gage, 1⅜" long, Annual ringed, 6d cooler nail
	Vertical	Either direction	24	8	12	
Fastening required with adhesive application						
½ or ⅝	Horizontal	Either direction	16	16	16	As required for ½" and ⅝" gypsum wallboard, see above
		Perpendicular	24	12	16	
	Vertical	Either Direction	24	16	24	
2 layers each ⅜" (¾" total)	Horizontal	Perpendicular	24	16	16	Base ply nailed as required for ½" gypsum wallboard and face ply placed with adhesive
	Vertical	Either direction	24	24	24	

Note a. Where the metal framing has a clinching design formed to receive the nails by two edges of metal, the nails shall be not less than ⅝ 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 cooler nail (No. 13½ gage, 1⅝ inches long, 15/64 inch head) for ½ inch gypsum wallboard; 6d cooler (No. 13 gage, 1⅞ inches long, 15/64 head) for ⅝-inch gypsum wallboard.

Note b. Two nails at 2 inches to 2½ inches apart may be used if the pairs are spaced 12 inches center-to-center except around perimeters.

Note c. Screws shall be No. 6 with tapered head and long enough to penetrate into wood framing not less than ⅝ inch and metal framing not less than ¼ inch.

Note d. All nails shall meet ASTM C514 or Federal Specification FF-N-105C.

Note e. For fireresistance rated construction, see the pertinent fire test information.

Note f. 1 inch = 25.4 mm.

Table C-2
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES IN POUNDS PER FOOT
FOR VERTICAL DIAPHRAGMS OF LATH AND PLASTER OR GYPSUM BOARD FRAME WALL ASSEMBLIES[a]

Type of material	Thickness of material	Wall construction	Nail spacing[b] maximum (in inches)	Shear[c] value	Minimum nail size
Gypsum lath, plain or perforated	3/8" Lath and 1/2" Plaster	Unblocked	5	100	No. 13 gage, 1 1/8" long, 19/64" head, plasterboard blued nail.
Gypsum sheathing board	1/2"x2'x8'	Unblocked	4	75	No. 11 gage, 1 1/4" long, 7/64" head, diamond-point, galvanized.
	1/2"x4'	Blocked	4	175	
	1/2"x4'	Unblocked	7	100	
Gypsum wallboard or veneer base	1/2"	Unblocked	7	100	5d cooler nails.
			4	125	
		Blocked	7	125	
			4	150	
	5/8"	Blocked	4	175	6d cooler nails.
		Blocked Two ply	Base ply 9 Face ply 7	250	Base ply—6d cooler nails. Face ply—8d cooler nails.

Note a. These vertical diaphragms shall not be used to resist loads imposed by masonry or concrete construction. Values are for short time loading due to wind or earthquake and must be reduced 25 percent for normal loading.

Note b. Applies to nailing at all studs, top and bottom plates and blocking.

Note c. Values shown are for gypsum board applied to one side only. The shear values may be doubled when identical materials are applied to both sides of wall.

Note d. 1 inch = 25.4 mm.

APPENDIX D

METRIC EQUIVALENTS

1 inch equals 25.4 millimeters
1 foot equals 304.8 millimeters
1 square inch equals 645.16 square millimeters
1 square foot equals 0.093 square meters
1 cubic foot equals 0.028 cubic meters
1 cubic yard equals 0.765 cubic meters
1 gallon equals 0.00379 cubic meters
1 pound (avdp.) equals 0.454 kilograms
1 ton equals 0.907 metric ton or 907.2 kilograms
1 pound per square inch equals 6.895 kilo-Pascals or 0.000703 kilogram per square millimeter
1 pound per foot equals 1.489 kilograms per meter
1 pound per square foot equals 47.88 Pascals or 4.882 kilograms per square meter
1 pound per cubic foot equals 16.02 kilograms per cubic meter
1 foot per minute equals 0.00508 meters per second
1 inch per ton equals 0.028 millimeters per kilogram
1 cubic foot per square foot equals 0.301 cubic meters per square meter
1 gallon per minute per square foot equals 0.00068 cubic meters per second per square meter
1 gallon per minute equals 0.0000631 cubic meters per second
1 mile per hour equals 0.447 meters per second
1 cubic foot per minute equals 0.0004719 cubic meter per second
1 foot candle equals 10.764 lux
1 inch water column (at 60 degrees F.) equals 248.84 Pascals
1 ton per square foot equals 9765 kilograms per square meter
1 degree (angle) equals 0.01745 radian
1 Btu per hour per square foot per degree F. equals 5.678 Watts per square meter per degree K
1 Btu per hour equals 0.2931 Watt
1 Btu per cubic foot equals 10.468 Watts per cubic meter
Temperature (degrees C.) equals [temperature (degrees F.) -32] divided by 1.8
1 degree F. per minute equals 0.00926 degrees C. per second

APPENDIX E

EXCERPTS FROM KENTUCKY ARCHITECTS AND ENGINEERS REGISTRATION LAWS

KRS 322.550. If the drawings and specifications are signed by the authors thereof with the true titles of the occupations as may be required by law, the following buildings and additions to buildings, classified by use group, shall require the services of a professional engineer or architect registered in the Commonwealth of Kentucky:

(1) Factory and industrial use groups having a capacity of 100 persons or more;

(2) High hazard use group, regardless of capacity;

(3) Storage use group having a capacity of 100 persons or more.

KRS 323.010. As used in this chapter (KRS 323) unless the context requires otherwise:

(1) "Board" means the state board of examiners and registration of architects of Kentucky;

(2) An "architect" is any person who engages in the practice of architecture as hereinafter defined;

(3) The "practice of architecture" is the rendering or offering to render certain services, hereinafter described, in connection with the design and construction of a structure or group of structures which have as their principal purpose human habitation or use, and the utilization of space within and surrounding such structures. The services referred to in the previous sentence include planning, providing preliminary studies, designs, drawings and specifications and administration of construction contracts;

(4) A "building" is a structure which has as its principal purpose human habitation or use;

(5) "Use group" is the classification of a building or structure based on the purpose for which it is used, as set forth in the *Kentucky Building Code;*

(6) "Consultant" is an individual, partnership, or firm acting subordinately and in a position of service to an architect engaged in the practice of architecture as defined.

KRS 323.030. Persons and buildings to which chapter does not apply:

(1) A nonresident licensed to practice architecture in his own state or country but not in the Commonwealth and having no established place of business in the Commonwealth may act solely as a consulting associate of an architect licensed in the Commonwealth;

(2) An architect acting solely as an officer or employee of the United States government is not required to be licensed in the Commonwealth;

(3) A licensed professional engineer may prepare plans and specifications for and supervise the construction of structures as an incident to the practice of his own profession;

(4) If the drawings and specifications are signed by the authors thereof with the true titles of their occupations as may be required by law, this chapter does not apply to:

(a) Any building which is to be used for farm purposes only;

(b) Any building containing not more than 20,000 square feet total floor area, except:

1. An asylum, hospital, nursing or convalescent home, or home for the aged, regardless of capacity;

2. A school or educational institution, regardless of capacity;

3. A residential building containing more than 12 bedrooms;

4. A place of assembly, having a capacity in excess of 100 persons or churches having a capacity in excess of 400 persons or 6,000 square feet of total floor space;

5. A mercantile building having a capacity in excess of 100 persons;

6. An industrial building having a capacity in excess of 100 persons; and

7. An office building having a capacity in excess of 100 persons;

(c) Alterations to any building to which this chapter does not apply, if the alterations do not involve changes affecting structural safety.

KRS 323.031.

(1) If the drawings and specifications are signed by the authors thereof with the true titles of their occupations as may be required by law, this chapter (the architects registration law) does not apply to:

(a) Any building which is to be used for farm purposes only;

(b) Any building classified by use group other than those listed under this act;

(c) Any structure not classified as a building by KRS 323.010(4).

(2) Provisions of this chapter shall not apply to:

(a) Any individual, partnership, or firm acting solely as a consultant to an architect licensed in the Commonwealth;

(b) An architect or other person acting solely as an officer or employee of the United States government.

KRS 323.033.

(1) Except as otherwise provided hereinafter, the following buildings, or additions to existing buildings, classified by use group, shall require the services of an architect licensed in the Commonwealth of Kentucky.

(a) Assembly use group having a capacity of 100 persons or more;

(b) Business use group having a capacity of 100 persons or more;

(c) Institutional use group, regardless of capacity;

(d) Mercantile use group having a capacity of 100 persons or more;

(e) Residential use groups of more than 12 dwelling units or having a capacity of 50 persons or more;

(f) Mixed use group containing one or more of the use group classifications and capacities listed under paragraphs (a) through (c) of this subsection.

(2) Alterations or new construction requiring compliance with the *Kentucky Building Code* for any building containing one or more of the use group classifications and capacities listed under subsection (1) of this section shall require the services of an architect licensed in the Commonwealth of Kentucky; except that, when such alterations or new construction predominantly involves primarily structural components or mechanical or electrical systems, services may be performed by one or more licensed professional engineers.

(3) Buildings, or additions to existing buildings, containing one or more of the use group classifications and capacities listed under subsection (1) of this section shall require, in addition to the services of an architect, the services of one or more licensed engineers.

(4) The following buildings and additions to existing buildings, classified by use group, shall require the services of either an architect or a professional engineer registered in the Commonwealth of Kentucky.

(a) Factory and industrial use group having capacity of 100 persons or more;
(b) High hazard use group, regardless of capacity;
(c) Storage use group having a capacity of 100 persons or more.

KRS 323.095. Seal required; use

(1) Each architect licensed for practice within the Commonwealth shall secure an embossed circular seal of the design prescribed by regulation of the board;

(2) All working drawings, specifications and reports prepared by, or under the supervision of the individual, partnership or firm, must bear the imprint of this seal;

(3) No architect shall sign or affix his seal to any drawings, specifications or reports which have not been prepared under his immediate supervision.

NOTE: Copies of the complete text of the statutes and regulations are available from the Kentucky State Board of Examiners and Registration of Architects, 3302 Brookhill Circle, P.O. Box 22097, Lexington, KY 40522 or Kentucky State Board of Registration of Professional Engineers and Land Surveyors, 160 Democrat Drive, Frankfort, Kentucky 40602.

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M E M O R A N D U M

TO: Judith Walden
Legal Counsel

FROM: Don Newberry
Office Supervisor

RE: Errors in the 1988 Kentucky Building Code (KBC)

DATE: January 7, 1988

As discussed, the following are portions of the KBC which I have found to either appear to be in error or are mislocated, etc.

I will try to notify you bi-weekly; and, I will just add to the list so you will have a complete list each time.

JANUARY 7, 1988

1. Table 401 does not have the required and referenced notes. The notes on Page 57 of the 1987 BOCA Code should be added to Page 61 of the KBC.

2. See Section 1019.2.2 of the 1987 BOCA Code (Page 226). The words (a complete) were omitted and the word (an) was added in the KBC (Page 230). (See a copy of the BOCA Code Attached)

3. Section 900.2.1 "Certificate of Compliance" is a Kentucky Addition (Page 169 of the KBC) that is structural in nature, which I feel should be located as Section 1100.2, Page 235 of the KBC.

4. Section 812.4.2, Page 148 of the KBC has a Kentucky change to introduce the exception. This exception was made for Use Group A-3, not Use R-3, which is printed.

5. Section 3314.5, Page 478 of the KBC, references Figure 20 and there is no Figure 20.

cc: Jack M. Rhody, Chief Building Codes Official/Director
Terry M. Slade, Assistant Director
Plan Reviewers

Table 401
FIRERESISTANCE RATINGS OF STRUCTURE ELEMENTS (IN HOURS)

Structure element Note a		Type of construction Section 401.0									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1 Section 402.0		Type 2 Section 403.0			Type 3 Section 404.0		Type 4 Section 405.0	Type 5 Section 406.0	
		Protected		Protected		Unprotected	Protected	Unprotected	Heavy timber Note c	Protected	Unprotected
		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
1 Exterior walls	Load-bearing	4	3	2	1	0	2	2	2	1	0
	Nonload-bearing	← Not less than the rating based on fire separation distance (see Section 906.2) →									
2 Fire walls and party walls (Section 1407.0)		4	3	2	2	2	2	2	2	2	2
		← Not less than fire grading of use group — (see Table 902) →									
3 Fire separation assemblies (Sections 313.0, 910.0 and 913.0)		← Fireresistance rating corresponding to fire grading of use group — (see Table 902) →									
4 Smoke barriers (Section 911.0 and Note g).		1	1	1	1	1	1	1	1	1	1
5 Fire enclosures of exits, exit hallways and stairways (Section 816.9.2, 910.0 and Note b).		2	2	2	2	2	2	2	2	2	2
6 Shafts (other than exits) and elevator hoistways (Sections 910.0, 915.0 and Note b)		2	2	2	2	2	2	2	2	1	1
		← Noncombustible →									
7 Exit access corridors (Notes f, g)		1	1	1	1	1	1	1	1	1	1
		← Note d →									
8 Separations	Tenant spaces (Note f)	1	1	1	1	0	1	0	1	1	0
		← Note d →									
	Dwelling unit (Note f)	1	1	1	1	1	1	1	1	1	1
		← Note d →									
	Other nonbearing partitions	0	0	0	0	0	0	0	0	0	0
		← Note d →									

Table 401 (cont'd.)
FIRERESISTANCE RATINGS OF STRUCTURE ELEMENTS (IN HOURS)

Structure element Note a		Type of construction Section 401.0									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1 Section 402.0		Type 2 Section 403.0			Type 3 Section 404.0		Type 4 Section 405.0	Type 5 Section 406.0	
		Protected		Protected		Unprotected	Protected	Unprotected	Heavy timber Note c	Protected	Unprotected
		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
9 Interior bearing walls, bearing partitions, columns, girders, trusses (other than roof trusses) and framing (Section 912.0)	Supporting more than one floor	4	3	2	1	0	1	0	see Sec. 405.0	1	0
	Supporting one floor only or a roof only	3	2	1½	1	0	1	0	see Sec. 405.0	1	0
10 Structural members supporting wall (Section 912.0 and Note g)		3	2	1½	1	0	1	0	1	1	0
		← Not less than fireresistance rating of wall supported →									
11 Floor construction including beams (Section 913.0 and Note h)		3	2	1½	1	0	1	0	see Sec. 405.0 Note c	1	0
12 Roof construction, including beams, trusses and framing, arches and roof deck (Section 914.0 and Notes e, i)	15' or less in height to lowest member	2	1½	1	1	0	1	0	see Sec. 405.0 Note c	1	0
		← Note d →									
	More than 15 but less than 20' in height to lowest lowest member	1	1	1	0	0	0	0	see Sec. 405.0	1	0
		← Note d →									
	20' or more in height to lowest member	0	0	0	0	0	0	0	see Sec. 405.0	0	0
		← Note d →									

Note a. For increased fireresistance rating requirements in special high hazard uses involving a higher degree of fire severity and higher concentration of combustible contents, see Section 600.2. For fireresistance rating requirements for structural membranes and assemblies which support other fireresistance rated members or assemblies, see Section 912.1.

Note b. For reductions in the required fireresistance rating of exit and shaft enclosures, see Sections 816.9.2 and 915.3.

Note c. For substitution of other structural materials for timber in Type 4 construction, see Section 1702.2.

Note d. For requirements for fire-retardant treated wood, see Sections 903.5 and 905.3.

Note e. For permitted uses of heavy timber in roof construction in buildings of Types 1 and 2 construction, see Section 914.4.

Note f. For reductions in required fireresistance ratings of exit access corridors, tenant separations and dwelling unit separations, see Section 810.4 and 810.4.1.

Note g. For exceptions to the required fireresistance rating of construction supporting exit access corridors and smoke barriers, see Sections 910.6 and 911.2.

Note h. For buildings having habitable or occupiable stories or basements below grade, see Section 807.3.1.

Note i. 1 foot = 304.8 mm.

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MARTHA LAYNE COLLINS
GOVERNOR

JACK M. RHODY, P.E.
DIRECTOR

FORMAL INTERPRETATION

NUMBER: 12-2.2.5 & 12-3.7.5/81/84171

DOCUMENT: 1981 Life Safety Code

QUESTION: When a pair of doors are installed, such as in a horizontal exit or a smoke partition, is there a requirement as to which leaf swings in what direction?

ANSWER: Yes. Though the code does not specify which leaf is to swing in the direction of egress travel, it is understood that normal traffic flow indicates the door leaf to an individuals right (as the door is faced) is to swing in the direction of egress travel. Therefore, this office will require that the right leaf (as the door is faced) shall swing in the direction of egress travel.

EXCEPTION 1. Existing installations may remain unchanged.

Jack M. Rhody
Chief Building Codes Official

JMR/JAH/jc