

EPCOT

BUILDING CODE

2018 EDITION

**AS ADOPTED BY THE
REEDY CREEK IMPROVEMENT DISTRICT**

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**P.O. BOX 10170
LAKE BUENA VISTA, FL
32830**



Since 1967
Reedy Creek
IMPROVEMENT DISTRICT

EPCOT

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RECOMMENDED PROCEDURES IN USING THE EPCOT BUILDING CODE

1. Determine Occupancy Classification of the structure. Select Occupancy Classification that most accurately fits the use of the building. (Chapter 5.)
2. Determine actual physical properties of building.
 - (a) Determine building area each floor. (Area definition Chapter 2.)
 - (b) Determine grade elevation for building. (Grade definition Chapter 2.)
 - (c) Determine building height in feet above grade. (Height definition Chapter 2.)
 - (d) Determine building height in stories. (Story definition Chapter 2.)
3. Determine minimum Type of Construction necessary to accommodate proposed occupancy.
 - (a) Determine maximum allowable heights and floor areas for Types of Construction and Occupancy Classification. (Table 7.5.)
 - (b) Check allowable height and area increases permitted. (Chapter 7.)
4. Check detailed Occupancy requirements. (Chapter 5.)
5. Check detailed Construction requirements.
 - (a) Fire Protection of Structural Members. (Chapter 6 and Table 6.2.)
 - (b) Fire Protection Requirements. (Chapter 7.)
 - (c) Means-of-Egress Requirements. (Chapter 8.)
6. Review design and related standards. (Appendix A.)
7. Check other requirements as necessary.
 - (a) Amusement Attractions. (EPCOT Standards 5-12 and 5-13.)
 - (b) Elevators. (EPCOT Standard 5-1.)
 - (c) Sprinklers, Standpipes and Alarm Systems. (Chapter 7.)
 - (d) Use of Combustible Materials—Interior. (Chapter 7 and Tables.)
 - (e) Roof Coverings. (EPCOT Standard 7-7.)
 - (f) Light, Ventilation and Sanitation. (Chapter 5.)

These steps are naturally varied in sequence by individual preferences; however, the first three are standard steps that should be followed in proper order to assist in the design or review of buildings.

PREFACE

The *EPCOT Building Code* is intended to promote the development of sound building construction and a safe environment for the public through accomplishing the following objectives:

- To accomplish coordinated, balanced and harmonious development in accordance with present and future needs.
- To provide the flexibility that will encourage American industry, through free enterprise, to introduce, test and demonstrate new ideas, materials and systems emerging now and in the future from the creative centers of industry.
- To provide an environment that will stimulate the best thinking of industry and the professions in the creative development of new technologies to meet the needs of people, expressed by the experience of those who live, work and visit here.
- To assure the safety, health and general welfare of the District's inhabitants, visitors and premises.
- To establish a sound, safe and forward-looking basis for developing and maintaining the District and its properties.
- To provide safety and good practice during construction, alteration, removal or demolition of buildings and structures within the district by establishing uniform, modern and progressive standards, rules and regulations.
- To regulate the quality of materials and systems for all buildings and structures within the District, including their design, construction, occupancy, location and maintenance.

This preface to the EPCOT Codes was written by Marty Sklar, a Walt Disney Imagineering legend, after he had met with Walt Disney, and shortly before Walt's untimely death. The meeting included an in-depth discussion about Walt's vision for EPCOT.

HOW TO USE THE EPCOT BUILDING CODE

For ease of reference and use, this Code is divided into standard code categories. Insofar as practical, all detailed information and requirements concerning a specific subject appear together, cross referenced to relate requirements in other sections. The plan of numbering the Code is as follows:

Chapters are designated by Arabic numerals as:

CHAPTER 1 TITLE, VALIDITY, SCOPE AND ORGANIZATION

Sections are designated by Arabic whole numbers and capital letters, as:

SECTION 103 SCOPE

Subsections are designated by Arabic decimalized numbers and small capital letter description as:

103.1 Application. Paragraphs and subparagraphs are designated by lower-case letters of Arabic numbers, in parentheses as appropriate.

A Table of Contents of chapters and sections appears in the front of the book. A detailed Index by subject, section and subsection appears in the back of the book.

Marginal Markings

Solid vertical lines in the margins within the body of the code indicate a technical change from the requirements of the 2015 edition. Deletion indicators in the form of an arrow (➡) are provided in the margin where an entire section, paragraph, exception or table has been deleted, or an item in a list of items or a table has been deleted.

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CHAPTER 1

TITLE, VALIDITY, SCOPE AND ORGANIZATION

SECTION 101 TITLE

101.1 Title. The provisions in the following chapters and sections of this volume, together with the appendices, shall constitute and be known as “The *EPCOT Building Code*,” hereinafter referred to as “this Code.”

101.2 Referenced standards. Standards referred to throughout this Code as “EPCOT Standard” followed by a number, are listed in Appendix A and these standards are hereby declared to be a part of this Code.

101.3 Fire limits. The requirements for Fire Limits in the Reedy Creek Improvement District (the District) are set forth in Appendix B and these requirements are hereby declared to be a part of this Code.

101.4 Definitions. For the purpose of this Code, certain abbreviations, terms, phrases, words and their derivations shall be construed as specified in Chapter 2, and these definitions are hereby declared to be a part of this Code.

101.5 Validity. If any section, subsection, sentence, clause or phrase of this Code is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining parts of this Code.

SECTION 102 PURPOSE

102.1 Purpose. The purpose of this Code, is to provide minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within the District and certain equipment specifically regulated herein.

SECTION 103 SCOPE

103.1 Applicability.

103.1.1 General. Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

103.1.2 Building. The provisions of this Code shall apply to the construction, alteration, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures within the jurisdiction of the District.

103.1.3 Electrical. The provisions of the *EPCOT Electrical Code* shall apply to the installation of electrical systems,

including alterations, repairs, replacement, equipment, appliances, fixtures, fittings and appurtenances thereto.

103.1.4 Gas. The provisions of the *EPCOT Fuel Gas Code* shall apply to the installation of consumers’ gas piping, gas appliances and related accessories as covered in this Code. These requirements apply to gas piping systems extending from the point of delivery to the inlet connections of appliances, and the installation and operation of residential and commercial gas appliances and related accessories.

103.1.5 Mechanical. The provisions of the *EPCOT Mechanical Code* shall apply to the installation of mechanical systems, including alterations, repairs, replacement, equipment, appliances, fixtures, fittings and/or appurtenances, including ventilating, heating, cooling, air-conditioning and refrigeration systems, incinerators, and other energy-related systems.

103.1.6 Plumbing. The provisions of the *EPCOT Plumbing Code* shall apply to every plumbing installation, including alterations, repairs, replacement, equipment, appliances, fixtures, fittings and appurtenances, and when connected to a water or sewerage system and all aspects of a medical gas system.

103.1.7 Energy. The provisions of the *EPCOT Energy Efficiency Code for Building Construction* shall apply to all new buildings and manufactured homes, additions to existing buildings and manufactured homes and renovations to existing buildings. These requirements shall apply to site-installed building components and to the installation or replacement of building systems and building components.

103.1.8 Accessibility. The provisions of the *EPCOT Accessibility Code for Building Construction* shall apply to all new or altered buildings that may be frequented in, lived in or worked in by the public for which a permit is required under Section 301.

103.1.9 Referenced standards. Standards referenced in the technical codes shall be considered an integral part of the codes without separate adoption. If specific portions of a standard are denoted by code text, only those portions of the standard shall be enforced. Where code provisions conflict with a standard, the code provisions shall be enforced. Permissive and advisory provisions in a standard shall not be construed as mandatory.

103.2 Additions, alterations and repairs. Additions, alterations, repairs and changes of use or occupancy in all buildings and structures shall comply with the provisions for new buildings and structures, except as otherwise provided in this Section and Subsection 302.6.

103.3 Moved buildings. Buildings and structures moved into or within the District shall comply with the provisions of this Code for new buildings.

SECTION 104 ORGANIZATION

104.1 Creation of building department. There is hereby created in the District the Department of Building and Safety, which shall be under the direction of the Manager of Building and Safety, who shall also bear the title of Building Official.

104.2 Appointment of Building Official. The Chief Appointing Authority of the District shall appoint a Building Official. Such person shall have not less than 10 years experience, either as a professional engineer, registered architect, building official or superintendent of construction, for five years of which he shall have been in responsible charge of work.

104.3 Delegation of authority. The Building Official shall have the power to delegate powers and assignments to subordinate employees working under his authority. Such employees shall have the duties and powers as delegated by the Building Official.

104.4 Reports and records.

- (a) The Building Official shall submit a report to the Appointing Authority of the District, not less than once a year, covering the work of the department during the preceding period. He shall incorporate in said report a summary of his recommendations of desirable amendments to this Code.
- (b) The Building Official shall keep a permanent record, accurate account of all fees and other monies collected and received under this Code, the names of the persons on whose account the same were paid, the date and amount thereof, together with the location of the building or premises to which they relate.

104.5 Right of entry.

- (a) Whenever necessary to make an inspection to enforce any of the provisions of this Code, or whenever the Building Official or his authorized representative has reason to believe that there exists in any building or upon any premises a condition that makes such building or premises unsafe as defined in Section 310, the Building Official or his authorized representative may enter such building or premises at reasonable times to inspect the same, or to perform any duty imposed on the Building Official by this Code; provided that if such building or premises be occupied, he shall first present proper credentials and request entry; and if such building or premises be unoccupied, he shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. If such entry is refused, the Building Official or his authorized representative shall have recourse to remedy provided by law to secure entry.
- (b) No owner, occupant or other person having charge, care or control of any building or premises shall fail or neglect, after proper request made as herein provided, to permit entry therein by the Building Official or his authorized representative for the purpose of inspection and examination as provided by this Code. Any person violating this Subsection shall be guilty of a misde-

meanor as provided under Section 67 of Chapter 67-764, Laws of Florida, Special Acts of 1967.

104.6 Stop work orders. Whenever any building work is being done contrary to provisions of this Code, or is being done in an unsafe or dangerous manner, the Building Official may order such work stopped, or may order the violation corrected by notice in writing served on the person(s) engaged in doing or causing such work to be done; and such persons shall immediately stop the work until authorized by the Building Official to proceed.

104.7 Unlawful occupancy. Whenever any building or part thereof is being used or occupied contrary to the provisions of this Code, the Building Official shall order such use or occupancy discontinued and the building or part thereof vacated. Such order shall be in writing, served on the person(s) using or causing to be used, such building or parts thereof. Within a 30-day period after receipt of notice or order, such building or part thereof shall be made to comply with the requirements of this Code; however, in the event of an emergency, Subsections 310.5 and 310.7 shall apply.

104.8 Concealed work. The Building Official may order parts of the structural frame of any building or structure to be exposed for inspection when, in his opinion, the building or part thereof is in an unsafe or dangerous condition, or when there is willful or negligent concealment of a violation of this Code.

104.9 Requirements not covered by code. Any requirement necessary for the strength or stability of any existing or proposed building or structure, or for the safety or health of the occupants thereof, not specifically covered by this Code, shall be determined by the Building Official, subject to the Board of Appeals.

SECTION 105 OTHER REGULATORY AGENCIES

105.1 Approvals by other agencies having jurisdiction. The Building Official shall require that the laws, rules and regulations of all other regulatory agencies having jurisdiction shall be met before a building permit is issued to an applicant. The Building Official shall require evidence in writing to show that other regulatory agencies having jurisdiction over the design, construction, alteration, repair, equipment, maintenance, and relocation of buildings and structures in the District, have approved the proposed construction. The Building Official shall not be held responsible for enforcement of the regulations of such other regulatory agencies unless he is specifically authorized to enforce that agency's regulations.

SECTION 106 BOARD OF APPEALS

106.1 Creation of Board of Appeals.

- (a) There is hereby established a Board to be designated the Board of Appeals, consisting of five members qualified by training and experience to rule on matters relating to building, who shall be appointed by the

Chief Appointing Authority of the District. A majority of the members shall be professional engineers or registered architects. The Board shall select one of its members to serve as chairman, and the Building Official shall be an ex officio member without vote and shall act as Secretary to the Board.

- (b) Whenever the Building Official shall reject or refuse to approve the manner of proposed construction, and to assist in determining the suitability of alternative materials and methods of construction, the owner of such building or structure or his duly authorized agent may appeal from the decision of the Building Official to the Board of Appeals.

106.2 Term of office. The Chief Appointing Authority of the District shall appoint one member of the Board of Appeals for a term of one year, two members for a term of two years and two members for a term of three years; and thereafter, they shall be appointed for a term of three years. Vacancies shall be filled for an unexpired term by the Chief Appointing Authority. Absence of a member from three consecutive meetings of the Board, unless excused, shall render such member liable to immediate removal from office by the Chief Appointing Authority.

106.3 Quorum. Four members of the Board of Appeals shall constitute a quorum. In varying the application of any provision of this Code, or in modifying an order of the Building Official, a majority vote shall be required.

106.4 Meetings and records. Meetings of the Board shall be held at the call of the chairman and at such other times as the Board may determine. All hearings before the Board shall be open to the public. The Board shall keep minutes of its proceedings, showing the vote of each member on every question, or if the member is absent or fails to vote, indicating such facts. The Board shall also keep records of its examinations and other official actions. Minutes and records of the Board shall be public records.

106.5 Procedures. The Board shall establish rules and regulations for its own procedures consistent with the provisions of this Code.

106.6 Appeals. An appeal may be made within 30 days from the date of the decision appealed by filing with the Building Official and the Board of Appeals a notice of appeal, specifying the grounds thereof. In the case of a building or structure that, in the opinion of the Building Official, is unsafe or dangerous, the Building Official may limit the time for such appeal to a shorter period. The Building Official shall forthwith transmit to the Board all the papers on which action appealed from was taken and shall schedule a public hearing thereon.

106.7 Modifications and variations.

- (a) When appealed to and after such public hearing, the Board may vary the application of any provision of this Code to any particular case when in the opinion of the Board:
1. The enforcement thereof would constitute an injustice and would be contrary to the purpose of this Code or to the public interest; or

2. A variance is required to modify, amend or reverse the interpretation of the Building Official.
- (b) The Board may grant variances to this Code to encourage the development of a new art and science of building design and construction, and the use of new materials in new applications.
- (c) A decision of the Board to vary the application of any provision of this Code, or to modify an order of the Building Official, shall be in writing and shall specify the manner in which such variation or modification is made, the conditions upon which it is made and the reasons therefore.

106.8 Decisions.

- (a) In every case, the Board shall reach a decision without unreasonable or unnecessary delay. Every decision of the Board shall be entered in the minutes of such meeting. Every decision shall be promptly filed in the office of the Building Official and shall be open for public inspection. A certified copy shall be sent by mail or messenger to the appellant and a copy shall be publicly posted in the office of the Building Official for two weeks after filing. The decision of the Board shall be final, subject to such remedy as any aggrieved party might have at law or in equity.
- (b) If a decision of the Board reverses or modifies a refusal order or disallowance of the Building Official, or varies the application of any provision of this Code, the Building Official shall take action immediately in accordance with such decision.

SECTION 107 LIABILITY

107.1 Liability.

- (a) Any officer or employee, or member of the Board of Appeals, charged with the enforcement or interpretation of this Code, acting for the applicable governing body in the discharge of his duties, shall not thereby render himself personally liable, and he is relieved from all personal liability for any damage that may accrue to persons or property as a result of any act required or permitted in the discharge of his duties. Any suit brought against any officer or employee because of such act performed by him in the enforcement of any provision of this Code shall be defended by the legal counsel of the District until the termination of the proceedings.
- (b) This Code shall not be construed to relieve from or lessen the responsibility of any person owning, operating or controlling any building or structure for any damages to persons or property caused by defects, nor shall the code enforcement agency or its parent jurisdiction be held as assuming any such liability by reason of the inspections authorized by this Code or any permits or certificates issued under this Code.

**SECTION 108
VIOLATIONS AND PENALTIES**

108.1 Violations and penalties. Any person, firm, corporation or agent who shall violate a provision of this Code, or fail to comply therewith, or with any of the requirements thereof, or who shall erect, construct, alter, demolish or relocate any structure, or has erected, constructed, altered, repaired, relocated or demolished a building or structure in violation of a detailed statement or drawing submitted and approved thereunder, shall be guilty of a misdemeanor as provided under Section 67 of Chapter 67-764, Laws of Florida, Special Acts of 1967.

CHAPTER 2

DEFINITIONS

SECTION 201 GENERAL

201.1 Purpose. The abbreviations, terms, words and their derivatives defined herein shall be construed as specified in this Chapter in applying the provisions of this Code. Definitions of technical terms relating to a specific subject appearing in other Chapters are referenced herein to the Chapter and Section in which they appear.

201.2 Scope.

- (a) Words used in the present tense include the future tense; words used in the masculine gender include the feminine and neuter genders; the singular includes the plural and the plural includes the singular.
- (b) Where terms are not defined or the definition herein is supplementary, terms shall have the meaning given in *Merriam-Webster's Tenth New Collegiate Dictionary*, as revised.
- (c) Terms relating to the fire-resistive qualities of building materials and assemblies of materials shall have the meaning specified in ASTM E176 entitled "*Terms Related to Fire Tests of Building Construction Materials*."

SECTION 202 DEFINITIONS

ACCEPTED ENGINEERING PRACTICE. Practice conforming to the accepted principles, tests or standards of nationally recognized technical or scientific authorities, as determined by the Building Official.

ACCESSORY BUILDING. See Group S, Satellite Occupancies, Section 516.

AGRICULTURAL BUILDING. Building located on agricultural property used for sheltering farm implements, hay, grain, livestock, or other farm produce or equipment in which there is not human habitation and that is not used by the public.

ALLEY. Public space or thoroughfare less than 20 feet wide, but not less than 10 feet wide that has been deeded or dedicated to the public for permanent public use.

ALTER OR ALTERATION. Change, addition or modification in the construction, installation or occupancy of a building.

ANSI. American National Standards Institute. Formerly, the United States of America Standards Association.

APARTMENT. Room or suite of rooms that is occupied or intended to be occupied or that is designed to be occupied by one family (q.v.) for living and sleeping.

APARTMENT HOUSE. Building or part thereof designed, built, rented or leased to be occupied, or that is being occupied as the home or residence of more than three families living independently of each other and doing their own cooking in the housekeeping and unit they occupy.

APPROVED. As applied to a material, device or method of construction, means approved by the Building Official in accordance with the provisions of this Code.

APPROVED AGENCY. An established and recognized agency regularly engaged in conducting tests or supplying inspection services, when such agency has been approved by the Building Official.

ARCADE. Passageway roof over and enclosed, with egress at the ends and serving as a common entrance and exit for buildings located thereon.

ARCHITECT OR REGISTERED ARCHITECT. Person qualified and licensed by the State of Florida to practice architecture.

AREA. As applied to a building or structure, the usable area, in square feet, under the horizontal projection of the roof or floor above.

AREA, GROSS FLOOR. The area within the inside perimeter of the exterior walls with no deduction for corridors, stairs, closets, thickness of walls, columns or other features, exclusive of areas open and unobstructed to the sky.

AREA, NET FLOOR. The area actually occupied not including accessory unoccupied areas, such as corridors, stairs, closets, thickness of walls, columns, toilet rooms, mechanical areas or other features.

AREA OF REFUGE. An area with direct access to an exit where persons unable to use stairs can remain temporarily in safety to await instructions or assistance during emergency evacuation.

AREAWAY. Unroofed surface adjacent to a building.

ASSEMBLY BUILDING. See Subsection 504.1.

ASTM. ASTM International. Formerly, the American Society for Testing and Materials.

ATRIUM. A space, intended for occupancy within a building, extending vertically through the building and enclosed at the top.

ATTIC OR ATTIC STORY. Space between the ceiling beams of the top habitable story and the roof rafters that may be used for storage or habitation.

AUTOMATIC. As applied to a fire door or other opening protective, means normally held in an open position and automatically closed by a releasing device activated by excessive heat, smoke or a predetermined rate of rise in temperature.

AUTOMATIC FIRE-EXTINGUISHING SYSTEM. Definitions pertaining to fire-extinguishing systems and standpipes appear in Section 715.

BALCONY. Seating space of an assembly area, the lowest part of which is raised 4 feet or more above the level of the main floor.

DEFINITIONS

BASEMENT. Story of a building between floor and ceiling, partly below and partly above grade, located so that the vertical distance from grade to the floor below is less than the vertical distance from grade to ceiling. (See “Story.”)

BAY WINDOW. Window supported on a foundation extending beyond the main walls of a building.

BOILER. See the *EPCOT Mechanical Code*.

BOILER ROOM. Any room with a boiler.

BUILDING. Structure built for support, shelter, enclosure or use of persons, animals, chattels or property of any kind.

BUILDING, EXISTING. A building erected prior to adoption of this Code, or one for which a legal 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 OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this Code, or duly authorized representative by the Building Official.

BUILDING, PUBLIC. See “Public building.”

BUILDING, UNSAFE. See “Unsafe building.”

BULKHEAD.

- (a) Exterior walls of a store building that support show windows.
- (b) Structure above the roof of a building, enclosing elevator machinery, tanks, stairs or the like, or the part of a shaft extending above the roof.
- (c) Retaining structure intended to withstand lateral pressure.

CANOPY. Any fixed roof-like structure, which is self-supporting in whole or in part, but having no sidewalls or curtains other than valances not exceeding 18 inches in depth.

CART. A mobile unit that is easily moveable by no more than two persons and may require some disassembly prior to transport or storage.

CAST STONE. Precast building stone manufactured from Portland cement concrete, used as trim, veneer or facing on or in a building.

CELLAR. See “Basement.”

CHIMNEY. Vertical structure containing one or more flues used to remove hot gases from combustion or from industrial processes. For classification of chimneys, see the *EPCOT Mechanical Code*.

CONCRETE. Mixture of Portland cement, aggregates and water. (See additional definitions in EPCOT Standard 1003-1.)

CONCRETE, PLAIN. Concrete without reinforcement.

CONCRETE, REINFORCED. Concrete in which reinforcement other than that provided for shrinkage or temperature change is embedded in such a manner that the two materials act together in resisting forces.

CONSTRUCTION. Work or operations necessary or incidental to land clearing, grading, excavation and filling; or

erection, demolition, assembling, installing or equipping of buildings or structures; or alterations incidental thereto, or to the finished product of construction operations.

CONTRACTOR. One who contracts on predetermined terms to provide labor and materials and to be responsible for performance of a construction job in accordance with established plans and specifications.

CORRIDOR. An enclosed exit access component that defines and provides a path of egress travel.

CORRIDOR, PRIVATE. Any corridor other than a public corridor.

CORRIDOR, PUBLIC. Corridor open to general or common use by the public.

COURT. An open, uncovered, unoccupied space on the same property as a building. An inner court is any court other than an outer court or yard. An outer court other than a yard (q.v.) having at least one side open to a street, alley, yard or other permanent open space.

DEAD LOAD. See “Load, dead.”

DEMOLITION. Dismantling or razing of all or part of a building and all operations incidental thereto.

DISPLAY SIGN. Structure arranged, intended or designed as an advertisement, announcement or direction; includes signs, sign screens, billboards and advertising devices of all kinds.

DOOR ASSEMBLY. See “Fire door.”

DORMITORY. Room in other than a Group R-3 occupancy having separate sleeping accommodations for more than three persons.

DRAFTSTOP. See “Firestop.”

DUMBWAITER. See ANSI A17.1.

DWELLING. Building occupied exclusively for residential use having not more than two dwelling units.

DWELLING UNIT. One or more rooms arranged for the use of one or more persons as a single housekeeping unit, with facilities for cooking, living and sleeping and with sanitary facilities as required in the *EPCOT Plumbing Code*.

ELEVATOR. See EPCOT Standard 5-1.

ENGINEER OR REGISTERED ENGINEER. Person qualified and licensed by the State of Florida to practice the profession of engineering.

ESCALATOR. See EPCOT Standard 5-1.

EXISTING BUILDING. See “Building, existing.”

EXIT. For definitions pertaining to means of egress, see Subsection 801.4.

FAMILY. Two or more persons living as a single housekeeping unit, including persons related by blood, marriage or adoption and domiciled servants, but not paying guests.

FENCE. Freestanding wall, a balustrade or a railing 3 feet or more high, erected to divide property, to serve as a barrier or guard, or for decoration.

FIRE DIVISION WALL. See “Wall, fire division wall.”

FIRE DOOR. A door and its assembly constructed and assembled in place to give protection against the passage of fire, complying with the requirements of Chapter 7.

FIRE PARTITION. A vertical assembly of materials designed to restrict the spread of fire in which openings are protected.

FIRE-RESISTIVE CONSTRUCTION. See Chapter 6.

FIRE-RESISTIVE RATING. Time, in hours, that a material or construction will withstand fire exposure as determined by a fire test made in conformity to EPCOT Standard 6-1.

FIRE-RETARDANT-TREATED WOOD. See EPCOT Standard 1010-9.901.

FIRE WALL. See “Wall, fire division wall.”

FIRE WINDOW. Window and its assembly, constructed and assembled in place to give protection against the passage of fire and complying with the requirements of Chapter 7.

FIRESTOP. A solid, tight enclosure placed to restrict the spread of fire and smoke in attics, under and between floors, and in other concealed places.

FLOOR AREA. Area included within the surrounding exterior walls of a building or part thereof, exclusive of vent shafts and courts. The floor area of a building or part thereof not having surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above.

FOOTING. Part of the foundation of a structure that spreads and transmits the load direct to the soil or to piles.

FOYER. Area or space within a building, located between the main entrance and the occupied areas of a building. When used in connection with a theater, the area between the lobby and the main floor.

GALLERY. That part of the seating area of a theater or assembly room located above a balcony and having a seating capacity of more than 10.

GARAGE. Building, other than open carport structure, or part thereof in which a motor vehicle, containing a flammable liquid in its fuel storage tank, is stored, housed, kept, repaired or serviced.

Automotive Service Garage. Garage where no repair work is done, except the exchange of parts and maintenance requiring no open flame, cutting, welding or use of highly flammable liquids.

Basement Parking Garage. Parking garage having exterior walls around more than 50 percent of the perimeter.

Enclosed Parking Garage. Parking garage having exterior walls around more than 50 percent of the perimeter.

Mechanical Access Garage. See Subsection 508.5.

Open-Air Parking Garage. Garage having at least 50 percent of the perimeter open to the air at each story.

Parking Garage. Garage used solely for parking motor vehicles.

Private Garage. A building or part thereof not more than 1,000 square feet in area, in which only motor vehicles

used by the owner or tenants of the building are stored or kept.

Ramp, Access Garage. See Subsection 508.5.

Repair Garage. Garage where major repairs can be made to three or more motor vehicles at the same time.

GRADE (GROUND LEVEL). Average of the finished ground level at the center of all walls of a building. Where walls are parallel to and within 5 feet of a sidewalk, the ground level shall be measured at the sidewalk.

GRADE (LUMBER). Classification of solid sawn lumber with respect of strength, quality, mechanical properties and use.

GROUND FLOOR. Floor of a building located not more than 2 feet below, nor more than 6 feet above, grade.

GUARDRAIL. A safety method to prevent people or objects from falling from elevated walking surfaces or stairs.

GUEST. Person hiring or occupying a room for living or sleeping, not included in a family as defined herein.

GUEST ROOM. A room that is used, rented or hired out to be occupied for sleeping purposes.

HABITABLE ROOMS. Room in a residential occupancy used for living, sleeping, cooking and eating, but excluding bath, storage and service area, and corridors.

HANDRAIL. A railing provided for grasping with the hand for support.

HARDWARE, PANIC. See Subsection 801.4.

HEIGHT OF BUILDING. Vertical distance from the grade (q.v.) to the highest point of the coping of a flat roof or to the deck line of a mansard roof or to the average height of the highest gable of a pitch or hip roof. (See “Story.”)

HEIGHT, STORY. Vertical distance from top to top of two successive tiers of floor beams or finished floor surfaces.

HEIGHT, WALL. Vertical distance from the top measured from the foundation wall or from a girder or other immediate support of such wall.

HELIPORT. Area of land or structural surface used or intended to be used for maintenance, refueling, landing and take-off of helicopters, and any appurtenant areas used or intended to be used for heliport buildings and facilities.

HELISTOP. Same as Heliport, except that no refueling, maintenance, repair or storage of helicopters is permitted.

HORIZONTAL EXIT. See Subsection 801.4.

HORIZONTAL SEPARATION. Permanent open space between a building wall and the lot line or the centerline of a facing street, alley or public way. Where two or more buildings are located on the same lot, the horizontal separation of the wall shall be measured from an imaginary line drawn at a distance from the facing wall equal to the horizontal separation applicable for that wall.

HOTEL. Building having facilities accommodating four or more transient guests with rooms intended or designed to be rented or used for sleeping.

DEFINITIONS

JURISDICTION. Legally constituted authority that has adopted this Code by law or ordinance.

KIOSK. A kiosk is defined as a small structure, no larger than 200 square feet, which may be portable through more extensive disassembly, but is primarily intended as permanent. It may be constructed on- or off-site, then anchored and connected to utilities as permanent.

LIQUID PROPANE. Propane that has been liquefied. For purposes of this Code, LP fuel is considered a gas.

LOAD, DEAD. The weight of the walls, permanent partitions, framing, floors, roofs and all other permanent stationary construction entering into and becoming a part of the building.

LOAD, LIVE. Weight superimposed by the use and occupancy of the building or structure, not including the wind load, dynamic load or dead load.

LOBBY. Enclosed vestibule directly accessible from the main entrance of a theater, hotel, apartment house or similar building with an occupant load of 10 or more.

LODGING HOUSE. Building or part thereof with accommodations for not more than four guests where rent is paid in money, goods or labor. A lodging house shall comply with the requirements of this Code for Group R-2 occupancies.

LOT. Smallest parcel of land considered as a unit.

LOT LINE. Line dividing one lot from another, or from a street or other public space.

LP FUEL. Liquid propane.

MALL. Definitions pertaining to mall, covered walkways and tunneled walkways appear in Subsection I-101.2.

MARQUEE. Permanent roofed structure attached to and supported by a building. Human occupancy is prohibited, except for service of equipment.

MASONRY. Built-up unit of construction or combination of materials, such as clay, shale, concrete, glass, gypsum, tile or stone, set in mortar. (For definitions of masonry classifications and special subjects, see EPCOT Standard 1006-2.)

MEZZANINE OR MEZZANINE FLOOR. Intermediate floor placed in a room or story of a building. When the total area of a mezzanine is more than $33\frac{1}{3}$ percent of the total floor area of the room or floor, it shall be considered as an additional story.

MOBILE FOOD DISPENSING VEHICLE. A vehicle mounted public food service establishment, self-propelled or otherwise moveable from place to place. Such vehicles must be self-sufficient for utilities. Each mobile food dispensing vehicle is required to have a State approved commissary that it reports to at least once a week.

NOMINAL DIMENSION. Commercial size width and thickness in standard solid sawn lumber and glued-laminated lumber designated by the lumber industry; somewhat larger than standard net size of dressed lumber.

NONCOMBUSTIBLE MATERIAL. A material that complies with any one of the following shall be considered a non-combustible material:

- (a) The material, in the form in which it is used, and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat;
- (b) The material is reported as passing ASTM E136;
- (c) The material is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652.

Exception: Inherently noncombustible materials such as steel, concrete, masonry, glass, etc., are not required to be tested in order to be classified as non-combustible materials.

NONCONFORMING. Building or structure that does not conform to the requirements of this Code, its Standards, Appendices or Amendments.

OCCUPANCY. The use or intended use of a building, or the building or part of the building housing such use.

OCCUPANT LOAD. See Subsection 801.4.

OWNER. The owner of a building or structure or his duly authorized agent or attorney, a purchaser, devisee, fiduciary and a person having a vested interest in the property.

PANIC HARDWARE. See Subsection 801.4.

PARAPET. That part of a wall entirely above the roof line.

PARTITION. An interior wall that subdivides spaces within a story, or the attic or basement of a building. A partition may be permanent or temporary.

PARTITION, PARTIAL. A partition with a maximum height of 72 inches.

PASSENGER ELEVATOR. See "Elevator."

PENTHOUSE. Enclosed structure other than a roof structure (q.v.) located on a roof, extending not more than 12 feet above a roof. (See "Story.")

PERMIT. Written authorization by the Building Official to proceed with construction, alteration, repair, installation, removal or demolition of a building; or with plumbing, electrical, gas or mechanical work.

PERSON. A natural person, his heirs, executors, administrators or assigns; including a firm, partnership or corporation, or their successors, or assigns or the agent of any of the entities named herein.

PLACE OF ASSEMBLY. Room or space used for assembly of 50 or more persons. (See Subsection 504.1.)

PLASTIC. Material containing as an essential ingredient an organic substance of large molecular weight, is solid in its finished state and, at some stage in its manufacture or in its processing into finished articles, can be shaped by flow.

PLATFORM. 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 purpose wherein there are no overhead hanging curtains, drops, scenery or stage effects other than lighting.

PLATFORM, PERFORMANCE OR EVENT. An area within or exterior to a building used for entertainment or presentation wherein there are limited combustible material or finishes, which is erected on a temporary basis not to exceed 90 days.

PREFABRICATED. Fabricated prior to erection or installation on or in a building or on a foundation.

PRIVATE STAIRWAY. See Subsection 801.4.

PUBLIC BUILDING. Building or part of a building that is open to public access as described in the *EPCOT Accessibility Code for Building Construction*.

PUBLIC SPACE. Open spaces dedicated for public use such as public parks, rights-of-way, waterways, public beach, and other permanently unobstructed yards or courts having access to a street as required in Chapter 5.

PUBLIC WAY. See Subsection 801.4.

RATPROOFING. Impervious to rodent infestation and propagation.

REINFORCED CONCRETE. See “Concrete, reinforced.”

REPAIR. Replacement or renewal of any part of an existing building with equivalent materials for the purpose of its maintenance, excluding addition, change or modification as defined in Alteration (q.v.).

REPAIR GARAGE. See “Garage.”

REQUIRED. Required by this Code, the EPCOT Standards or the Appendices.

RESIDENTIAL OCCUPANCY. See Sections 513 to 515.

ROOF STRUCTURE. Structure above the roof of any part of a building enclosing a stairway, tank, elevator machinery, service equipment or part of a shaft extending above the roof, not housing living or recreational accommodations.

SAFE DISPERSAL AREA. See Subsection 817.2.

SEATING CAPACITY. As determined by Subsection 802.1 and Table 8.1.

SELF-CLOSING. As applied to a fire door or other opening protective, means normally closed and equipped with an approved device that will ensure closing after having been opened for use.

SEPARATION, HORIZONTAL. See “Horizontal separation.”

SHADE STRUCTURE. A free-standing structure open on all sides that is primarily intended for use by occupants for protection from the elements and not used for merchandising, retail, storage or other nonapproved uses, with a minimum separation of 15 feet to the nearest building or structure.

SHAFT. Vertical opening or passage through two or more floors of a building or through floors and roof.

SHALL. Where used in this Code, shall is mandatory.

SHED. A manufactured or site-built building not exceeding 200 square feet in size and is used only for storage.

SIGN. See Appendix D.

SMOKE BARRIER. A continuous membrane, or a membrane with discontinuities created by protected openings, where such membrane is designed and constructed to restrict the movement of smoke.

SOLID MASONRY. See “Masonry.”

STAGE. Partly enclosed portion of an assembly building, designed or used for presentation of plays, demonstrations or other entertainment, wherein scenery, drops or other effects may be installed or used, and where the distance between the top of the proscenium opening and the ceiling above the stage is more than 5 feet. (See “Platform.”)

STAIRWAY. One or more flights of stairs and the landings and platforms connecting them, forming a continuous and uninterrupted passage from one level to another in a building or structure. Two or more risers shall constitute a flight of stairs.

STAND. See Subsection 817.2.

STANDPIPE. See Subsection 715.2.

STORY. Part of a building between a floor and the next floor or roof above. A mezzanine shall be considered a story when it exceeds 33 $\frac{1}{3}$ percent of the area of the floor immediately below. A penthouse shall be considered a story when it exceeds 1,000 square feet or 33 $\frac{1}{3}$ percent of the roof area. A basement used for human occupancy shall be considered a story.

STREET. Thoroughfare more than 20 feet wide that has been legally dedicated or deeded to public use.

STREET LINE. A lot line dividing a lot from a street.

STRUCTURAL ELEMENTS. See Subsection 702.1.

STRUCTURAL FRAME. Frame composed of individual members of a building or structure required to transmit loads to the ground.

STRUCTURAL MEMBERS. Members that transmit loads to the ground.

STRUCTURE. Combination of materials forming a construction regulated by this Code.

STUDIO. Motion picture and television soundstages. (See Appendix M.)

SUITE. A group of rooms occupied as a unit.

TANK. A structure, above grade, that encloses a volume that either holds bulk solids or liquids, or simulates that.

TEMPORARY. Intended for use for a period not exceeding 90 days. (For Trailers, see Appendix J.)

TOWER. A structure, above grade, which may or may not have access by people, having emphasis on the vertical. It may function as a support, antenna or decoration.

DEFINITIONS

TYPE OF CONSTRUCTION. Combination of materials used in the construction of a building or structure, based on the varying degrees of fire resistance, as specified in Subsection 601.1(b).

UNSAFE BUILDING. See Section 310.

VALUE OR VALUATION. The total value of all work, including the cost of materials and labor, used as a basis for determining the permit fee.

Exception: Costs associated with landscaping plant materials and irrigation systems are not to be included in the determination of the value of valuation for permitting.

WALL.

Bearing Wall. Wall supporting a vertical load in addition to its own weight.

Cavity Wall. Wall built of masonry units or of plain concrete, or a combination of these materials, arranged to provide an airspace within the wall and in which the inner and outer wythes of the wall are tied together with metal ties.

Faced Wall. Wall in which the masonry facing and backing are of different materials and are bonded to exert a common reaction under load.

Fire Division Wall. Wall constructed in accordance with Section 708 for subdividing buildings to restrict the spread of fire.

Foundation Wall. Wall below the floor nearest grade, supporting a wall, pier, column or other structural part of a building or structure.

Masonry-Bonded Hollow Wall. Wall built of masonry units arranged to provide an airspace within the wall, in which the inner and outer wythes of the wall are tied together with masonry units.

Nonbearing Wall. Wall that supports no vertical load other than its own weight.

Panel Wall. Nonbearing wall built between columns and piers wholly supported at each story.

Veneered Wall. Wall having a facing of masonry, plastic, glass or other material securely attached to the backing, but not bonded to exert a common reaction under load.

WATERWAY. Channel of water navigable by boats. When located within a special amusement building, the occupant load assigned to waterways shall not exceed the maximum load capacity of the ride vehicles.

WRITING. Includes handwriting, typewriting, printing, photo-offset or any other form of reproduction in legible symbols or characters.

WRITTEN NOTICE. Notification, in writing, delivered in person to the individual or to the parties for whom intended, or delivered or sent by certified or registered mail to the last business address known to the agency giving notice.

YARD. Open, unoccupied space, other than a court, unobstructed from the ground to the sky, except where specifically provided by this Code, on the lot on which a building is located. (See "Court.")

CHAPTER 3

BUILDING PERMITS, COMPLIANCE OF BUILDINGS AND STRUCTURES

SECTION 301 PERMITS

301.1 Permits required.

(a) **When required.** Any owner, authorized agent, person or contractor who desires to construct, enlarge, alter, repair, move, demolish or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, the installation of which is regulated by the technical codes, or to cause any such work to be done, shall first make application to the Building Official and obtain the required permit for the work.

Exceptions:

1. Replacement may be made without a permit provided that:
 - 1.1. Replacement shall not violate any of the provisions of this Code.
 - 1.2. The value of labor and materials, as determined by the Building Official, to replace the item does not exceed \$2,500. For the purpose of this Section, permits may not be evaded by performing a series of small replacements consecutively.
 - 1.3. The replacement is not required to meet wind-loading requirements or is not a structural member.
 - 1.4. The replacement is not part of a pressurized piping system, including natural and LP gas. For the purpose of this Section, sinks, lavatories, water closets, urinals and their associated faucets, ball cocks or flush-o-meters shall not be considered as part of a pressurized system.
 - 1.5. The replacement does not require modifications to ductwork in order to retrofit replacement air-handling equipment or fans.
 - 1.6. Replacement components are identical in terms of equipment ratings, listings, function and performance.
 - 1.7. The replacement is not a component of a fire-resistive assembly.
 - 1.8. Fences or railings less than 3 feet high.

2. Walking or driving surfaces that are not structural elements, not over any basement or story below, not more than 30 inches above adjacent grade and/or not part of an accessible route shall be exempt from permitting and inspection.

(b) Separate permits shall be required for plumbing, air-conditioning, heating and ventilating systems, elevators, escalators and transporting assemblies, gas, sprinkler, roofing, electrical, fire alarm systems, security alarm systems, swimming pool, project management and show/ride installations.

(c) A previously issued lawful permit shall be valid on the terms of the code under which it was issued, provided that no such permit shall be subject to the limitations specified in this Section.

(d) **Temporary structures.** A special building permit for a limited time shall be obtained before the erection of temporary structures, such as construction sheds, seats, canopies, tents and fences, used in construction work or for temporary purposes, such as reviewing stands. Such structures shall be completely removed upon expiration of the time limit stated in the permit.

301.2 Other jurisdictions. Permits required for work to be accomplished under the jurisdiction of other District departments shall be issued only on presentation of written proof of compliance with Subsection 105.1.

SECTION 302 APPLICATIONS

302.1 Permit application requirements. A permit application shall be filed and the permit shall be issued prior to commencement of work. Application documentation may be required such as, but not limited to, the following:

- (a) A completed permit application, notarized when applicable.
- (b) Payment of permit and plan review fees.
- (c) A site plan meeting the requirements of Subsection 302.5.
- (d) A copy of the contract or purchase order that provides verification of the job valuation as defined in Chapter 2.
- (e) Two sets of drawings, specifications and calculations, including a demolition plan, where applicable.
- (f) Professionally designed, signed and sealed plans and specifications when the valuation of the work is more than \$25,000, or for work of a structural nature, or work requiring wind loading, regardless of the valuation.
- (g) An owner's signature for work more than \$2,500.

- (h) A Notice of Commencement for work more than \$2,500.
- (i) Additional plans requiring the approval of a state or local government agency, such as the Florida Department of Business and Professional Regulation, Hotel Restaurant Division or the Health Department.
- (j) Fire Alarm submissions over \$5,000 must be signed and sealed by a design professional.

302.2 Surveyor’s certificate required. Application for permit for new construction and additions shall be accompanied by a registered land surveyor’s certificate and plan, in duplicate, on which shall be indicated clearly the property corner stakes, property line dimensions, existing structures and their location, existing rights-of-way, sidewalks, easements, street zoning and property zoning of record, critical elevations and building setbacks required by law, general block plan and other pertinent survey data that may be required. The Building Official may waive the requirements for such survey when property line stakes are known to be in place, and when the work contemplated is minor and is clearly within building lines.

302.3 For relocation of buildings. Application for permit for relocating a building within the District shall be submitted in the form that the Building Official requests. The application shall be accompanied by plans or other data that, in the opinion of the Building Official, are necessary to show compliance with this Code and the zoning, and other regulations of the District. A physical examination of the structure shall be made by the Building Official before he issues a permit for relocation. [See Subsection 306.1(b).]

302.4 For demolition of buildings and structures. Application for permits for the work of demolition of buildings or structures shall be accepted only from qualified persons or firms to do the work. Qualifications of persons or firms to demolish the building or structure shall be in accordance with a special ordinance of the District providing for qualification and certification of construction tradesmen.

302.5 Site plan requirement.

- (a) Prior to the commencement of any construction on a development parcel within the District, the applicant shall provide the District Manager of Planning and Development with a site plan for the entire development parcel at a suitable scale, depending on the size of the development parcel. A development parcel is defined as the land containing a proposed project, exclusive of lands designated as conservation on the Future Land Use Map of the District’s Comprehensive Plan and/or public road rights-of-way contained within the proposed project. The development parcels are shown on a map available from the Planning and Development Department.
- (b) The minimum criteria for inclusion in a site plan application are as follows:
 - 1. Name of project.
 - 2. Statement of the intended use of the site.
 - 3. Legal description of the development parcel.
 - 4. Size, in acres, of the proposed development.

- 5. Evidence that the soil conditions are suitable for the proposed development.
- 6. The amount of impervious surface within the development parcel.
- (c) The minimum contents of a site plan are as follows:
 - 1. The footprints of all structures, including the square footage and/or number of rooms, as may be appropriate.
 - 2. The total acreage within the development parcel.
 - 3. The location and size of all storm water management facilities within the development parcel.
 - 4. The location and number of all required parking spaces to serve the development, with the required number of accessible spaces being specifically designated.
 - 5. The location and size of the open space within each development. A minimum of 30 percent of the area of each development parcel shall be maintained in open space.
 - 6. The location and size of proposed and/or existing road rights-of-way; proposed and/or existing transit corridors or facilities as may be appropriate; and location of pedestrian facilities, both existing and proposed.
 - 7. The limits of the 100-year flood plain as determined by consultation with the District engineer.
 - 8. The most landward limits of either the South Florida Water Management District (SFWMD), the Federal Department of Environmental Regulation (FDER) or the Army Corps of Engineers (ACOE) wetland jurisdictions.
 - 9. The location of proposed and/or existing types of landscaped and hardscape areas.

302.6 Alteration of buildings and structures.

- (a) **Compliance with Code.** Buildings or structures to which additions, alternations, repairs or changes of occupancy are proposed or intended shall be made to comply with all requirements for new buildings or structures of like area, height, type of construction or occupancy classification, except as provided in this Section.
- (b) **Alterations of 25 percent or less.** Alterations and repairs to any part of a building within any 12-month period, the cost of which does not exceed 25 percent of the value of the building or structure, shall comply with the requirements of this Code for new buildings or structures, except that minor structural additions, alterations and repairs may be made with the same materials of which the building or structure is constructed. Such building or structure, including new additions, shall not exceed the area and height provided in this Code for the type of construction and occupancy classification.
- (c) **Alterations from 25 percent to 50 percent.** Alterations and repairs exceeding 25 percent, but not exceeding 50 percent of the value of a building or structure, may be made within any 12-month period without making the

entire building or structure comply with this Code. Additions shall conform to the requirements of this Code for a new building of like area, height and occupancy. The entire building or structure, including the new addition, shall not exceed the area and height specified in this Code for its type of construction and occupancy classification.

- (d) **Alterations of more than 50 percent.** When additions, alterations or repairs within any 12-month period exceed 50 percent of the value of a building or structure, such building or structure shall be made to conform to all requirements for a new building or structure, or shall be demolished.
- (e) **Roofing.** Not more than 25 percent of the roof covering of any building or structure shall be replaced in any 12-month period unless the roof covering of the entire building or structure is made to conform to the requirements of this Code.
- (f) **Value determination.** For the purpose of this Section, the value of an existing building or structure shall be determined by the Building Official.
- (g) **Structural determination.** For the purpose of this Section, structural shall mean any part, material or assembly of a building or structure that affect the safety of the building or that supports any dead or designed live load, or where the removal of any part, material or assembly could cause or be expected to cause any part of the building or structure to become unsafe or to collapse.
- (h) **Change of occupancy or nature of use.** An existing building for which the occupancy classification or the nature of use is changed shall comply with the requirements for a new building of the same occupancy classification and type of construction, except as follows:
 1. Where, in the opinion of the Building Official, the proposed occupancy or change in use is not more hazardous than the existing use, based on life and fire risk, the Building Official may approve such change of occupancy and may require compliance with the requirements of this Code for buildings of like occupancy or use that, in his opinion, are specifically pertinent to safeguard the life, health and welfare of persons.
 2. Change of occupancy classification or nature of use shall not be construed to be a change of tenants or ownership where the occupancy classification and nature of use remain the same. When a building or part thereof has been vacant for a period of six months or more, a new Certificate of Occupancy shall be obtained before tenancy begins.
- (i) **Time limitation of application.** An application for a permit for any proposed work shall be deemed to have been abandoned 180 days after the date of filing, unless such application has been pursued in good faith or a permit has been issued; except that the Building Official is authorized to grant one or more extensions of time for additional periods not exceeding 90 days each. The

extension shall be requested in writing and justifiable cause demonstrated.

SECTION 303 PLANS AND SPECIFICATIONS

303.1 Plans and specifications required.

- (a) Each application for a permit shall be accompanied by an electronic set of plans or two sets of hardcopy plans, specifications and calculations when required by the Building Official.
- (b) The Building Official may issue a permit without plans, specifications and calculations for small or finish work, but in every case where work is of a structural nature, plans, details and calculations shall be submitted for review and approval.
- (c) Unless specifically exempted by the Building Official, buildings and/or structures, alterations, repairs or improvements, replacements and additions with a valuation of \$25,000 or more except as noted in paragraphs 1 and 2 below; or where the finished work is designed for public occupancy, the plans and specifications shall be prepared and approved by, and shall bear the seal, signature and date of, a professional engineer or registered architect either of whom shall be registered in the State of Florida.
 1. Any specialized mechanical, electrical, or plumbing document which includes a medical gas, oxygen, steam, vacuum, toxic air filtration, halon, or fire detection and alarm system which costs more than \$5,000.
 2. Fire sprinkler documents which includes a fire sprinkler system which contains 50 or more sprinkler heads. Personnel as authorized by Chapter 633 Florida Statutes, may design a fire sprinkler system of 49 or fewer heads and may design the alteration of an existing fire sprinkler system if the alteration consists of the relocation, addition or deletion of not more than 49 heads, notwithstanding the size of the existing fire sprinkler system.
- (d) Plans for additions and alterations in which mechanical or electrical design is required shall, at the discretion of the Building Official, be prepared by and bear the seal of a professional mechanical or electrical engineer registered in the State of Florida.
- (e) Plans shall be drawn to scale, identified by name of designer and owner on every sheet, and shall be an electronic Portable Document Format (PDF) or mechanically reproduced prints. A plot plan shall show all occupied and unoccupied parts of the lot or lots. The use, name and occupancy of all parts of the building shall be shown, including all foundations, wall sections, floor plans, elevations and structural details. Mechanical, plumbing, electrical, fire sprinkler and alarm details shall be shown on the plans and representing the designs for those disciplines, along with such other information

as may be required to show clearly the nature, character and location of the proposed work.

- (f) Plans for all buildings shall indicate how required structural and fire-resistance integrity will be maintained where a penetration of a required fire-resistant wall, floor or partition will be made for electrical, gas, mechanical, plumbing and communication conduits, pipes and systems, and also indicate, in sufficient detail, how the fire integrity will be maintained where required fire-resistant floors intersect the exterior walls.
- (g) **Manufacturing and installation of amusement rides and devices.** Two sets of signed and sealed plans are required for the manufacturing and installation of all amusement rides and devices. All structural components of the ride or device structure, including vertical or horizontal structural support members, shall have structural calculations performed and submitted for approval. All amusement building systems including, but not limited to, structural, electrical, mechanical, plumbing or gas shall be signed and sealed by a licensed engineer.

Exception: In lieu of signed and sealed plans and specifications, a letter signed and sealed by a professional engineer, registered in the State of Florida, attesting that the design of the amusement ride or device complies with ASTM F24 and EPCOT Standard 5-13 may be accepted at the discretion of the Building Official.

1. For the purpose of this Section, definitions of amusement ride and amusement device found in Subsection 5-13.101.3 shall apply.

303.2 Examination of plans.

- (a) The Building Official shall examine all plans and applications for permits and amendments thereto for their compliance with this Code. If the applications or the plans do not conform to the requirements of all pertinent laws, the Building Official shall reject such application for a building permit in writing, stating the reasons therefor. Plans that are rejected may be returned for corrections. If, upon examination, the application, plans and specifications are found to comply with the requirements of this Code, the plans shall be signed by the Building Official or his deputy and shall be stamped “APPROVED.” [See Subsection 305.2(b).]
- (b) When practical difficulties are involved in carrying out the requirements of this Code, the Building Official may grant modifications for individual cases. This requires first a finding that a special individual reason makes strict conformance impractical and second that the modification is in compliance with the intent and purpose of this Code. Fire protection and structural integrity shall not be lessened.
- (c) Upon approval of the Building Official of a plan to segment the construction into more than one permit, drawings shall be submitted for each permit phase. All work in any permit phase shall be at the complete risk of the contractor and owner. Upon approval of the drawings,

specifications and calculations of that phase, a permit will be issued for that phase.

303.3 Partial approval.

- (a) Pending the completion of checking of plans and specifications, and on payment of the fee required, the Building Official, at his discretion, may authorize the issuance of a temporary permit for site preparation, excavation, construction, foundation, structural and/or show/ride installations. The holder of such temporary permit shall proceed at his own risk and without assurance that a completion permit will be granted.
- (b) Whenever there is a delay in approval of plans under similar special circumstances, the Building Official may permit the builder to place tool sheds, materials, batterboards and construction equipment on the site prior to actual construction, or may permit exploratory uncovering of concealed structural elements of existing buildings for design information, pending completion of plans for proposed alterations.
- (c) Upon approval by the Building Official of a plan to segment the construction into more than one permit, drawings and permits shall be submitted for each phase. All work in any phase is at the complete risk of the contractor and owner. Upon approval of the drawings, specifications and calculations of that phase, a permit shall be issued for that phase.
- (d) The drawings for each phase must be complete in themselves so that review and inspection can properly be made. Preliminary plans of the total building shall be submitted in enough detail with the working drawings so that proper evaluation can be made. Areas and items not included in the phase to be permitted shall be shown as not included.

303.4 Approved plans.

- (a) The Building Official shall retain one set of the approved plans, specifications and computations. The other set shall be kept at the building site, open to inspection at all times when the offices of the District are open.
- (b) After permit issuance, all changes and deviations from the approved plans shall be submitted to the Building Official for approval.
- (c) Approved plans and amendments thereto, which are retained by the Building Official, shall become public record; provided, however, that they be considered as confidential records of their author, that they shall be open to the public only for inspection, that the Building Official may permit bona fide owners or designers employed by such owners to inspect the plans when not available from their author. Upon written application, the Building Official may permit the plans to be copied by the owner in the event of the author’s death or inability of the author to supply copies of the plans.
- (d) At the time a Certificate of Occupancy is issued, an updated set of plans and specifications shall be submitted and a permit fee shall be paid to reflect increased costs.

303.5 Multi-tenant buildings. Buildings, which may be completed in phases due to occupancy by tenants, shall be permitted for completion by owner to a rough-in status. The individual tenant area shall then have a permit issued and, upon completion of all work, a Certificate of Occupancy will be issued for that area only. The Building Official must approve the Certificate of Occupancy by stages before starting construction, and may require special conditions to provide safety during the completion.

Buildings, which will later be occupied by multiple tenants (lessees), may be permitted to have certain areas constructed to an unfinished “rough-in” condition without affecting the Certificate of Occupancy issued for the finished portions of the buildings. Future construction to accommodate individual tenants may be approved upon submittals of acceptable plans and specifications for permit purposes. Certificates of Occupancy will be granted on a case-by-case basis when code compliance has been achieved.

Construction in individual tenant areas may require special safety and fire protection measures to assure the safety of the building occupants during construction operations.

SECTION 304 PERMIT FEES

304.1 Fee required. Any person requiring a building permit, in addition to filing an application therefor and before such permit is issued, shall pay such permit fee and plan check fee as required by the District.

304.2 Basis of permit fee. The Building Official may require an estimate of cost and other descriptive data as a basis for determining the permit fee. The permit fee and plan review fee shall be based on the valuation of the work to be done. The valuation shall include the total value of all work, including the cost of materials and labor, and shall be based on the contract or selling price of the installation or alteration, and shall include electrical, plumbing, mechanical, sprinkler, elevator and owner-furnished equipment.

Exception: Costs associated with landscaping plant materials and irrigation systems are not to be included in the determination of the value or valuation of permitting.

304.3 Refunds. Permit and plan review fees are nonrefundable.

SECTION 305 CONDITIONS OF PERMIT

305.1 Permit card. When plans, specifications and application for permit have been approved and the required fee has been paid, the Building Official will issue a permit for the work. With each permit, the Building Official shall issue a weather-resistant permit card bearing the legal description of the property, the nature of the work being done, the names of the owner and builder or contractor, and other pertinent information. The permit card shall be posted and maintained in legible condition in a conspicuous place within 200 feet of

the construction area during the entire time period the work authorized by the permit is in progress.

305.2 Compliance with Code.

- (a) Issuing or granting of a permit or approval of plans and specifications by the Building Official shall not be construed to be a permit for, or an approval of, any violations of any of the provisions of this Code. No permit presuming to give authority to violate or cancel any of the provisions of this Code shall be valid, except insofar as the use of work which it authorizes is lawful.
- (b) When plans and specifications have been approved, the issuance of a permit shall not prevent the Building Official from thereafter requiring correction of errors in such plans and specifications, or from preventing building operations being carried on thereunder in violation of this Code or of any other regulations of the District applicable thereto. Compliance with this Code is the responsibility of the owner or his authorized agent.

305.3 Time limitation.

- (a) Permits shall expire if the work authorized by such permit is not commenced within six months from the date of the permit, or if, after commencing, the work is suspended or abandoned for a period of six months at any time during construction operations. The Building Official may extend such permit for a period of 90 days from the date of expiration if the work has not commenced, or for a period of 90 days from the date of the last recorded inspection, if written application for such extension is received and approved by the Building Official prior to the date of expiration of the initial permit, and provided that the proposed work complies with all requirements of the code in effect at the time of such renewal.
- (b) A previously issued lawful permit shall be valid on the terms of this Code under which it was issued, provided, however, that such permit shall be subject to the limitations specified in this Section.
- (c) Before work for which a building permit has become void can be resumed, a new permit shall be required. The work for which the new permit is issued shall conform to the provisions of this Code at the time of reissuance of the permit. The fee shall be based on the amount of work remaining to be done.

305.4 Revocation of permit.

- (a) The Building Official may revoke a permit or approval issued under the provisions of this Code when any false statement or misrepresentation of fact is made in the application or on the plans on which the permit or approval was based.
- (b) Whenever the work for which a permit has been issued is not being performed in compliance with plans, specifications or descriptions, or approved plans are not being kept at the site, the Building Official shall notify the contractor or owner, or their agent, in writing that the permit is suspended. Written notice shall be mailed or given to the permit holder or his agent, and it shall be

unlawful for any person or persons to perform any work in or about the building or structure, except work required for correction of the violations. If, in the judgment of the Building Official, there is imminent danger that requires immediate action, the permit may be revoked or suspended verbally and written notice may be served later.

- (c) When a permit has been suspended it shall not be reinstated until all violations have been corrected. Written notice of reinstatement shall be given to the permit holder when requested.

**SECTION 306
INSPECTION**

306.1 Inspection required.

- (a) Before issuing a permit, the Building Official may inspect any building or structure for which an application has been received for a permit to enlarge, alter, repair, relocate, demolish or change the occupancy thereof. The Building Official shall inspect all buildings and structures from time to time during the work for which a permit was issued and on completion of the work. The Building Official shall cause to be kept a record of every inspection and of all violations of this Code, and of the correction and disposition of such violations.
- (b) Before a building permit is issued for moving a building or structure within or into the District, such building or structure shall be inspected by the Building Official. The Building Official shall ascertain that the building being relocated complies with the requirements of this Code and all other applicable laws or regulations of the District.
- (c) All construction or work for which a permit is required shall be subject to mandatory inspections by the Building Official as prescribed in Subsection 306.2, and certain types of construction shall have special engineering inspections as specified in Subsection 306.3. Prior to issuance of a Certificate of Occupancy, a final inspection shall be made by the Building Official of all construction or work for which a permit has been issued.
- (d) When considered necessary by the Building Official, he shall make an inspection of materials or assemblies at the place of manufacture or fabrication. He shall keep a record of every such inspection and of all violations of this Code noted during the inspection.
- (e) The Building Official may make or cause to be made the inspections required in this Section. He may accept written reports of inspectors employed by approved inspection services, provided that after investigation the Building Official is satisfied as to the qualifications and reliability of the inspection service. No certificate called for by any of these requirements shall be based on such reports, unless the reports are in writing and are certified by the officer of the agency who made the inspection. Reports issued by inspection services engaged by owner, designer or contractor of a building shall be

promptly forwarded to the Building Official for his information and records.

- (f) Work requiring a building permit shall not be commenced until the permit holder or his agent shall have posted the building permit card in accordance with the requirements of Subsection 305.1. This permit card shall be maintained in such position by the permit holder until the Certificate of Occupancy has been issued by the Building Official.

306.2 Mandatory inspections.

- (a) Work requiring mandatory inspections shall not be covered or concealed in any manner without first obtaining the approval of the Building Official.
- (b) Work shall not be done on any part of a building or structure beyond the stage of work indicated in each of the successive mandatory inspections until inspection has been completed and written approval has been given by the Building Official or his deputy.
- (c) The permit holder or his agent shall notify the Building Official of the time when that stage of construction will be ready for inspection. The Building Official shall then make such called inspection and other inspection as may be necessary, and he shall either approve, in writing, on the permit card that part of the construction as completed or shall notify the permit holder or his agent specifically wherein the work fails to comply with the provisions of this Code.
 1. **Foundations.** When the excavation for footings is complete, footing forms, required anchorage and reinforcing steel are in place, but before concrete is placed.
 2. **Reinforcing steel (lower stresses).** After all reinforcing steel is in place, slab, soffit, beam, girder, column and joist forms, on one side of wall forms are in place and are braced, before the concrete is placed and reshoring after concrete placement.
 3. **Framing.** To be made at each floor level and after all floor, wall and roof framing, and fire blocking are complete; welds and clip connections are made and all pipes, chimneys, vents, ductwork, rough plumbing and rough electrical work are in.
 4. **Insulation.** To be made before lathing, wallboard or other finishes are applied.
 5. **Lathing and wallboard.** When supports, backing, lath, and (or) wallboard are in place and ready for plaster and other finish work, and all plastering materials are delivered on the job, but before any finish is applied and before wallboard joints and fasteners are taped and finished.
 6. **Roofing.** After anchor sheet or sheets are on, secured and before installation of capsheet or other finish course.
 7. **Masonry.** After units are set, reinforcing steel is placed and prior to grouting.

8. **Structural steel.** When structural steel members and required connections are complete, but before concealing any members or connections.
 9. **Plumbing and gas systems.** To be made in accordance with the requirements of the *EPCOT Plumbing Code* and the *EPCOT Fuel Gas Code*.
 10. **Electrical systems.** To be made in accordance with the requirements of the *EPCOT Electrical Code*.
 11. **Heating and ventilating systems.** To be made in accordance with the requirements of the *EPCOT Mechanical Code*.
 12. **Fire protection systems.** Shall be in accordance with applicable standards.
 13. **Special inspections.** To be made immediately after completion and at such intervals during the progress of the work as the Building Official may require, and as follows:
 - **Elevators, escalators, transporting assemblies and amusement rides.** To be made in accordance with the requirements of EPCOT Standard 5-1.
 - **Swimming pools.** To be made in accordance with the requirements of Appendix E.
 - **Signs.** To be made in accordance with the requirements of Appendix D.
 14. **Other inspections.** To be made as the Building Official, owner or contractor may reasonably request. Prefabricated assemblies may be inspected at the place of manufacture as set forth in Subsection 306.1(c).
 15. **Final inspection.** To be made when the building or structure is completed and is ready for use or occupancy.
- (d) Requests for final inspections shall be made to the office of the Building Official, and reasonable time shall be allowed for such inspection to be made. Rejection or refusal to approve the work for reasons of incompleteness, violation of the provisions of this Code or inadequacy of the construction shall nullify the request for final inspection. The work shall be made to comply with this Code and the request for inspection shall be repeated as required herein.

306.3 Special engineering inspection.

- (a) In addition to the mandatory inspections to be made by the Building Official as specified in Subsection 306.2, continuous inspection by an approved independent engineering inspector shall be required under the following conditions:
1. Reinforced concrete with design strength of more than 2,500 pounds per square inch.
 2. Reinforced masonry work when using full design stresses.
 3. Multiple-pass welding of all structural metals in both shop and field.

4. High-strength bolts—shop and field.
 5. Foundation piles—all types.
 6. High-lift grouting of structural reinforced masonry.
 7. Pneumatically applied structural mortar or concrete.
 8. Prestressed concrete.
 9. Other items, at the discretion of the Building Official. The Building Official may waive continuous inspections when minor quantities of structural materials are used and where no unusual hazards are present; or, where in the judgment of the Building Official, the unit stresses used in design do not exceed those permitted elsewhere in this Code for work not continuously inspected and where no unusual hazards are present.
- (b) **Special periodic inspections.** In addition to the continuous inspections to be made as required in Subsection 306.2, there may be required special periodic inspections by an approved independent engineering inspector at intervals to be determined by the Building Official and under the following conditions:
1. Structural lightweight concrete at batching and placing locations.
 2. Reinforced gypsum concrete.
 3. Open-web joist—complete examination at site, prior to erection.
 4. Single-pass structural welds designed for more than 50 percent of permitted stresses for structural materials.
 5. Precast concrete.

306.4 Entertainment functions and special event inspections. Any function involving the use of temporary tents, stages, performance platforms, bleachers, show power or trailers shall comply with the provisions established for temporary structures in Subsections 301.1(d), 302 and 308.5. A Certificate of Occupancy shall be issued upon completion of all mandatory inspections.

306.5 Inspection reports. The Building Official shall keep a record of all inspections made, results, plans filed, surveys made and Certificates of Occupancy issued.

SECTION 307 CLEANUP OF SITE

307.1 Cleanup of site. Upon completion of the proposed work, the permit holder shall clear the site of rubbish, debris, construction sheds or materials of construction. In the event that there has been damage to public property, or that rubbish, debris, construction sheds or materials of construction have been left at the site, the Building Official shall refuse to make final inspection and shall notify the permit holder to correct the condition of violation within five days. For failure to comply with such notice after such period of five days, the permit holder shall be subject to the penalties specified herein. The Building Official shall have the cleanup work done and the

public property restored in accordance with the applicable requirements of Chapter 4 and Appendix F, in which event the costs therefore shall become a lien against the property on which the permit was issued.

**SECTION 308
CERTIFICATE OF OCCUPANCY**

308.1 Certificate required.

- (a) No building hereafter erected, altered, enlarged or relocated, or where a change of occupancy has been made, shall be used in whole or in part until a Certificate of Occupancy has been issued by the Building Official certifying that the building and occupancy are in accordance with the provisions of this Code and all other laws and regulations applying thereto. When the building or part thereof complies with the provisions of all pertinent laws and regulations, the Building Official shall issue the Certificate of Occupancy for the building or part thereof. A Certificate of Occupancy for places of assembly shall indicate thereon and make record of the number of persons for which such certificate is issued. In all manufacturing, commercial, storage or warehouse occupancies, the design live loads shall be plainly posted.
- (b) Any building altered and/or enlarged, when in the opinion of the Building Official, is in compliance with this Code, the owner shall be issued a letter affirming compliance in lieu of a Certificate of Occupancy.

308.2 Existing occupancy. If an occupancy that was authorized prior to the adoption of this Code does not comply with the requirements of this Code, the Building Official shall issue a new Certificate of Occupancy therefore, unless the building and use, in his opinion, constitute a serious hazard to life, limb or property. If an application for a new Certificate of Occupancy is denied, such existing occupancy shall be in violation of this Code.

308.3 Revocation of certificate. The Building Official shall revoke a Certificate of Occupancy for any building occupied in whole or in part for any use not authorized in this Code, or in other laws and regulations of the District, or that is changed in occupancy to a classification not complying with this Code, or for any building where the live load imposed on any floor, or where the number of persons permitted to assemble therein or thereon exceed those authorized in said Certificate of Occupancy. Continued use of the building or structure after the revocation of said certificate shall be in violation of this Code.

308.4 Temporary Certificate Of Occupancy. A Temporary Certificate of Occupancy may be issued by the Building Official for the use of parts of a building prior to completion of the entire building.

308.5 Connection of services. It shall be unlawful for a public service corporation or agency to begin utility service to a building or structure, except temporary service for use during building construction and/or testing operations, until a Certificate of Occupancy has been issued.

**SECTION 309
MAINTENANCE OF
BUILDINGS AND PROPERTY**

309.1 Buildings. The requirements contained in this Code for maintenance of buildings shall apply to all buildings and structures in existence on the date of enactment of this Code and those hereafter erected. All buildings and structures, and all parts thereof, shall be maintained in a safe condition, and all devices and safeguards required by this Code shall be maintained in operating condition. This Section shall not be construed as permitting the removal or nonmaintenance of existing devices or safeguards, unless authorized by the Building Official.

309.2 Property. No debris shall remain on any property, sidewalk or street contiguous thereto, resulting from fire, windstorm, demolition or partial demolition of any building; nor shall any equipment, excess building materials, storage shed or debris remain upon any such property, sidewalk or street upon completion of any new building upon such lot; nor shall any equipment, materials, toolshed or debris be stored on any vacant or partly vacant lot, except as provided in the land use regulations of the District.

309.3 Existing installations. Buildings in existence at the time of the adoption of this Code may have their existing use or occupancy continued if such use or occupancy was legal at the time of the adoption of this Code, provided such continued use is not dangerous to life.

**SECTION 310
UNSAFE BUILDINGS**

310.1 Unsafe building defined. All buildings shall be considered unsafe buildings that are, or that hereafter become unsafe, unsanitary or deficient in exit facilities; or that constitute a hazard from fire or windstorm; or that are otherwise dangerous to human life or public welfare by reason of illegal or improper use, occupancy or maintenance; or that do not comply with the provisions of applicable codes; or that have been substantially damaged by the elements, acts of God, fire or explosion, or other cause; or that are incomplete buildings for which building permits have expired. All such buildings, deemed to be unsafe by the Building Official, are hereby declared to be public nuisances and shall be demolished and removed from the premises concerned or shall be made safe and sanitary in a manner required by the Building Official and as provided in this Section and other applicable laws and regulations of the District.

310.2 Criteria.

- (a) A building shall be deemed to be a fire hazard and unsafe when it is vacant and unguarded and open at door or window; or when there is an unwarranted accumulation of dust, debris or other combustible materials therein; or when the building does not provide the exits or fire protection required herein for the most recent occupancy; or when the electrical or mechanical installations or systems create a hazardous condition. The falling away, the hanging loose or loosening of any siding, block, brick or other building material, structural

member, appurtenance or part thereof of a building; the deterioration of the structure or structural parts of a building; a partially destroyed building; any unusual sagging or leaning out of plumb of a building or any part of a building, when caused by deterioration or over-stressing, all shall be considered unsafe. The existence of unsanitary conditions by reason of inadequate malfunctioning sanitary facilities or waste disposal systems shall be considered unsafe. Buildings which, by reason of illegal or improper use, occupancy or maintenance, do not conform to provisions of this Code shall be considered unsafe.

- (b) If the cost of alteration, repair or replacement of an unsafe building or part thereof exceeds 50 percent of its value, the building shall be demolished and removed from the premises. If the cost of alteration, repair or replacement of an unsafe building or part thereof does not exceed 50 percent of such replacement cost, the building may be repaired and made safe as provided in Section 302.
- (c) If the cost of structural repair or structural replacement of an unsafe building or part thereof exceeds 33 percent of the structural value, such building or part thereof shall be demolished and removed from the premises; and if the cost of such structural repairs does not exceed 33 percent of such replacement cost, such building or part thereof may be structurally repaired and made safe, as provided in Section 302.
- (d) To determine the value of a building and the cost of alterations, repairs and replacement, the regulations in Subsection 302.6(f) shall apply.

310.3 Inspection of unsafe buildings. The Building Official, on his own initiative or as a result of reports filed with the Department of Building and Safety, shall examine or cause to be examined every building appearing to be or reported to be unsafe, and if such is found to be an unsafe building as defined in Section 310, the Building Official shall post the property on which the building is located and shall furnish the owner of such building with a written Notice of Violation. The manner of posting and furnishing written notice shall be as provided in Subsections 310.4 to 310.6 inclusive.

310.4 Notice of violation. At least 14 days prior to posting a noncomplying building, the Building Official shall give the owner of the premises written notice by certified mail, addressed to the owner's last known address. If proof of service by certified mail is not completed by signed return receipt, a copy of the written notice shall be affixed to the structure concerned and such procedure shall be considered proper service, and the time for compliance stipulated in the notice shall commence with the date such notice is so affixed. This written notice shall state the defects that constitute a violation of this Code and prescribe the action to be taken by the owner of the building to comply with this Code and the time within which compliance must be accomplished. Such time shall be reasonable under the circumstances of the case, subject to reasonable extension when requested in writing, for reasons which the Building Official considers as justifying an extension of time. All extensions of time shall be by written

approval of the Building Official. In addition, this written notice shall explain the right of appeal of the decision of the Building Official to the Board of Appeals, and shall state that unless there is compliance with the instructions in the Notice of Violation, or an appeal is filed, that a public hearing before the Board of Appeals will be initiated by the Building Official after the time period for compliance has expired.

310.5 Recording notice of violation.

- (a) If the owner of the property has not complied with the requirements as stated in the Notice of Violation within the time specified, the Building Official may file an appropriate instrument in the office of the Clerk of the Circuit Court, to be recorded in the public records of the County in which the violation occurred, indicating that violations of this Code, and of Section 310 thereof exist upon the property involved.
- (b) The recording of such notice shall constitute legal notice to all concerned, as well as any subsequent purchasers, transferees, grantees, mortgagees, lessees, and all persons claiming or acquiring interest in the property.
- (c) When a violation specified in the Notice of Violation has been corrected and the filing fees incurred have been paid, the Building Official shall file a certificate attesting that the violation has been corrected.

310.6 Posting notice of violation. The Building Official shall post a signed notice in a conspicuous location on the building that has been determined to be unsafe, but not before 14 days after the Notice of Violation provided in Subsection 310.4 has been served. The posted notice shall be dated and shall read: "UNSAFE BUILDING – This building is unsafe, in the opinion of the Building Official, as specified in Section 310 of the *EPCOT Building Code*. This building shall be vacated, shall not be occupied. Action shall be taken by the owner as further prescribed by written notice previously served. THIS NOTICE SHALL NOT BE REMOVED EXCEPT BY THE BUILDING OFFICIAL."

310.7 Emergency action.

- (a) When, in the opinion of the Building Official, there is actual or immediate danger of the failure or collapse of a building, or when there is a health, windstorm or fire hazard, the Building Official may order the occupants to vacate, temporarily close for use or occupancy the rights-of-way thereto, sidewalks, streets or adjacent buildings, or nearby areas, and institute such other temporary safeguards, including securing and posting of the building as the Building Official may deem necessary under the circumstances. The Building Official may employ the necessary labor and materials to perform the required work as expeditiously as possible.
- (b) Costs incurred in the performance of such emergency work shall be paid by the governmental authority having jurisdiction. Upon recording in the public records of the County in which such emergency work was completed, a certificate, executed by the Building Official, certifying the amount expended and the reasons therefore, the cost shall become a lien against the property on which such emergency work was required.

310.8 Appeal and review. The owner of, or anyone having an interest in, a building that has been determined to be unsafe, concerning which a Notice of Violation has been served by the Building Official as stated in the Notice of Violation, may appeal to the Board of Appeals and such appeal shall be filed in accordance with the provisions of Subsections 106.6 and 106.7 prior to the expiration of the time allowed for compliance specified in such notice. In no case shall the appeal period be less than 15 days.

SECTION 311 ALTERNATIVE MATERIALS AND METHODS OF CONSTRUCTION

311.1 Alternatives permitted. The provisions of this Code are not intended to prevent the use of construction systems, materials, methods of design or interpolations, calculations, evaluations or similar evidence based upon test data acceptable to the Building Official as alternatives to the standards and provisions set forth in this Code. Such alternatives may be offered for approval and their consideration shall be as provided in this Section.

311.2 Standards. Construction systems, materials or methods of design referred to in this Code shall be considered as standards of quality and strength. New or alternative construction systems, materials or methods of design shall be at least equal to and meet the intent of these standards for the corresponding use intended. Test or prototype installations of new materials, methods or systems may be permitted for scientific and development purposes.

311.3 Application.

- (a) Any person desiring to use construction systems, materials or methods of design not specifically mentioned in this Code shall file with the Building Official a request for permission to use such systems, materials or methods, together with proof in writing from an approved agency, in support of claims that may be made regarding the sufficiency of such construction systems, materials or methods of design. If a test installation is proposed, a description of the location and purpose of test also shall be submitted.
- (b) Where a building or part thereof is a structural unit, the integral parts of which have been built or assembled prior to incorporation into the building, such building or part thereof shall conform to the requirements of this Code. Materials and assemblies shall be tested and certified in accordance with the provisions of this Section. Inspections shall be made by the Building Official as required in this Code for the materials and types of construction used in the prefabricated assemblies.

Exception: Continuous inspection may be required during prefabrication if the approved agency certifies to the compliance of the construction with this Code and supplies evidence of such compliance in writing by a professional engineer, a registered architect, or an approved agency or laboratory.

- (c) The Building Official shall approve such alternative construction systems, materials or methods of design when it is clear that the standards of this Code are at

least equaled. If, in the opinion of the Building Official, the standards of this Code will not be equaled by the alternative requested, he shall refuse approval for permanent work. He shall, however, give consideration to test or prototype installations.

311.4 Tests.

- (a) Whenever there is insufficient evidence of compliance with the requirements of this Code or evidence that any material or method of construction does not conform to the requirements of this Code, or to substantiate claims for alternative construction systems, materials or methods of construction, the Building Official may require tests for proof of compliance to be made by an approved agency at the expense of the owner or his agent.
- (b) Test methods shall be as specified by this Code for the material in question. If there are not appropriate test methods specified in this Code, the Building Official shall determine the test procedure to be followed.

311.5 Appeal. Any person whose request for use of alternative systems and materials or methods of design has been refused by the Building Official may appeal to the Board of Appeals by written request to the Secretary of the Board, and such written request shall be transmitted to the Board immediately. The method of appeal shall be as provided in Subsection 106.6.

CHAPTER 4

REGULATIONS FOR USE OF STREETS AND FOR PROJECTIONS OVER PUBLIC AND PRIVATE PROPERTY

SECTION 401 PROTECTION OF PEDESTRIANS DURING CONSTRUCTION OR DEMOLITION

401.1 General.

- (a) No persons shall place or store any material or equipment necessary for the work under a building permit, on a street, alley or public sidewalk, nor shall any work be performed, except in accordance with the provisions of this Chapter and Appendix F.
- (b) No person shall perform any work on any building or structure, if by so doing he endangers pedestrians on the street that abuts the property line, unless the pedestrians are protected as specified in this Chapter.
- (c) Any material or structure temporarily occupying public property, including fences and walkways, shall be adequately lighted between sunset and sunrise.

401.2 Temporary use of streets or alleys. The use of public property shall meet the requirements of the District. Whenever requested, plot plans and construction details shall be submitted for review by the Building Official.

401.3 Maintenance and removal of protective devices. Required protective devices shall be maintained in place and kept in good order for the entire length of time pedestrians may be endangered. Every protection fence or canopy shall be removed within 30 days after such protection is no longer required for pedestrians.

401.4 Demolition. The work of demolishing any building shall be done in accordance with Appendix F and shall not be commenced until the required pedestrian protection structures are in place. The Building Official may require the permittee to submit plans and a complete schedule for demolition. Where such are required, no work shall be done until such plans and/or schedule are approved by the Building Official.

401.5 Construction fences. For requirements see Appendix F.

SECTION 402 PERMANENT OCCUPANCY OF PUBLIC PROPERTY

402.1 General requirements.

- (a) No part of any structure or any appendage thereto, except signs, shall project beyond the property lines of the building site, except as specified in this Section. Signs and their method of installation shall conform to the requirements of Appendix D.
- (b) Structures or appendages regulated by this Code shall be constructed of materials as specified in Section 707.

- (c) The projection of any structure or appendage shall be the distance measured horizontally from the property line to the outermost point of the projection.

- (d) No provisions of this Chapter shall be construed to permit the violation of other laws or ordinances regulating the use and occupancy of public property.

402.2 Projection into alleys.

- (a) No part of any structure or any appendage thereto shall project into any alley.
- (b) A curb or buffer block may project not more than 9 inches and not exceed a height of 9 inches above grade.
- (c) Footings located at least 8 feet below grade may project not more than 12 inches.

402.3 Space below sidewalk. The space adjoining a building below a sidewalk on public property may be used and occupied in connection with the building for any purpose not inconsistent with this Code, or other laws or rules regulating these, and occupancy of such spaces on condition that the right to use and occupy may be revoked by the District at any time and that the owner of the building will construct the necessary walls and footing to separate such space from the building and pay all costs and expenses attendant thereto.

402.4 Balconies and appendages. Oriel windows, balconies, unroofed porches, cornices, belt courses and appendages, such as water tables, sills, capitals, bases and architectural projections, may project over the public property of the building side a distance determined by the clearance of the lowest point of the projection above the grade immediately below, as follows:

Projections less than 8 feet are not permitted above a walking surface on public or private property. One inch of projection is permitted for every 1 inch above 8 feet, up to a maximum of 4 feet of projection.

402.5 Marquees.

- (a) For the purpose of this Section, a marquee shall include any object or decoration attached to or a part of said marquee. A marquee shall be fire protected as required in Chapter 7.
- (b) The horizontal clearance between a marquee and the curb line shall be not less than 2 feet.
- (c) A marquee projecting more than two-thirds of the distance from the property line to the curb line shall be not less than 12 feet above the ground of the pavement below.
- (d) A marquee projecting less than two-thirds of the distance from the property line to the curb line shall be not less than 8 feet above the ground or pavement below.

- (e) A marquee projecting more than two-thirds of the distance from the property line to the curb line shall not be more than 25 feet along the direction of the street.
- (f) The maximum height or thickness of a marquee measured vertically from its lowest to its highest point shall not exceed 9 feet.
- (g) A marquee shall be supported entirely by the building, constructed as specified in Section 707 and shall be of noncombustible material, or, when of Type VI construction, may be of 1-hour fire-resistive construction.
- (h) The roof or any part thereof may be a skylight when wired glass not less than 1/4 inch thick is used and no single pane is more than 18 inches wide. Every roof and skylight of a marquee shall be sloped to downspouts, which shall conduct any drainage from the marquee under the sidewalk to the curb.
- (i) Every marquee shall be located so as not to interfere with the operation of any exterior standpipe or to obstruct the clear passage of stairways or exits from the building or the installation or maintenance of electroliners.

402.6 Movable awnings or hoods.

- (a) An awning is a movable shelter supported entirely from the exterior wall of a building and of a type which can be retracted, folded or collapsed against the face of a supporting building.
- (b) Such awning or hood may extend over public or private property not more than 7 feet from the face of a supporting building, nor within 2 feet of the curb line, measured horizontally.
- (c) Class I and II plastics may be used in awnings and canopies when constructed in accordance with the requirements for marquees in Subsection 402.5. (See Section 1008.)
- (d) Collapsible awnings shall be so designed that they shall not block a required exit when the awning is collapsed.
- (e) Movable awnings or hoods may have collapsible coverings supported on noncombustible frames attached to the building and entirely supported by the building.
- (f) Such awning or hood may extend over the public property not more than two-thirds the distance from the property line to the nearest curb in front of the building site.
- (g) All parts of awnings shall be at least 8 feet above a public walkway, except as permitted in Paragraph (h).
- (h) A valance attached to an awning shall be of cloth unless it is fabricated of the same material used for the roof of the awning. A metal valance shall not project above the roof of the awning at the point of attachment and shall not extend more than 12 inches below the roof of the awning at the point of attachment; nor shall any part of a valance be less than 7 feet above a public way.

402.7 Doors. Doors, either fully opened or when opening, shall not project beyond the property line.

402.8 Roof drainage. Drainage water collected from the roof of a building or structure, awning, canopy or marquee that exceeds 16 square feet in area, or condensate from mechanical equipment, shall not discharge on to a public walking surface.

CHAPTER 5

REQUIREMENTS BASED ON OCCUPANCY

SECTION 501 CLASSIFICATION OF OCCUPANCIES

501.1 Occupancies classified. Every building erected in the District shall be classified by the Building Official according to its present or intended use or occupancy as a building of Group A, AA, B, D, E, H, I, R or S occupancy, as set forth in Sections 504 to 516 and Table 5.1.

501.2 Unclassified occupancies. Any occupancy not clearly identified shall be classified by the Building Official in the group that it most nearly resembles, based on life and fire hazards of the proposed occupancy.

**TABLE 5.1
CLASSIFICATION OF OCCUPANCIES**

Group A – Assembly	
A-1	Assembly buildings with a stage; occupant load of 1,000 or more.
A-2	Assembly buildings with a stage; occupant load of 50 or more, but less than 1,000.
A-3	Motion picture theaters; occupant load of 50 or more.
A-4	Churches, places of worship or religious assembly; occupant load of 50 or more.
A-5	Assembly rooms; occupant load of 50 or more, including, but not limited to, multipurpose rooms, restaurants, night clubs, dance halls, bowling lanes, drinking or dining establishments, assembly areas contiguous to bus or train depots or airports, libraries and museums.
A-6	Stadiums and grandstands not classified in other divisions of Group A.
A-7	Temporary grandstands.
A-8	Studios, motion picture and television soundstages.
Group AA – Amusement ride structures	
AA	Amusement ride structures as defined in EPCOT Standard 5-13.
Group B – Business—Commercial	
B-1	Wholesale and retail stores, malls, mercantile and office buildings with an occupant load of 500 or more.
B-2	Wholesale and retail stores, mercantile and office buildings not classified in Group B-1; related storage areas, paint stores without bulk handling, restaurants or places supplying food or drink that accommodate less than 100 people.
B-3	Gasoline service stations, automobile parking garages where no repair work is done and where no flammable liquids are used.
B-4	Aircraft hangars where no repair work is done, except exchange of parts and maintenance requiring no open flame, welding or the use of highly flammable liquids, open parking garages and structures, heliports and helistops.
Group D – Detention and hospitalization.	
D-1	Mental hospitals, mental sanitariums, jails, prisons, reformatories and buildings where personal liberties are restrained.
D-2	Hospitals, sanitariums, nursing homes with nonambulatory patients and nurseries for the full-time care of children.
D-3	Nursing homes for ambulatory patients and homes for children over kindergarten age, each accommodating more than five persons.

(continued)

501.3 Change in occupancy. No change shall be made in the occupancy or use of a building unless such building complies with the requirements of this Code for such re-classification.

Exception: The occupancy of existing buildings may be changed with the approval of the Building Official, and the building may be occupied for purposes in other occupancy groups without conforming to all of the requirements of this Code for those groups when the new or proposed use is less hazardous than the existing use, based on life and fire risk.

**TABLE 5.1—continued
CLASSIFICATION OF OCCUPANCIES**

Group E – Educational	
E-1	Buildings or parts of buildings, or a group of buildings, on one property with an occupant load of 50 or more, used for education, instruction or recreation of pupils from kindergarten (including preschool) through the 12th grade, for 12 hours or more per week, or 4 hours or more in any one day, not included in Group A.
E-2	Buildings or parts of buildings, or a group of buildings, on one property with an occupant load of less than 50, used for education, instruction or recreation of pupils from kindergarten (including preschool) through the 12th grade, for less than 12 hours per week, or less than 4 hours in any one day, not included in Group B.
E-3	Buildings or parts of buildings used for day care or day nursery care of five children or more.
Group H – Hazardous	
H-1	Buildings or parts of buildings used for storage and handling of hazardous and highly flammable or explosive materials other than flammable liquids.
H-2	Dry cleaning plants, paint stores and bulk handling, paint shops, paint spraying rooms and shops, and other uses requiring storage and handling of Class I, II or III flammable liquids.
H-3	Woodworking plants, planing mills and box factories, shops and factories where loose combustible fibers are manufactured or processed or where dust is generated, warehouses where highly combustible materials and high-piled stock are stored or kept.
H-4	Garages and aircraft hangars where maintenance and repair work is done.
Group I – Industrial	
I-1	Power plants, pumping stations, cold-storage buildings, creameries and ice plants.
I-2	Factories and warehouses wherein materials other than highly combustible are used, processed or stored; or where high-piled stock is warehoused, stored, used or processed.
I-3	Maintenance work shops and laboratories.
Group R – Residential	
R-1	Hotels, motels and similar facilities having three or more rooms for transient guests.
R-2	Multiple-residential apartment houses, convents, monasteries, dormitories, guest houses and facilities having three or more permanent residential units.
R-3	Dwellings of one and two units.

(continued)

**TABLE 5.1—continued
CLASSIFICATION OF OCCUPANCIES**

Group S – Satellite structures	
S-1	Private garages, carports, greenhouses, cabanas, bath houses, agricultural buildings, shade structures, guard shacks and kiosks.
S-2	Commercial stables.
S-3	Swimming pools.
S-4	Mobile homes, campers, trailers, unoccupied manufactured buildings and sheds.
S-5	Tanks and towers located above ground that support their own weight.
S-6	Fences as defined in Chapter 2.
S-7	Docks.
S-8	Animal support facilities.
S-9	Street lighting, signage, lift stations, electrical vaults or structures associated with roadway right-of-way.

**SECTION 502
OCCUPANCY SEPARATION**

502.1 Mixed occupancies.

- (a) When a building is used for more than one occupancy, each part of the building comprising a distinct occupancy, as described in this Chapter, shall be separated from other occupancies as specified in this Section and Table 5.2.
- (b) A building housing more than one occupancy shall conform to the requirements of this Code for height, area and type of construction applying to the principal occupancy of the building. Occupancies in the same building, other than the principal occupancy, shall not exceed the area limitations or be located at a story height greater than that permitted for such occupancy and the type of construction being used. [See Subsection 601.1(c).]
- (c) When minor accessory uses do not occupy more than 25 percent of the area of any floor of a building, nor more than the basic area permitted the occupancy by Table 7.5 for such minor use, for the purpose of determining permitted area, the principal use of the building shall determine the occupancy classification, when the uses are separated as specified in this Section.

Exception: The following accessory occupancies need not be separated from the primary occupancy as required herein:

1. An area used solely as a public dining room having an occupancy load of not more than 300 and accessory to a retail sales area classified in Group B-1, B-2 or R-1.
2. An assembly room not more than 750 square feet in area, when not accessory to a Group H (hazardous) occupancy.
3. Administrative, clerical or other office rooms, which, in the aggregate, are not more than 25 percent of the principal occupancy, when not accessory to a Group H occupancy, but shall be not more than the basic area permitted for the occupancy and type of construction.
4. Accessory rooms for educational instruction not more than 12 hours per week in buildings housing Group A-4 occupancies.

- (d) When a building is used for more than one occupancy, each part of the building housing a separate occupancy shall conform to all of the requirements of this Code for the occupancy housed therein.

502.2 Forms of occupancy separation. Occupancy separations shall be vertical, horizontal or both, or when necessary, of such other form as required to provide complete separation between occupancy divisions in the building.

502.3 Occupancy separations classified.

- (a) Occupancy separations shall be classified as, 3-hour fire resistive, 2-hour fire resistive and 1-hour fire resistive. (See EPCOT Standard 7-1 for specifications for fire dampers in air ducts piercing occupancy separations.)
- (b) A 3-hour fire-resistive occupancy separation shall be of not less than 3-hour fire-resistive construction. All openings in the walls forming such separation shall be protected by an approved opening protective having a 3-hour fire-resistive rating. The aggregate area of all openings in a 3-hour fire-resistive occupancy separation wall shall not exceed 25 percent of the wall in that story and no single opening shall have an area larger than 120 square feet. All openings in floors forming a 3-hour fire-resistive occupancy separation shall be protected by vertical enclosures extending above and below such openings. The walls of such vertical enclosures shall be not less than 2-hour fire-resistive construction and all openings therein shall be protected by an approved opening protective, as defined in Subsection 704.3, having a 1½-hour fire-resistive rating.
- (c) A 2-hour fire-resistive occupancy separation shall be of not less than 2-hour fire-resistive construction. The aggregate area of all openings in a 2-hour fire-resistive occupancy separation shall not exceed 25 percent of the wall area in that story. All openings in such separations shall be protected by an approved opening protective having a 1½-hour fire-resistive rating.
- (d) A 1-hour fire-resistive occupancy separation shall be of not less than 1-hour fire-resistive construction. The aggregate area of all openings in a 1-hour fire-resistive occupancy separation shall not exceed 25 percent of the wall area in that story. All openings in such separation shall be protected by an approved opening protective having a 1-hour fire-resistive rating.

502.4 Fire ratings for occupancy separations.

- (a) Separation shall be provided between the various groups and divisions of occupancies as specified in Table 5.2, and in accordance with Chapter 7 and other Chapters and parts of this Code.
- (b) Where the occupancy separation is horizontal, structural members supporting the separation shall be protected by an equivalent fire-resistive construction.
- (c) Storage areas of more than 30,000 cubic feet used for the storage of combustibles shall be separated from adjacent areas by not less than a 2-hour fire-resistive occupancy separation as specified in Subsection 502.3(c).

502.5 Tenant separations.

- (a) In a building or portion of a building of a single occupancy classification, when enclosed spaces are provided for separate tenants, such spaces shall be separated by not less than 1-hour fire resistance, except that in Group B buildings, non-fire-rated partitions may be used to separate tenants, provided no area between partitions rated at 1 hour or more exceeds 3,000 square feet.
- (b) Such wall shall be continuous from the foundation to the underside of the roof sheathing. The roof sheathing shall be of noncombustible material or fire-retardant-treated wood for not less than a 4-foot width on each side of such wall.

Exception: The exceptions for occupancy separations shall be applicable to tenant separations as permitted in Subsection 502.1(c).

502.6 Separations between townhouses. Each townhouse shall be considered a separate building and shall be separated from adjoining townhouses by the use of separate exterior walls meeting the requirements of Table 6.2 for zero clearance from property lines as required for the type of construction, or by a party wall, or when not more than three stories in height, may be separated by a single wall meeting the following requirements:

- (a) Such wall shall provide not less than a 2-hour fire-resistive rating. Plumbing, piping, ducts, electrical or other building services shall not be installed within or through the 2-hour wall, unless such materials and methods of penetration have been tested in accordance with Subsection 1001.1(c).
- (b) Such wall shall be continuous from the foundation to the underside of the roof sheathing. The roof sheathing shall

**TABLE 5.2
REQUIRED FIRE SEPARATIONS IN BUILDINGS OF MIXED OCCUPANCY**

GROUP	A-1	A-2	A-3	A-4	A-5	A-8	B-1	B-2	B-3	B-4	D-1	D-2	D-3	E-1	E-2	E-3	H-1	H-2	H-3	H-4	I-1	I-2	I-3	R-1	R-2	R-3	S-1	S-2	S-3	S-4	S-5	S-8
A-1	N	N	N	N	1	1	1	1	1	1	1	1	1	N	1	1	3	3	2	2	2	1	1	1	1	1	1	2	N	1	N	2
A-2		N	N	N	1	1	1	1	1	1	1	1	1	N	1	1	3	3	2	2	2	1	1	1	1	1	1	2	N	1	N	2
A-3			N	N	1	1	1	1	1	1	1	1	1	N	1	1	3	3	2	2	2	1	1	1	1	1	1	2	N	1	N	2
A-4				N	N	1	1	1	1	1	N	N	N	N	N	N	3	3	2	2	2	1	1	1	1	1	1	2	N	1	N	2
A-5					N	1	1	1	1	1	1	1	1	N	N	N	3	3	2	2	2	1	1	1	1	1	1	2	N	1	N	2
A-8						N	1	1	1	1	1	1	1	N	N	N	3	3	2	2	2	1	1	1	1	1	1	2	N	1	N	2
B-1							N	N	1	1	1	1	1	1	1	1	3	3	2	1	1	1	1	1	1	1	1	2	N	1	N	2
B-2								N	1	1	1	1	1	1	1	1	3	3	2	1	1	1	1	1	1	1	1	2	N	1	N	2
B-3									N	N	1	1	1	1	1	1	3	3	2	1	1	1	1	1	1	1	1	2	N	1	N	2
B-4										N	1	1	1	1	1	1	3	3	2	1	1	1	1	1	1	1	1	2	N	1	N	2
D-1											N	N	1	1	1	1	3	3	2	2	2	2	1	1	1	1	1	2	N	1	N	2
D-2												N	1	1	1	N	3	3	2	2	2	2	1	1	1	1	1	2	N	1	N	2
D-3													N	1	N	1	3	3	2	2	2	2	1	1	1	1	1	2	N	1	N	2
E-1														N	N	N	3	3	3	2	2	2	1	1	1	1	1	2	N	1	N	2
E-2															N	N	3	3	3	2	2	2	1	1	1	1	1	2	N	1	N	2
E-3																N	3	3	3	2	2	2	1	1	1	1	1	2	N	1	N	2
H-1																	N	3	3	3	3	3	3	3	3	3	2	N	3	N	2	
H-2																		N	3	3	3	3	3	3	3	3	2	N	3	N	2	
H-3																			N	2	2	2	2	2	2	2	2	2	N	2	N	2
H-4																				N	1	1	1	2	2	2	1	2	N	2	N	2
I-1																					N	1	1	2	2	2	2	2	N	2	N	2
I-2																						N	1	2	2	2	2	2	N	2	N	2
I-3																							N	1	1	1	1	2	N	1	N	2
R-1																								N	N	N	1	2	N	1	N	2
R-2																									N	N	1	2	N	1	N	2
R-3																										N	1	1	N	1	N	1
S-1																											N	1	N	1	N	1
S-2																												N	N	2	N	N
S-3																													N	N	N	N
S-4																														N	N	1
S-5																															N	N
S-8																																N

N = No fire separation required

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be of noncombustible material or exterior grade fire-retardant-treated wood, or one layer of $\frac{5}{8}$ -inch gypsum wallboard attached to the underside of the roof decking for not less than a 4-foot width on each side of such wall.

- (c) Each dwelling unit sharing such wall shall be designed and constructed to maintain its structural integrity independent of the unit on the opposite side of the wall.

Exception: Said wall may be penetrated by roof and floor structural members provided that the fire-resistance rating and the structural integrity of the wall is maintained.

SECTION 503 REQUIREMENTS APPLYING TO ALL OCCUPANCIES

503.1 Construction, heights and area.

- (a) Buildings or parts of a building classified in a specified occupancy group because of the use shall be limited to the types of construction specified in Subsection 601.1(b) and shall be fire protected as specified in Table 6.2, and shall not exceed the height or area specified in Sections 712, 713 and Table 7.5.
- (b) Buildings having a floor level used for human occupancy located more than 75 feet above the lowest level of fire department vehicle access shall also comply with the requirements of Sections 715, 718 and 810.

503.2 Location and property. Buildings or parts of buildings classified in Group A through R occupancies shall be subject to the requirements of Chapter 7 for protection of exterior walls and openings as determined by location on property and to Table 6.2.

503.3 Exits. Stairways, exits and exit enclosures shall be provided as required in Chapter 8. (For special requirements for exits in high-rise buildings, see Section 810.)

503.4 Occupancy load. The occupant load shall be calculated as specified in Chapter 8, Subsection 802.1 and Table 8.1.

503.5 Protection of vertical openings.

- (a) **Exits.** Where enclosures of exits and vertical openings are required, the enclosure shall be constructed in accordance with the requirements of Section 703 and Table 7.2.
- (b) **Elevator and escalator.** For protection of elevator and escalator openings, see EPCOT Standard 5-1.
- (c) **Waste and linen chutes.** In other than Group R-3 occupancies (dwellings), waste and linen chutes shall terminate in rooms separated from the remainder of the building by an occupancy separation having the same fire resistance as required for the shaft enclosure, but not less than 1 hour. Openings into chutes shall not be located in required exit corridors or in stairways. Construction of waste and linen chutes shall comply with EPCOT Standard 5-14.

503.6 Ceiling heights.

- (a) In all occupancies, ceilings of rooms used for human occupancy and all exitways shall have a clear height of

not less than 7 feet 6 inches measured to the finished floor and lowest projection from the ceiling and shall comply with the *EPCOT Accessibility Code for Building Construction*.

Exceptions:

1. Parking garages and mezzanines may have a minimum ceiling height of 7 feet above the finished floor.
 2. In Group R, kitchens, bathrooms and toilet rooms, storage rooms and laundry rooms may have a minimum ceiling height of 7 feet above the finished floor.
 3. For areas with sloped ceiling, the prescribed ceiling height for the rooms is required in one-half of the area thereof. Any portion of the room measuring less than 5 feet from the finished floor to the ceiling shall not be included in any computation of the minimum area thereof.
 4. For one- and two-family dwellings, beams or girders spaced not less than 4 feet on center shall be permitted to project not more than 6 inches below the required height.
- (b) Rotary fans without fan blade protection shall provide for not less than 8 feet of clearance from the finished floor level to the bottom side of the unprotected fan blades.

Exception: Fan blades of low-speed residential-type ceiling fans installed within dwelling units or guest rooms shall be located at least 6 feet, 8 inches from the finished floor to the lowest tip of the fan blade or motor housing, whichever is lower.

503.7 Light and ventilation.

- (a) Light and ventilation shall be provided in all rooms used by human beings and shall comply with the requirements of Section 517 and the provisions of this Subsection.
- (b) Except in Group R-3 occupancies, windows and skylights shall have an area of not less than 8 percent of the total floor area of the room. At least one-half of the window area shall be openable.
- (c) Windows shall open onto the street, public space or yard.
- (d) Skylights shall be constructed as required in Subsections 706.3 and 706.4 for glass and plastics, respectively.
- (e) Mechanical and artificial lighting and ventilation may be substituted for natural ventilation and lighting. Such installation shall be made in accordance with the requirements for the *EPCOT Mechanical Code*, the *EPCOT Electrical Code* and Section 517.
- (f) Emergency lighting systems shall be provided as required by Section 813 and this Subsection.
- (g) Where ventilation is provided by mechanical means, fresh air in sufficient quantity to maintain healthful conditions shall be provided to meet the requirements of all state laws. In the absence of such requirements, venti-

lation at least equivalent to the requirements of this Code governing natural ventilation shall be provided, or an approved air circulation and treatment system.

- (h) Where natural ventilation or an approved air-treatment system is not provided, lavatories, toilets, bathrooms and restrooms shall be provided with at least 2 cubic feet of exhaust air per minute per square foot of floor area, with the following exceptions:
 1. For lavatories, toilets, bathrooms and restrooms in one- and two-family dwellings, exhaust air may be reduced to a minimum 1 cubic foot per minute per square foot (cfm/ft²).
 2. For private toilet rooms (including hotel guest rooms) with not more than one water closet and one lavatory, exhaust air is only required when the room is occupied.
 3. Rooms where, by reason of use or occupancy, dust fumes, gases, vapors, odors or other hazardous, obnoxious or injurious impurities exist, shall be provided with adequate additional ventilation to ensure safe and healthful conditions.

503.8 Sanitation.

- (a) Sanitary facilities shall be provided in accordance with the applicable requirements of the *EPCOT Plumbing Code*, the *EPCOT Accessibility Code for Building Construction*, EPCOT Standard 5-2, Subsection 503.9 and this Subsection.
- (b) Floors and walls in toilet rooms of other than Group R-3 occupancies shall have an approved smooth, hard, nonabsorbent surface that extends upward onto the walls at least 5 inches. Walls in toilet compartments and walls within 2 feet of the front and sides of urinals shall be similarly finished to a height of 4 feet.
- (c) Doors and panels of shower and bathtub enclosures shall be constructed of approved shatter-resistant material.
- (d) Glass and plastics used in doors and panels of shower and bathtub enclosures shall be not less than the requirements of Section 1005.
- (e) Toilet rooms shall not open directly into a kitchen or room used for the preparation of food for service to the public.
- (f) Every toilet room shall have windows as specified for habitable rooms providing in no case less than 3 square feet of open space, or shall have approved equivalent mechanical ventilation.

503.9 Facilities for people with physical disabilities. All buildings available for public access as defined in Chapter 2 shall be provided with facilities for the physically disabled as required in Chapter 8, this Subsection and the *EPCOT Accessibility Code for Building Construction*.

503.10 Weather protection.

- (a) Where weather protection is required in an occupancy, such protection shall be applied in accordance with the requirements of this Subsection.

- (b) Asphalt-saturated felt, free from holes and breaks and weighing not less than 15 pounds per 100 square feet, or approved water-repellent paper shall be applied over studs or sheathing of all exterior walls. Such felt or paper shall be applied as for weather board, lapped not less than 2 inches at horizontal joints and not less than 6 inches at vertical joints.
- (c) Building paper may be omitted in the following cases:
 1. Where there is no human occupancy.
 2. When exterior covering is of approved weather-protected panels.
 3. In back-plastered construction.
 4. Over water-repellent panel sheathing.
 5. Under approved paperbacked metal or wire fabric lath.
 6. Under metal lath, wire lath or wire fabric on non-combustible construction.
- (d) Exterior openings exposed to the weather shall be caulked, flashed or counterflashed to make them water repellent.

503.11 Guardrails. All enclosed floor and roof openings; operable windows in exterior walls whose sill height is less than 30 inches above the floor below and more than 30 inches above grade; open and glazed sides of landings; and ramps, stairs, balconies or porches, which are more than 30 inches above grade, or a floor below and all publicly accessible docks regardless of water level shall be protected by a guardrail. Guardrails shall form a vertical protective barrier not less than 42 inches high. Open guardrails shall have intermediate rails or ornamental pattern such that a 4-inch-diameter sphere cannot pass through any opening. A bottom rail or curb shall be provided that will reject the passage of a 2-inch-diameter sphere. Construction of guardrails shall be adequate in strength, durability and attachment for their purpose as described in Subsection 902.2(h). Glass used in guardrails shall comply with Subsection 1005.8.

Exceptions:

1. Guardrails need not be provided on the loading side of loading docks.
2. Guardrails for one- and two-family residences shall be a minimum of 36 inches high.
3. Guardrails on a balcony, loge or gallery immediately in front of the first row of fixed seats and which are not at the end of an aisle shall be not less than 26 inches high. Guardrails 42 inches high and the width of the aisle shall be located at the front edge of a balcony, loge or gallery where the aisle terminates. When the slope of the aisle is less than 1:8, the guardrail shall be 42 inches high where the aisle terminates.
4. In assembly seating areas, guards at the end of aisles where they terminate at a fascia of boxes, balconies and galleries shall not have openings which allow passage of a sphere 4 inches in diameter up to a height of 26 inches. From a height of 26 inches to 42 inches above the adjacent walking surfaces, guards shall not

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have openings which allow passage of a sphere 8 inches in diameter.

5. A guardrail shall not be required at the front of any stage and enclosed platforms.
6. For areas not accessible to the public, including catwalks and mechanical areas, the clear distance between rails, measured at right angles to the rails, shall not exceed 18 inches.
7. Guardrails shall not be required along vehicle pits when the depth of the pit is less than 48 inches.
8. The triangular openings formed by the riser, tread and bottom rail at the open side of a stairway, shall be a maximum size such that a sphere of 6 inches in diameter cannot pass through the opening.
9. Docks where access is restricted or where space is dedicated for mooring of boats.

503.12 Fire protection and special systems.

- (a) A complete automatic sprinkler system shall be installed in locations as specified in Subsection 715.4.
- (b) Every building greater than 400 square feet not provided with automatic sprinkler protection throughout shall be provided with approved product of combustion detectors located in accordance with EPCOT Standard 7-20. Each detector shall be connected to an AC power source and shall be connected to a central monitored station, if available. If a central monitored station is not available, an outside audible alarm shall be installed subject to approval by the Building Official. Every building in which sleeping areas are provided shall have product of combustion detectors located in accordance with Subsection 513.4 and EPCOT Standard 7-20.
- (c) A fire alarm detection and evacuation system in accordance with NFPA 72 shall be installed in all occupancies.

Exception: A fire alarm detection and evacuation system is not required in Group A-7, R-3, S-1, S-4, S-5, S-6 and S-7 occupancies, temporary occupancies less than 300 occupants, construction trailers for the duration of the construction project, and manufactured buildings less than 3,200 square feet.

- (d) Portable fire extinguishers shall be provided in all occupancies, including temporary structures, in accordance with NFPA 10.

Exception: S-6 Occupancies.

- (e) Where required by occupancy, design or other provisions of this Code, the following systems and services shall be installed:
 1. Automatic sprinkler systems, fire alarms, standpipes, water supply and hose connections shall be installed as required in Section 715.
 2. Air-conditioning systems, chimneys, flues, vents and heat-producing equipment shall be designed as specified in the *EPCOT Mechanical Code*, and the applicable requirements of the *EPCOT Plumbing Code* and the *EPCOT Fuel Gas Code*.

3. Service of hazardous utilities shall be as specified by Subsection 708.3.
4. Every building shall have an approved outside gas shutoff valve.
5. Electrical installations shall be as specified in the *EPCOT Electrical Code*.
6. Elevators, escalators, dumbwaiters, manlifts and transporting assemblies shall be installed, tested, inspected, maintained and operated in accordance with the requirements of EPCOT Standard 5-1.
7. Except where prohibited, the storage of flammable materials shall comply with the requirements of EPCOT Standards 5-4, 5-5 and 5-6.
8. Blower and exhaust systems, where required, shall be installed as specified in EPCOT Standard 5-7.

503.13 Carbon monoxide protection. Every separate building or an addition to an existing building for which a permit for new construction is issued and having a fossil-fuel-burning heater or appliance, a fireplace, an attached garage, or other feature, fixture, or element that emits carbon monoxide as a byproduct of combustion shall have an operational carbon monoxide alarm installed in accordance with NFPA 720 within 10 feet of each room used for sleeping purposes in the new building or addition, or at such other locations as required by this Code.

503.13.1 Carbon monoxide alarm. The requirements of this Section shall be satisfied by providing for one of the following alarm installations:

1. A hard-wired carbon monoxide alarm.
2. A battery-powered carbon monoxide alarm.
3. A hard-wired combination carbon monoxide and smoke alarm.
4. A battery-powered combination carbon monoxide and smoke alarm.

503.13.2 Combination alarms. Combination smoke/carbon monoxide alarms shall be listed and labeled by a Nationally Recognized Testing Laboratory.

Exceptions:

1. An approved operational carbon monoxide detector shall be installed inside or directly outside of each room or area within a hospital, inpatient hospice facility or nursing home facility licensed by the Agency for Health Care Administration, or a new state correctional institution where a fossil-fuel burning heater, engine or appliance is located. The carbon monoxide detector shall be connected to the fire-alarm system of the hospital, inpatient hospice facility or nursing home facility as a supervisory signal.
2. This Section shall not apply to existing buildings that are undergoing alterations or repair unless the alteration is an addition. For the purpose of this Section only, an addition is defined as an extension or increase in floor area, number of stories or height of a building or structure.

503.14 Tents and air-supported structures. Structures used in connection with an occupancy for temporary shelter of persons, material or equipment, shall comply with the applicable provisions of EPCOT Standard 5-8 and Appendix N. Air-supported structures shall be designed and erected in accordance with Appendix N.

503.15 Motion picture projection rooms.

- (a) Equipment used in motion picture projection rooms shall be listed or approved equipment as defined in Appendix G.
- (b) Where a ribbon-type cellulose acetate film is used, or other safety film is used in conjunction with electric arc, Xenon or other light-source projection equipment, projection rooms shall be constructed as required in Appendix G, Part 2 (see Sections G-501 and G-601). The use, storage and (or) handling of cellulose nitrate film is prohibited.

503.16 Spandrel walls. For requirements covering spandrel walls, see Subsection 707.3(b).

503.17 Foam plastic. For requirements regarding the use of foam plastics, see Section 717.

503.18 Boiler rooms and central heating equipment.

- (a) Note: For purposes of this Subsection, a boiler is defined as any vessel used for generating steam and central heating equipment as any furnace or water heater with input greater than 1 million British thermal units (Btu).
- (b) Every room containing central heating equipment with an aggregate input capacity of 1 million Btu or more, installed in any building other than a one- or two-family dwelling, shall be enclosed and separated from the rest of the building by walls, partitions, floors and ceiling of not less than 1-hour fire-resistant construction. Self-closing or automatic-closing protectives having a 1-hour fire-resistive rating shall be installed in all openings. Not more than two central heating boilers and furnaces shall be permitted in any one tenancy in any building unless all are enclosed and separated by walls, partitions, floors and ceilings of 1-hour fire-resistant construction. [See Subsection 511.5(c) for boiler room requirements in Group H occupancies.]
- (c) Every steam boiler carrying more than 15 pounds per square inch (psi) of pressure with a rating in excess of 10 boiler horsepower, installed in a building other than one of Group S occupancy, shall be located in a separated room or compartment, shall not be located under a means of egress, and shall be separated from the rest of the building by walls or partitions having at least 2-hour fire resistance and by floor-ceiling construction having not less than 2-hour fire resistance, provided, however, that when, in the opinion of the Building Official, it is desirable to provide for the venting of a possible explosion upward, this rating may be reduced in accordance with the hazard existing.
- (d) All boiler rooms shall be located on an exterior wall of a building with at least one exit door on the exterior wall. (See Subsection 803.1 for other exit requirements.)

- (e) When the opening for a heater room or equipment room is protected by a pair of fire doors, the inactive leaf shall be secured in the closed position and shall be openable only by use of a tool. An astragal shall be provided and the active leaf shall be self-closing.
- (f) Where oil-fired equipment is used, a 6-inch-high non-combustible curb (dike) shall be provided.

503.19 Membrane structures. See Appendix N.

503.20 Solid wall structures. Buildings or structures of solid wall construction used for a duration of 90 days or less shall comply with Appendix N.

**SECTION 504
GENERAL REQUIREMENTS—
GROUP A OCCUPANCIES**

504.1 Definition. An assembly building is a building or part of a building used for the gathering together of 50 or more persons for such purposes as deliberation, worship, amusement, entertainment, awaiting transportation, drinking or dining.

504.2 Group A occupancies classified. Group A occupancies shall be classified in Subsection 501.1, Table 5.1 and as follows:

Group A – Assembly

- A-1 Assembly buildings with a stage; occupant load of 1,000 or more.
- A-2 Assembly buildings with a stage; occupant load of 50 or more, but less than 1,000.
- A-3 Motion picture theaters; occupant load of 50 or more.
- A-4 Churches, places of worship or religious assembly; occupant load of 50 or more.
- A-5 Assembly rooms; occupant load of 50 or more, including but not limited to: multipurpose rooms, restaurants, nightclubs, dance halls, bowling lanes, drinking or dining establishments, assembly areas contiguous to bus or train depots or airports, libraries and museums.
- A-6 Stadiums and grandstands not classified in other divisions of Group A.
- A-7 Temporary grandstands.
- A-8 Studios, motion picture and television soundstages.

504.3 Scope. Group A occupancies shall meet the requirements of Sections 501, 502, 503 and all other applicable requirements of this Code, and the provisions of Subsections 505.1 through 506.4, which follow.

**SECTION 505
SPECIAL REQUIREMENTS—
GROUP A-1 AND A-2 OCCUPANCIES**

505.1 Scope. In addition to the requirements of Sections 517 and 816; Subsections 501.1 to 504.3; and Tables 5.1 and 5.2, occupancies classified as Group A-1 or A-2 shall conform to the requirements of this Section.

505.2 Location on property. Buildings housing Group A, Division 1 and 2 occupancies, shall front directly on or have

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access to a public street not less than 30 feet wide. The access to the public street shall be a minimum of 30 feet wide, unobstructed right-of-way maintained only as access to the public street. The main entrance to the building shall be located on a public street or access way. (For fire-resistive protection of exterior walls and openings as determined by location on property, see Table 6.2 and Section 701.)

505.3 Construction, height and area.

- (a) Buildings or parts of buildings housing Group A, Division 1 occupancies, shall be of Type I or II construction. Heights and areas shall be limited as provided in Table 7.5.
- (b) Where atmospheric separations are used in buildings of Group A-1 or A-2 occupancy with an occupant load of 300 or more, the building shall comply with the requirements of Subsection 510.9.

505.4 Scope. The slope of the main floor of the assembly room shall not exceed 1 in 5.

505.5 Exits. Exitways shall be constructed and fire protected as required in Chapter 8. Exit signs and illumination shall be installed as provided in Chapter 8 and shall meet the requirements of the *EPCOT Electrical Code*.

505.6 Enclosure of exits and vertical openings. Stairways, exits and vertical openings, such as elevator shafts, vent shafts and smoke-protected stairways, shall be enclosed and the enclosure shall meet the requirements of Table 6.2 and Section 703. Buildings housing Group A occupancies that are more than 75 feet high shall also comply with the requirements of Sections 809 and 810 for exit protection and access.

505.7 Theater stages and platforms. Stages and enclosed platforms shall comply with the requirements of Chapter 9 for design, and with Section 715 and Appendix G, Part 1, for construction and fire protection.

SECTION 506 SPECIAL REQUIREMENTS— GROUP A-3 TO A-7 OCCUPANCIES

506.1 Scope. In addition to the requirements of Sections 502 through 504, 517, 816 and 817; and Tables 5.1 and 5.2, occupancies classified in Groups A-3 to A-7 shall comply with the requirements of this Section.

506.2 Location on property. Buildings housing Group A-3 to A-5 occupancies shall front directly on or shall have access to a public street not less than 20 feet wide. The access to the public street shall be a right-of-way not less than 20 feet wide, unobstructed and maintained only as access to the public street. The main entrance to the building shall be located on the public street or on the access way.

506.3 Construction, height and area.

- (a) In Group A, Division 5 occupancies (bowling lanes), the area occupied by the lanes shall be excluded when calculating occupant load and exits.
- (b) A fire-resistive roof-ceiling assembly shall not be required in a one-story building of Type III, IV, V or VI construction.

- (c) Buildings housing Group A, Division 3 to 5 occupancies, with an occupant load of 1,000 or more, shall be fire protected as required in Table 6.2.

506.4 Special requirements—Group A, Divisions 6 and 7.

- (a) Erection and structural maintenance of Group A, Division 6 and 7 structures, shall conform to the requirements of this Code. Where there are no specific requirements, such structures shall provide adequate safety for the loads to which they may be subjected and shall comply with the requirements for fire protection for the type of construction.
- (b) Group A, Divisions 6 (grandstands) and 7 (temporary grandstands), shall comply with the requirements of Table 7.5 for height, area and type of construction.
- (c) When spaces under Group A, Division 6 and 7 occupancies, are used for any purpose, the space shall be separated from all parts of such occupancies, including exits, by walls, floors and ceiling assemblies of not less than 1-hour fire-resistive construction; except that the underside of continuous deck grandstands, when erected outdoors, need not be protected when occupied for public toilets.
- (d) The Building Official may cause Group A, Division 6 and 7 structures, to be reinspected as he believes necessary for the safety of the structure.
- (e) Running tracks in gymnasiums and similar occupancies may be constructed of wood, or of unprotected steel or iron.
- (f) Temporary structures used for public assembly shall be constructed as required in this Code and the *EPCOT Fire Prevention Code*.
- (g) Bleachers and reviewing stands shall comply with Section 817 and shall comply with the accessibility requirements of the *EPCOT Accessibility Code for Building Construction*. Structural requirements shall comply with Chapter 9.

SECTION 507 SPECIAL REQUIREMENTS— GROUP AA OCCUPANCIES

507.1 Group AA occupancies classified. Group AA occupancies shall be amusement rides and devices as defined in EPCOT Standard 5-13.

507.2 Design and construction.

- (a) The design and construction of amusement rides and devices shall be in accordance with the recognized principles of structural, mechanical and electrical engineering, and with the intent of this Code for safety to life from fire and panic. The structures supporting such rides and devices shall provide safety for the loads to which they may be subjected and shall be equipped with approved safety devices.
- (b) Amusement rides and devices shall be constructed, installed and maintained as specified in EPCOT Standard 5-13.

**SECTION 508
GENERAL REQUIREMENTS—
GROUP B OCCUPANCIES**

508.1 Group B occupancies classified.

- (a) Group B occupancies shall be as classified in Subsection 501.1, Table 5.1, Section 818 and as follows:

Group B – Business—Commercial

- B-1 Wholesale and retail stores, malls, mercantile and office buildings with an occupant load of 500 or more.
- B-2 Wholesale and retail stores, mercantile and office buildings not classified in Group B-1; paint stores without bulk handling, restaurants or places supplying food or drink that accommodate less than 100 people.
- B-3 Gasoline service stations, automobile parking garages where no repair work is done and where no flammable liquids are used.
- B-4 Aircraft hangars where no repair work is done, except exchange of parts and maintenance requiring no open flame, welding or the use of highly flammable liquids; open parking garages and structures, heliports and helistops.

- (b) Group B occupancies shall meet the requirements of Sections 501, 502, 503, 712 and 713, and the provisions of this Subsection.
- (c) Escalator openings in Group B occupancies shall not be more than five stories.

508.2 Enclosure of exits and vertical openings.

- (a) Exits shall be enclosed as required in Chapter 8.
- (b) Other vertical openings shall be enclosed as specified in Table 6.2 and Section 703.

508.3 Construction.

- (a) Group B, Division 1 and 2 occupancies, shall comply with the special requirements of Section 506 for Group A, Division 5 occupancies.
- (b) Buildings or parts of buildings housing Group B, Division 1 and 2 occupancies, used for the storage of high-piled stock, shall be constructed as required in Subsection 511.7.
- (c) In Group B, Division 1 and 2 occupancies, adjoining tenants classified in the same occupancy shall be separated from each other by construction meeting the requirements for a 1-hour fire-resistive separation, both horizontally and vertically.
- (d) Group B, Division 3 occupancies, including canopies and supports over gasoline pumps, shall be of noncombustible, 1-hour or heavy timber construction. Canopies may be constructed of approved, plastic material or fire-retardant-treated wood when approved by the Building Official.
- (e) Floors in Group B, Division 3 and 4 occupancies, shall be protected against saturation of oil and other liquids by a smooth, hard finish of noncombustible material.

508.4 Smoke and heat venting. In one-story buildings housing Group B occupancies more than 50,000 square feet in undivided area, smoke and heat vents shall be installed in accordance with the requirements of Section 716.

508.5 Open parking garages.

- (a) Except where specific provisions are made in the following sections, other requirements for Group B shall apply in open parking garages.
- (b) An open parking garage is a structure of Type I, II, III or IV construction more than one tier high when at least 50 percent of the perimeter is open, and when the structure is used exclusively for parking or storing passenger motor vehicles (see Table 5.3).

1. At least 50 percent of the clear height between floors shall be open to the atmosphere for the full length of at least two exterior walls, excluding required stair and elevator walls and structural columns.

Where a skin structure or exterior façade uses perforated or slotted openings applied to the required clear area, the skin or façade must be a minimum of 40 percent open to contribute any amount to the overall openness calculation. The skin structure or façade shall be set out a minimum of 18 inches from the exterior wall surface.

2. The distance from any point on any floor level to an open exterior wall facing on a street, or to other permanently maintained open space at least 20 feet in width extending full width to a street, shall not exceed 200 feet.
3. When such structures are within 10 feet of a common property or building line, they shall be provided with an enclosure wall along the line of not less than 1-hour fire resistance without openings therein, except door openings meeting the requirements of Subsection 704.3 shall be permitted.
4. All floor and roof areas providing for the parking or movement of automobiles shall be provided with pedestrian guardrails in accordance with Subsection 503.11 at all exterior and interior vertical openings when the vertical distance to the ground or surface directly below exceeds 3 feet. Such parking areas shall also be provided with exterior or interior walls or impact guardrails, except at pedestrian or vehicular accesses, capable of withstanding an impact of not less than 150 pounds per lineal foot applied at 18 inches above the floor. Each floor of such structure shall have wheel guards not less than 4 inches in height above the floor with a clear passage of 3 feet between the wheel guard and edge of structure.

- (c) A shaft enclosure is not required for automobile ramps in open parking garages constructed in accordance with this Subsection.

508.6 Enclosed parking garages. Enclosed and basement public parking decks shall be provided with a mechanical ventilation system for each level in accordance with the *EPCOT*

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Mechanical Code. Enclosed garages shall be provided with automatic sprinklers in accordance with Section 715.

**TABLE 5.3
OPEN AUTOMOBILE PARKING STRUCTURES
ALLOWABLE HEIGHTS AND AREAS**

CONSTRUCTION TYPE	ALLOWABLE AREA (square feet per floor)	ALLOWABLE HEIGHT
Type I	No Limit	No Limit
Type II	No Limit	No Limit
Type III	30,000	4 stories or 40 feet
Type IV	160,000	8 stories or 75 feet

508.7 Prohibited uses. The following uses are not permitted within parking garages.

- (a) Automobile repair work.
- (b) Loaded commercial trucks and similar vehicles.
- (c) Partial or complete closing of required openings in exterior walls by tarpaulins or any other means.
- (d) Dispensing of fuel.

508.8 Helistops.

- (a) Helistops may be erected on buildings or at other locations when constructed in accordance with the requirements of this Subsection and EPCOT Standard 5-9. When erected on buildings, helistops shall be designed in accordance with Section 902 for design live and dead loads and as specified in Chapter 10 for materials of construction.
- (b) The touchdown or landing area for helicopters weighing less than 3,500 pounds shall be a minimum of 20 feet by 20 feet in area. The landing area shall be surrounded on all sides by a clear area having a minimum average width at roof level of 15 feet, but with no width less than 5 feet. For helicopters weighing more than 3,500 pounds, special requirements shall be met as determined by the Building Official.
- (c) Helicopter landing areas and the supports therefor on the roof of a building shall be of noncombustible construction. Landing areas shall be designed to confine any spillage of flammable liquid to the landing area. Provisions shall be made to drain such spillage away from exits and stairways.
- (d) Exits from helistops shall conform to the requirements of Chapter 8.
- (e) Guardrails shall be provided around all roofs or decks and shall comply with the requirements of Subsections 503.11 and 902.2.
- (f) Before operating helicopters from rooftops is permitted, written approval of the Federal Aviation Agency shall be presented to the Building Official.

**SECTION 509
GENERAL REQUIREMENTS—
GROUP D OCCUPANCIES**

509.1 Group D occupancies classified.

- (a) Group D occupancies shall be as classified in Subsection 501.1, Table 5.1, Section 819 and as follows:

Group D – Detention and hospitalization

- D-1 Mental hospitals, mental sanitariums, jails, prisons, reformatories; buildings where personal liberties are restrained.
- D-2 Hospitals, sanitariums, nursing homes with nonambulatory patients; nurseries for full-time care of children under kindergarten age, each accommodating more than five persons.
- D-3 Nursing homes for ambulatory patients, homes for children over kindergarten age, each accommodating more than five persons.

- (b) Buildings housing Group D occupancies shall meet the requirements of Sections 501, 502 and 503; Chapter 8; EPCOT Standard 5-2; and the *EPCOT Fire Prevention Code*, and the provisions of this Section.

509.2 Construction, height and area.

- (a) Buildings housing Group D, Division I occupancies, shall be of Type I or II construction. One-story buildings of Type III 1-hour, Type IV 1-hour or Type V 1-hour may be permitted when the floor area is not more than 3,900 square feet between separation walls of 2-hour fire-resistive construction with all openings protected. The opening protectives shall have 1½-hour fire-resistive rating. Thresholds and expansion joint covers shall be flush with the floor.
- (b) Ceilings in corridors, patients’ areas, nurses’ stations, labor rooms, nourishment stations and dining areas shall be acoustically treated in accordance with the requirements of EPCOT Standard 5-2.
- (c) Where personal liberties are restrained within the building, the floors shall be of noncombustible material.
- (d) Requirements for the control of sound transmission in Group D, Division 1 and 2 occupancies, shall be as specified in Table 5.4. Location of ductwork, fire blocking, electrical receptacles and other recessed wall attachments shall not interfere with the effectiveness of required sound insulation.

**TABLE 5.4
CONTROL OF SOUND TRANSMISSION
IN GROUP D OCCUPANCIES**

LOCATION	SOUND TRANSMISSION PARTITIONS	CLASS ^a FLOORS
Patient’s room to patient’s room	45	45
Corridor to patient’s room	40	45
Public areas to patient’s room ^b	50	50
Service areas to patient’s room ^c	55	55

- a. Sound transmission class determined in accordance with EPCOT Standard 5-10.
- b. Public areas include lobbies, dining rooms, recreation rooms, treatment rooms and similar areas.
- c. Service areas include kitchens, elevators, laundries, maintenance rooms, boiler rooms, mechanical rooms and garages.

509.3 Exits.

- (a) Stairways, exits and exit illumination, and smoke-protected enclosures shall be provided as specified in

Chapter 8. For special requirements for exits in Group D occupancies, see Section 819.

- (b) For the incidental accommodation of nonambulatory patients in Group D-3 occupancies, special provisions, such as a first-floor room with direct access to the exterior, shall be provided.

509.4 Enclosure of exits and vertical openings.

- (a) Exits shall be enclosed as required in Chapter 8.
- (b) Elevator shafts, vent shafts and other vertical openings shall be enclosed and the enclosure shall be constructed as required in Table 6.2 and Section 703.

509.5 Special requirements—Group D occupancies.

- (a) Storage of volatile flammable liquids shall not be permitted in buildings housing Group D occupancies, and the handling of such volatile flammable liquids shall not be permitted in quantities of more than 1 gallon, except when such handling complies with the requirements of EPCOT Standards 5-2, 5-4 and 5-5.
- (b) An approved fire alarm system shall be provided for all Group D, Division 2 occupancies. Audible alarm devices shall be used in all areas where patients are not housed. Visible alarm devices may be used in lieu of audible alarm devices in areas occupied by patients.
- (c) Central heating plant or boilers using solid or liquid fuel shall be protected by a 2-hour fire-resistive separation without openings, except for air-distribution ducts with fire dampers at the plane of the wall. When the fuel used is natural gas, the wall may be a minimum of 1-hour fire-resistive construction.
- (d) Installation of boiler rooms and heating equipment shall be in accordance with the requirements of Subsection 503.17, Table 5.2 and the *EPCOT Mechanical Code*.

**SECTION 510
GENERAL REQUIREMENTS—
GROUP E OCCUPANCIES**

510.1 Group E occupancies classified.

- (a) Group E occupancies shall be as classified in Subsection 501.1, Table 5.1, Section 820 and as follows:

Group E – Educational

E-1 A building or part of a building, or a group of buildings, on one property with an occupant load of 50 or more, used for education, instruction or recreation of pupils from kindergarten (including preschool) through the 12th grade for 12 hours or more per week, or 4 hours or more in any one day, not included in Group A.

E-2 A building or part of a building, or a group of buildings, on one property with an occupant load of 50 or more, used for education, instruction or recreation of pupils from kindergarten (including preschool) through the 12th grade for less than 12 hours per week, or less than 4 hours in any one day, not included in Group B.

E-3 A building or part of a building used for day care or day nursery care of five children or more.

- (b) Group E occupancies shall meet the requirements of Sections 501, 502 and 503, and the provisions of this Section.

510.2 Location on property.

- (a) Buildings housing Group E occupancies shall front on or have access to a public street not less than 20 feet wide.
- (b) The access to the public street shall be not less than 20 feet wide, unobstructed and maintained only as a right-of-way to the public street or access way.
- (c) At least one required exit shall be located on the public street or access way.

510.3 Construction, height and area.

- (a) Buildings or parts of buildings housing Group E occupancies shall be limited to the types of construction specified in Subsection 601.1(b) and Table 6.2, and shall not exceed the limits specified in Sections 712 and 713 for height and area. Where the maximum travel distance required in Subsection 803.4 is reduced by 50 percent, the area limits may be increased by 50 percent.
- (b) Buildings of Type III, IV 1 hour and Type V 1 hour, housing Group E, Division 1 and 2 occupancies, may be two stories when the first and second floors are separated by a 2-hour, horizontal fire-resistive separation with no openings and when each classroom has an exit direct to the exterior of the building.
- (c) Janitor closets shall be of 1-hour fire-resistive construction. Location under required exit stairs shall be prohibited.
- (d) Where buildings housing Group E occupancies are constructed with atmospheric separations, they shall comply with the requirements of Subsection 510.9.

510.4 Accessory occupancies.

- (a) The following accessory uses to Group E, Division 1 occupancies, need not be separated from the primary occupancy:
 - 1. Assembly rooms, dining rooms, libraries, gymnasiums and multipurpose rooms.
 - 2. Similar accessory uses as determined by the Building Official.
- (b) Accessory uses not included in Paragraphs 1 and 2 shall comply with the requirements for the principal occupancy.

510.5 Special occupancy separations.

- (a) Vocational shops, laboratories, mechanical equipment rooms, machine shops, storage rooms and similar areas shall be separated from each other and from classrooms by not less than 1-hour fire-resistive occupancy separations as defined in Section 502.
- (b) Balconies and bleachers over usable spaces shall be protected by a 1-hour fire-resistive occupancy separation as defined in Section 502.

REQUIREMENTS BASED ON OCCUPANCY

510.6 Exits. Stairways, exits and vertical openings shall be constructed as required in Chapter 8.

510.7 Enclosure of exits and vertical openings.

- (a) Stairways and exits shall be enclosed as specified in Chapter 8 and the enclosures shall be constructed as required in Section 703.
- (b) Elevator shafts, vent shafts and other vertical openings shall be enclosed and the enclosures shall be constructed as required in Table 6.2, Section 703 and EPCOT Standard 5-1.

510.8 Special requirements—Group E occupancies.

- (a) In addition to the requirements of Subsections 503.12 and 510.9, where applicable, the requirements of this Subsection shall apply to fire safety in Group E occupancies.
- (b) Storage of volatile flammable liquids shall be limited to approved amounts required for maintenance, demonstration and laboratory use, and the storage and handling of such materials shall be in accordance with the requirements of EPCOT Standards 5-4, 5-5 and 5-6.
- (c) Approved fire alarm systems shall be provided in all Group E occupancies with an occupant load of 50 or more. In Group E occupancies equipped with an approved automatic sprinkler system, the operation of the systems shall automatically activate the school fire alarm, which shall include an alarm mounted on the exterior of the building.
- (d) Stages and platforms in Group E, Division 1 occupancies, shall be constructed as required in Appendix G, except that platforms that are part of a classroom and do not occupy more than 15 percent of the floor area may be constructed of combustible material.
- (e) Proscenium curtains shall be noncombustible or fire resistive as required in Appendix G, Part 1.
- (f) Gymnasiums, auditoriums, multipurpose rooms and similar occupancies shall comply with the requirements of this Code for Group A occupancies.

510.9 Special requirements for atmospheric separations.

- (a) **Scope.** The requirements of this Subsection shall comply only to requirements for providing separate atmospheres in Group E, Division 1 and 2 occupancies, and in Group A where the occupant load is more than 300. (See Subsection 502.3.)
- (b) **Definitions.** The following definitions are applicable to the requirements of this Subsection.
 - 1. **Common atmosphere.** A common atmosphere exists between rooms, spaces or areas within a building that are not separated by an approved smoke and draftstop barrier.
 - 2. **Separate atmosphere.** A separate atmosphere exists between rooms, spaces or areas that are separated by an approved smoke or draftstop barrier.
 - 3. **Smoke and draftstop barrier.** A smoke and draftstop barrier consists of walls, partitions,

floors and openings of construction that will prevent transmission of smoke or gases through the construction. The minimum requirement for such a barrier is that it endure a 20-minute fire exposure as established in EPCOT Standard 6-1.

- (c) **Construction.** Walls, partitions and floors forming all or part of an atmosphere separation shall be of materials consistent with the requirements for the type of construction, but shall be of construction no less effective than a smoke or draftstop barrier as defined in Paragraph (b). Glass lights of approved wire glass set in steel frames may be installed in such walls or partitions. Every door opening therein shall be provided with an opening protective as required elsewhere in this Code, but not less than a self-closing or automatic-closing, tight-fitting smoke or draftstop assembly having a fire-protective rating of not less than 20 minutes when tested in accordance with the requirements of EPCOT Standard 6-1, Part 1.
- (d) **Fire protection and special systems.** In addition to or in lieu of the requirements of Subsections 503.12 and 510.8, the requirements of this Paragraph apply to Group E occupancies where atmospheric separations are used:
 - 1. Ducts penetrating atmospheric separation walls, partitions or floors shall be equipped with an approved automatic-closing smoke damper when the ducts open into more than one atmosphere.
 - 2. Automatic-closing opening protectives installed in the atmospheric separation shall be activated by approved detectors of products of combustion other than heat.
 - 3. Rooms or groups of rooms in which flammable liquids, combustible dust or similar hazardous materials are used, developed, stored or handled shall be separated from other parts of the building by not less than a 1-hour fire-resistive occupancy separation as classified in Subsection 502.3.
 - 4. Rooms or groups of rooms sharing a common atmosphere, in which flammable liquids, combustible dust or similar hazardous materials are used, stored, developed or handled to a degree in excess of the requirements of this Code, shall be protected by an approved automatic sprinkler system as specified in Section 715.
 - 5. Equipment rooms or groups of rooms sharing a common atmosphere where flammable liquids, combustible dust or similar hazardous materials are used, stored, developed or handled shall conform to the requirements of the *EPCOT Fire Prevention Code*.

The specific requirements of this Subsection are not intended to prevent the design and use of other systems, equipment or techniques that will effectively prevent the products of combustion from breaching the atmospheric separation.

**SECTION 511
GENERAL REQUIREMENTS—
GROUP H OCCUPANCIES**

511.1 Group H occupancies classified.

- (a) Group H occupancies shall be as classified in Subsection 501.1, Table 5.1, Section 821 and as follows:

Group H – Hazardous

H-1 Buildings or parts of buildings used for storage and handling of hazardous and highly flammable or explosive materials other than flammable liquids.

H-2 Dry cleaning plants, paint stores with bulk handling, paint shops and other uses requiring the storage and handling of Class I, II or III flammable liquids.

H-3 Woodworking establishments, planing mills and box factories; shops and factories where loose, combustible fibers are manufactured or processed or where dust is generated; warehouses where highly combustible materials or high-piled stock are stored or kept.

H-4 Garages and aircraft hangars where maintenance and repair work is done.

- (b) Group H occupancies shall meet the requirements of Sections 501, 502, 503 and 821, and the provisions of this Section.
- (c) Buildings housing less than the amounts of hazardous materials as specified in Table 5.5 shall be exempt from classification as Group H occupancies unless so classified by other requirements of this Code.
- (d) The following uses shall not be classified as Group H occupancies, except as required by other provisions of this Code:
 1. Buildings containing less than the amounts of hazardous materials specified in Table 5.5.
 2. Rooms containing flammable liquids in tightly closed, approved containers of 1 gallon or less capacity for retail sale or private use on the premises and in quantities not more than 2 gallons per square foot of room area.
 3. Rooms used in preparation or storage of food products for retail sale on the premises.
 4. Rooms where flammable liquids are dispensed, used or stored as incidental to a Group A-5 or B occupancy.
 5. Drug stores.
 6. Hardware stores.
 7. Retail paint stores with quantities of paint not more than 2 gallons per square foot of room area.
 8. Retail liquor stores.
 9. Agricultural property where combustible or flammable materials are stored for use on the property.

**TABLE 5.5
EXEMPT AMOUNTS OF HAZARDOUS MATERIALS**

HAZARDOUS MATERIALS	EXEMPT AMOUNTS OF STORAGE MANUFACTURE, PROCESS OR USE OF HAZARDOUS MATERIALS
Flammable liquids Class 1-A Class 1-B Class 1-C Class II	60 gallons 120 gallons 180 gallons 240 gallons
Combustible liquids	500 gallons
Combination flammable liquids ^a	240 gallons
Flammable gases	3,000 ft ³ at one atmosphere of pressure at 70°F
Liquid flammable gases	60 gallons
Flammable dusts	See the <i>EPCOT Fire Prevention Code</i>
Flammable fibers—loose	100 ft ³
Flammable fibers—baled	1,000 ft ³
Flammable solids	500 lbs.
Dangerous chemicals	See the <i>EPCOT Fire Prevention Code</i>
Unstable materials	No exemption

a. Containing not more than the exempt amounts of Class 1-A, 1-B and 1-C flammable liquids.

511.2 Construction, height and area.

- (a) In Group H, Division 1 and 2 occupancies, one wall of the occupancy shall be an exterior wall to provide explosion venting. Accessory Group H-1 and H-2 occupancies, meeting the requirements of Subsection 502.1(c), shall be placed on the perimeter of the building so that the explosion venting is directly to the outside. The venting shall have a minimum of 25 percent of the exterior wall of the Group H occupancy, unless specifically approved by the Building Official.
- (b) Smoke and heat vents shall be installed in Group H occupancies with more than 15,000 square feet in a single floor, and such vents shall be installed in accordance with the requirements of Section 716.
- (c) Aircraft hangars where maintenance and repair work is done shall have exterior walls of not less than 1-hour fire-resistive construction, or shall be surrounded by public space, streets or permanent yards not less than 60 feet wide. Area increases permitted in Section 712 shall be not more than 50 percent for aircraft hangars.
- (d) In Group H, Division 4 occupancies, where flammable or explosive liquids are stored or kept, floors shall be protected against saturation by noncombustible materials.
- (e) The structural frame of the buildings housing Group H occupancies more than 95 feet high shall be protected by not less than 3-hour fire-resistive construction and the floor assembly shall be of not less than 3-hour fire-resistive construction.

REQUIREMENTS BASED ON OCCUPANCY

511.3 Exits. Stairways, exits and smoke-protected enclosures shall be provided as specified in Chapter 8. (See Section 821.)

511.4 Enclosure of exits and vertical openings. Stairways and exits shall be enclosed as specified in Chapter 8. Elevator shafts, vent shafts and other vertical openings shall be enclosed and the enclosure shall have the fire-resistance specified in Table 6.2 and Section 703.

511.5 Special requirements—Group H occupancies.

- (a) The use, handling and storage of gasoline, fuel oil and other flammable liquids shall comply with the requirements of EPCOT Standards 5-4, 5-5 and 5-6.
- (b) Dry cleaning plants shall be limited to the use of solvents with a flash point above 140°F and shall comply with the requirements of EPCOT Standard 5-6 for Class III dry cleaning plants.
- (c) Every boiler room or room containing a heating plant shall be separated from other parts of the building by a 3-hour fire-resistive separation as defined in Section 502. There shall be no interior openings between the Group H occupancy and a boiler room, furnace room or incinerator room.
- (d) In Group H, Division 4 occupancies, space heaters shall comply with the requirements of the *EPCOT Mechanical Code*.
- (e) Every building housing a Group H occupancy shall be provided with an approved outside gas shutoff valve, conspicuously marked. (See the *EPCOT Fuel Gas Code*.)
- (f) Each machine used in a dry cleaning shop using volatile flammable liquid shall have a steam line connected directly to it, arranged so that the steam will be released automatically to the inside when an explosion occurs in a machine. (See the *EPCOT Fire Prevention Code*.)

511.6 Paint spraying and dipping booths. Where an approved spray booth is installed in a building housing a Group H occupancy, in accordance with the requirements of EPCOT Standard 5-11, such booth need not be separated from other Group H and I occupancies.

511.7 High-piled stock.

- (a) Buildings used or intended to be used for the storage of high-piled stock as defined in Paragraph (b) shall comply with the requirements of this Subsection.
- (b) High-piled stock shall be combustible commodities or packaging materials that are placed in closely packed piles more than 12 feet high, or that are highly combustible materials placed in piles, stacks or racks more than 6 feet high.

Combustible commodities include the following classifications:

1. Manufactured combustible materials.
2. Wrapped or packaged in or protected by combustible materials.
3. Stored on combustible pallets or racks.

Highly combustible commodities include the following:

1. Rubber goods.
 2. High-hazard foam plastic products.
 3. Other materials that are subject to rapid combustion.
- (c) In rooms containing high-piled stock, ceilings shall be divided into areas not more than 20,000 square feet by approved noncombustible draftstops, constructed as required in Subsection 705.5, extending at least 2 feet below the ceiling. In lieu of draftstops, curtain boards and roof vents may be installed as provided in Section 716 and EPCOT Standard 7-9.
 - (d) In buildings containing an area of more than 10,000 square feet of high-piled stock, access shall be provided on both sides of the area. Doorways 3 feet wide and 6½ feet high, located in exterior walls at intervals not more than 100 feet, shall be considered sufficient, except where steel roll-up doors or other types of doors are used that obstruct the access.

SECTION 512 GENERAL REQUIREMENTS— GROUP I OCCUPANCIES

512.1 Group I occupancies classified.

- (a) Group I occupancies shall be as classified in Section 501, Table 5.1 and as follows:

Group I – Industrial

- I-1 Power plants, pumping stations, cold-storage buildings, creameries and ice plants.
 - I-2 Factories and warehouses wherein materials other than highly combustible are used, processed or stored; or where high-piled stock is warehoused, stored, used or processed.
 - I-3 Maintenance workshops and laboratories.
- (b) Group I occupancies shall comply with the applicable requirements of Sections 502 and 503, and with the provisions of this Section and Chapter 8.

512.2 Construction and fire protection.

- (a) In Group I-2 occupancies where high-piled stock is stored as described in Section 511, construction shall be in accordance with Paragraphs (c) and (d) of Subsection 511.7.
- (b) Fire protection of the underside of the roof framing may be omitted in buildings housing Group I occupancies.

512.3 Enclosure of openings.

- (a) Interior stairways, ramps and escalators serving Group I occupancies shall be enclosed as specified in Chapter 8, and the enclosure shall be fire protected as required in Table 6.2 and Section 703.

- (b) Transporting assemblies shall be fire protected as required in Chapter 7, and shall be constructed and operated in accordance with the requirements of EPCOT Standard 5-1 and the rules and regulations of Florida Statute 442. (For fire protection of conveyer openings, see EPCOT Standard 7-6.)

512.4 Special requirements—Group I occupancies. In addition to the requirements of Subsection 503.12, the following requirements for fire safety shall apply to Group I occupancies:

- (a) Storage, use and handling of gasoline, fuel oil and other flammable liquids shall conform to the requirements of EPCOT Standards 5-4, 5-5 and 5-6. In rooms where volatile flammable liquids are used or stored, no device generating a glow or flame capable of igniting gasoline vapor shall be installed or used within 24 inches of the floor.
- (b) Transformer vaults shall be constructed in accordance with the requirements of the *EPCOT Electrical Code*.
- (c) In one-story buildings housing Group I-2 occupancies, with more than 50,000 square feet in undivided areas, smoke and heat vents shall be installed in accordance with the requirements of Section 716.

**SECTION 513
GENERAL REQUIREMENTS—
GROUP R OCCUPANCIES**

513.1 Group R occupancies classified.

- (a) Group R occupancies shall be classified in Section 501, Table 5.1 and as follows:

Group R – Residential

R-1 Hotels, motels and similar facilities having three or more rooms for transient guests.

R-2 Multiple-residential apartment houses, convents, monasteries, dormitories, guest houses and facilities having three or more permanent residential units.

R-3 Dwellings of one and two units.

- (b) Group R occupancies shall comply with the applicable requirements of Sections 501 through 503 and 822, and this Section.

513.2 Special construction requirements.

- (a) In Group R occupancies of more than a single dwelling, walls, partitions and floor-ceiling construction separating individual units from each other or from public halls, corridors or stairs, shall have a minimum sound transmission class rating of 45 in accordance with EPCOT Standard 5-10 for airborne noise. This requirement shall not apply to entrance doors of individual units. Verification of the sound transmission class shall be test data by an approved testing laboratory in accordance with the requirements of EPCOT Standard 5-10.
- (b) Tenant separations shall be provided between units of Group R-1, R-2 and R-3 occupancies in accordance with Subsection 502.5.

513.3 Ventilation and sanitation. Ventilation and sanitation shall be provided as required in Subsections 503.7 and 503.8 and Section 517, and as specified in the *EPCOT Mechanical Code* and the *EPCOT Plumbing Code*.

513.4 Fire detection systems. An approved detector of the products of combustion other than heat shall be installed in every dwelling and every dwelling unit within an apartment house, condominium, townhouse and every guest room in a motel or hotel. Every single- and multiple-station smoke detector shall be connected to an AC power source. Detectors shall comply with the requirements of EPCOT Standard 7-4 and this Subsection, and shall be installed in accordance with the manufacturer’s recommendations and listings. When activated, the detector shall sound a local audible alarm.

Exception: In existing buildings, a monitoring battery source is permitted.

513.5 Fire-extinguishing systems. Automatic fire-extinguishing systems required by this Code shall be installed in accordance with Section 715 and EPCOT Standards 7-10 through 7-13.

513.6 Separation of garages.

- (a) A separation between a private garage and a dwelling shall be a minimum of 1-hour fire resistance, except in the case of a Group R-3 occupancy. (See Subsection 515.3.)
- (b) Attached garages shall not open directly into a sleeping area.

**SECTION 514
SPECIAL REQUIREMENTS—
GROUP R-1 AND R-2 OCCUPANCIES**

514.1 Protection of openings. Exits, smoke-protected stairways and other vertical openings shall be enclosed and the enclosure shall be as specified in Section 703 and Chapter 8 for vertical openings and exits, respectively. (See Subsection 809.1.)

**SECTION 515
SPECIAL REQUIREMENTS—
GROUP R-3 OCCUPANCIES**

515.1 Scope. Group R, Division 3 occupancies, shall meet the applicable requirements of Sections 501, 502, 503, 513, 822 and this Section.

515.2 Protection of vertical openings. Dumbwaiter shafts, clothes chutes, trash chutes and other vertical openings shall be enclosed as required in Section 703.

515.3 Separation of garages.

- (a) A dwelling and an attached garage shall be separated from the floor to the roof with a fire-resistive wall with the membrane on the garage side, complying with that portion of a 1-hour tested assembly with no openings in the wall. A self-closing, tight-fitting solid wood core door or the equivalent, not less than 1³/₈ inches thick, may be permitted by the Building Official.
- (b) Attached garages shall not open directly into a sleeping room.

REQUIREMENTS BASED ON OCCUPANCY

515.4 Stair enclosures. Where stairways are required to be enclosed, the enclosure shall be as specified in Section 809.

SECTION 516 GENERAL REQUIREMENTS— GROUP S OCCUPANCIES

516.1 Group S occupancies classified.

- (a) Group S occupancies shall be as classified in Section 501, Table 5.1 and as follows:

Group S – Satellite structures

- S-1 Private garages, carports, greenhouses, sheds, cabanas, bath houses, agricultural buildings, shade structures and guard shacks.
 - S-2 Commercial stables.
 - S-3 Swimming pools.
 - S-4 Mobile homes, campers and trailers.
 - S-5 Tanks and towers located above ground that support their own weight.
 - S-6 Fences as defined in Chapter 2.
 - S-7 Docks.
 - S-8 Animal support facilities.
 - S-9 Street lighting, signage, lift stations, electrical vaults or structures associated with roadway right-of-way.
- (b) Group S occupancies shall meet the applicable requirements of Sections 502 and 503, Chapter 8, and the provisions of this Section.
- (c) Group S structures shall be designed to support their own live and dead loads, and wind loads as required in Chapter 9.
- (d) Group S-2 occupancies shall comply with the requirements of Appendix H.
- (e) Group S-3 occupancies shall comply with the requirements of Appendix E.
- (f) Group S-4 occupancies shall comply with the requirements of Appendix J.
- (g) Group S-8 occupancies shall comply with the requirements of Appendix Q.
- (h) Group S-9 occupancies shall comply with the requirements of Appendix D and/or the *EPCOT Electrical Code*.

516.2 Construction, height and area.

- (a) In a building of mixed occupancy, the total area of private garages used exclusively for parking of passenger motor vehicles may be 3,000 square feet when the exterior walls and openings are protected as required for the primary occupancy of the building. Each part of a building separated as specified in Section 502 may be considered to be a separate building. Increases in area may apply to a building of single occupancy when the use of the building is as specified and the protection of

exterior walls and openings is as required for a building housing a Group S-1 occupancy.

- (b) When a private parking garage is erected at least 20 feet from the main building, the area of the garage may be 3,000 square feet. When erected less than 20 feet from the main building, the exterior wall facing the main building shall be of 1-hour fire-resistive construction with no openings.
- (c) Separations of garages attached to buildings housing Group S-2 occupancies shall be as required for Group R-3 occupancies in Subsection 515.3(a).
- (d) In areas where motor vehicles are stored or operated, floor surfaces shall be of noncombustible materials or of asphaltic paving materials.

SECTION 517 SPECIAL REQUIREMENTS FOR LIGHT AND VENTILATION—ALL OCCUPANCIES

(For Basic Requirements, see Chapter 4 of the *EPCOT Mechanical Code*, the *EPCOT Electrical Code* and the *EPCOT Energy Efficiency Code for Building Construction*)

517.1 Group A and E occupancies.

- (a) Artificial ventilation shall comply with Section 403 of the *EPCOT Mechanical Code*.
- (b) Ventilation of stages and stage dressing rooms shall be as required in Appendix G, Part 1.
- (c) Ventilation of motion picture machine rooms shall be as required in Appendix G, Part 2.

517.2 Group B and I occupancies.

- (a) Artificial ventilation and mechanical systems, installed as required in the *EPCOT Mechanical Code*, shall supply at least two changes of air per hour. The system shall be vented to the outside air. The discharge point shall be located at least 5 feet from an openable window.
- (b) Toilet rooms shall have exterior windows not less than 3 square feet in area, fully openable or a vertical duct not less than 100 square inches in area for the first toilet and not less than 50 square inches for each additional toilet, or shall have an approved mechanical ventilating system, as required in the *EPCOT Mechanical Code*.
- (c) Group B-3 occupancies used for storage and handling of automobiles under their own power may have a mechanically operated exhaust system connected to a light switch, to provide four changes of air per hour, air to be taken from near floor level. In storage garages and airplane hangars greater than 5,000 square feet, the Building Official may waive this requirement when the building is provided with unobstructed openings to the outer air sufficient to supply required ventilation.
- (d) In Group B occupancies where flammable liquids are stored or kept, exhaust ventilation shall be provided sufficient to produce four changes of air per hour, air to be taken from near floor level.

517.3 Group D occupancies.

- (a) Artificial ventilation and mechanical systems shall be installed as required in the *EPCOT Mechanical Code*. The number of changes of air shall be as required in EPCOT Standard 5-2.
- (b) Group D-1 and D-2 heating and ventilating systems shall comply with EPCOT Standard 5-2 and shall provide temperature and humidity ranges as follows:

ROOM DESIGNATION	TEMPERATURE (°F)	HUMIDITY %
Operating	70 – 76 ^a	50 – 60
Delivery	70 – 76 ^a	50 – 60
Recovery	75	50 – 60
Nursery (full-term and observation)	75	50
Nursery (premature)	70 – 80 ^a	50 – 60 ^a
Intensive care	70 – 80 ^a	30 – 60

a. Variable range required.

- (c) Ducts for all mechanical systems shall serve no other occupancy and shall be an approved material.
Emergency lighting systems shall be provided as required in the *EPCOT Electrical Code*.
- (d) All air supply and exhaust systems shall be mechanically operated. Outdoor supply intakes shall not be located closer than 25 feet from exhausts of ventilating systems. The bottom of outdoor intakes serving central systems shall be located not less than 8 feet above the ground level or, if installed through the roof, it shall be not less than 3 feet above roof level.

517.4 Group H occupancies.

- (a) Artificial ventilation and mechanical systems, installed as required in the *EPCOT Mechanical Code*, shall supply at least two changes of air per hour. The system shall be vented to the outside air. The discharge point shall be located at least 5 feet from an openable window.
- (b) In rooms where dust, fumes, vapors, gases or other impurities are present, a mechanical ventilating system shall be provided and the installation shall be in accordance with the *EPCOT Mechanical Code*.
- (c) In buildings where flammable liquids are used, exhaust ventilation shall be provided and shall produce not less than four changes of air per hour, and the air shall be taken from near the floor level.
- (d) Toilet rooms shall have exterior windows not less than 3 square feet in area and shall be fully openable, or a vertical duct having not less than 100 square inches in area for the first toilet and 50 square inches for each additional toilet.
- (e) A mechanical ventilating system installed as required in the *EPCOT Mechanical Code* may be substituted when approved by the Building Official.

517.5 Group R occupancies.

- (a) Artificial ventilation and mechanical systems, installed as required in the *EPCOT Mechanical Code*, shall supply the following changes of air per hour:
 - R-1 and R-2 guest rooms, living rooms 2
 - Kitchens, bathrooms, toilet rooms, laundry rooms 12
 - R-3 bathroom and toilet rooms 12
- (b) Light and ventilation shall be provided in Group R-1 and R-2 occupancies, in accordance with the rules and regulations of the State of Florida. Window area shall be at least 8 percent of the floor area and shall be at least one-half openable.
Exception: Buildings protected throughout by an approved supervised automatic sprinkler system installed in accordance with NFPA 13 and provided with an approved engineered smoke control system with mechanical ventilation system capable of providing at least two air changes per hour in all areas.
- (c) In Group R-3 dwellings, the window area in bathrooms and toilet rooms shall be not less than 3 square feet and at least one-half of the area shall be openable.

517.6 Group S occupancies.

- (a) Where light and ventilation are required in buildings of Group S-1 occupancy, artificial illumination with mechanical systems, installed as required in the *EPCOT Mechanical Code*, may be substituted.
- (b) In buildings of Group S-2 occupancy (commercial stables), mechanical systems may not be substituted for natural ventilation, except as approved specifically by the Building Official.

**SECTION 518
SPECIAL CONSTRUCTION**

518.1 Children’s play structures. Children’s play structures installed inside all occupancies covered by this Code shall comply with the following:

- (a) **Materials.** Children’s play structures shall be constructed of noncombustible materials or of combustible materials that comply with the following:
 1. Fire-retardant-treated wood.
 2. Light-transmitting plastics complying with Section 1008.
 3. Foam plastics (including the pipe foam used in soft-contained play equipment structures) having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975.
 4. Aluminum composite material (ACM) meeting the requirements of Class 1 interior finish in

REQUIREMENTS BASED ON OCCUPANCY

accordance with Section 711 when tested as an assembly in the maximum thickness intended for use.

5. Textiles and films complying with the flame propagation performance criteria contained in NFPA 701.
 6. Plastic materials used to construct rigid components of soft-contained play equipment structures (such as tubes, windows, panels, junction boxes, pipes, slides and decks) exhibiting a peak rate of heat release not exceeding 400 kW/m² when tested in accordance with ASTM E1354 at an incident heat flux of 50 kW/m² in the horizontal orientation at a thickness of 6 mm.
 7. Ball pool balls, used in soft-contained play equipment structures, having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975. The minimum specimen test size shall be 36 inches by 36 inches by an average of 21 inches deep, and the balls shall be held in a box constructed of galvanized steel poultry netting wire mesh.
 8. Foam plastics shall be covered by a fabric, coating or film meeting the flame propagation performance criteria of NFPA 701.
 9. The floor covering placed under the children's playground structure shall exhibit a Class 1 interior floor finish classification, as described in Section 711, when tested in accordance with NFPA 253.
- (b) **Fire protection.** Children's play structures shall be provided with the same level of approved fire suppression and detection devices required for other structures in the same occupancy.
- (c) **Separation.** Children's play structures shall have a horizontal separation from building walls, partitions and from elements of the means of egress of not less than 5 feet. Children's playground structures shall have a horizontal separation from other children's play structures of not less than 20 feet.
- (d) **Area limits.** Children's play structures shall not exceed 300 square feet in area, unless a special investigation has demonstrated adequate fire safety.

CHAPTER 6

REQUIREMENTS BASED ON TYPES OF CONSTRUCTION

SECTION 601 CLASSIFICATION, SCOPE AND CRITERIA

601.1 Classification.

(a) The Building Official shall classify all buildings and structures according to the type of construction set forth in Subsection 601.1(b) and Table 6.2 representing the various degrees of fire resistance in the building. All buildings and parts of buildings hereafter constructed in the District shall conform to the requirements for the specific types of construction as provided in this Chapter, Chapter 7, and as set forth in Subsection 601.1(b) and Table 6.2, and shall comply with the applicable requirements of other Chapters and Sections of this Code.

(b) Classification of types of construction.

Type I—Structural elements of approved noncombustible materials, exterior walls of masonry, reinforced concrete or other approved noncombustible materials, fire protected as specified in Table 6.2 and EPCOT Standards.

Type II—Structural elements of approved noncombustible materials or other approved materials, exterior walls of masonry, reinforced concrete or other approved materials, fire protected as specified in Table 6.2 and EPCOT Standards.

Type III—Structural elements of heavy timber (HT), sawn or glued-laminated, or of fire-resistive construction when materials other than heavy timber are used, exterior walls of masonry, reinforced concrete or other approved materials, fire protected as specified in Table 6.2 and EPCOT Standards.

Type IV—Structural elements and exterior walls of approved noncombustible materials may be unprotected or fire protected as specified in Table 6.2 and EPCOT Standards.

Type V—Structural elements and exterior walls of approved materials, may be unprotected or fire protected as specified in Table 6.2 and EPCOT Standards.

Type VI—Structural elements and exterior walls of wood or other approved combustible materials, may be unprotected or fire protected as specified in Table 6.2 and EPCOT Standards.

(c) Buildings not conforming to a type of construction classified in Subsection 601.1(b) and Table 6.2 shall be classified by the Building Official according to the type having equal or less fire resistance.

(d) Where two or more types of construction are used in the same building and are separated as required in Chapter 7, each part so separated may be classified in the type of construction to which it conforms; otherwise, the entire

building shall be classified as the least fire-resistive type of construction in the building and shall be subject to the requirements for that type.

601.2 Scope.

(a) No building or part of a building shall be required to conform to a type of construction that is more restrictive than the minimum type required for occupancy and location.

(b) Requirements for specific materials, types of construction and fire protection shall be minimum requirements and any material, type of construction or fire protection may be used that affords safety or fire resistance equal to or greater than that provided in this Code.

601.3 Criteria.

(a) Construction materials, assemblies of materials and systems tested by an approved laboratory, in accordance with Section 311 and EPCOT Standard 6-1, shall be rated according to test results and conditions.

(b) All types of construction shall comply with the following Chapters and Sections:

1. Structural design—Chapters 9 and 10.
2. Fire protection of exterior walls and structural elements of buildings—Sections 701, 707 and 708.
3. Openings in walls (opening protectives)—Section 704.
4. Enclosure of vertical openings—Section 703.
5. Fire protection of floors, roofs and ceilings—Section 705.
6. Penthouses, roof structures and skylights—Section 706.
7. Fire division walls—Section 708.
8. Partitions—Section 709.
9. Veneer—Section 710.
10. Interior wall, ceiling and floor finish—Section 711.
11. Maximum floor areas—Section 712 and Table 7.5.
12. Maximum heights of buildings—Section 713 and Table 7.5.
13. Fire-extinguishing systems—Subsection 503.12 and Section 715.
14. Smoke and heat venting—Section 716.
15. Foam plastics—Section 717.

(c) In addition to the requirements specified in Subsections 601.1, 601.2 and 601.3, the special provisions of Sections 602 to 606 shall apply.

**SECTION 602
SPECIAL REQUIREMENTS—
TYPES I AND II CONSTRUCTION**

602.1 Floors.

- (a) Where wood sleepers are used in buildings of Types I and II construction for laying wood flooring on noncombustible floors, the furring space shall be filled with noncombustible material or shall be firestopped so that there will be no open space greater than 100 square feet in area under the flooring. Such spaces shall be filled solidly under all permanent partitions to prevent spread of fire under the flooring. (See Subsection 705.2.)
- (b) Mezzanine floors shall be on noncombustible construction as approved for 1-hour fire resistive.

602.2 Roofs. In buildings of Types I and II construction, noncombustible materials shall be protected in accordance with Table 6.2.

Exception: Fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor or ceiling immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.

602.3 Stairways. In buildings of Types I and II construction, stairways and stair platforms shall be constructed of reinforced concrete, iron or steel with treads and risers of concrete, iron or steel.

602.4 Walls.

- (a) In buildings of Types I and II construction, nonbearing walls required to be 1- or 2-hour fire-resistance construction shall be permitted to be fire-retardant-treated wood enclosed within noncombustible materials.
- (b) Fire-retardant-treated wood shall be permitted in nonbearing exterior walls where no fire rating is required.

**SECTION 603
SPECIAL REQUIREMENTS—
TYPE III CONSTRUCTION**

603.1 Structural elements.

- (a) Structural elements of buildings of Type III construction shall be of heavy timber members (sawn or glued-laminated) or of fire-resistive construction as set forth in Table 6.2 when materials other than heavy timber are used.
- (b) Where horizontal separation of 20 feet or more is provided in buildings of Type III construction, wood columns, arches, beams, roof decking conforming to the requirements for heavy timber in Chapter 10 and EPCOT Standard 1010-9.801 may be used on the exterior of the building.

- (c) In buildings of Type III construction, bulkheads 30 inches below show windows may be of combustible material.

603.2 Partitions. In buildings of Type III construction, permanent partitions may be of solid wood construction formed by not less than two layers of matched boards of 1-inch nominal thickness or of 1-hour fire-resistive construction as set forth in Table 6.2.

603.3 Floors. In buildings of Type III construction, floors may be of heavy timber, masonry, wood, steel or iron, and shall be constructed as required in Chapters 7, 9 and 10.

603.4 Roofs. In buildings of Type III construction, roofs of heavy timber complying with the requirements of Section 1010 or roofs of 1-hour fire-resistive construction may be used.

603.5 Stairways. In buildings of Type III construction, stairways may be constructed with wood treads and risers of not less than 2-inch nominal thickness. Where built-on, laminated or plank inclines are required for floors, stairways may be 1-inch nominal thickness or may be constructed as required for buildings of Type I or II construction.

**SECTION 604
SPECIAL REQUIREMENTS—
TYPE IV CONSTRUCTION**

604.1 Structural elements. In buildings of Type IV construction housing a Group A and (or) E occupancy, approved fire-retardant-treated wood may be used as an alternative to noncombustible roof construction. Fire protection of structural members may be omitted in such buildings where such structural members support a roof only and there is 20 feet or more clear height above the floor or balcony. In such buildings, structural members of heavy timber sizes may be used as alternatives to unprotected roof members. Approved exterior fire-retardant-treated wood studs may be used in exterior nonbearing walls when horizontally separated from the noncombustible structure by at least 5 feet.

604.2 Walls. In buildings of Type IV construction, nonbearing walls required to be 1- or 2-hour fire-resistance construction shall be noncombustible or fire-retardant-treated wood enclosed within noncombustible materials.

**SECTION 605
SPECIAL REQUIREMENTS—
TYPE V CONSTRUCTION**

605.1 Structural elements. The structural elements of buildings of Type V construction shall be approved materials complying with the applicable provisions of Chapters 7 and 10, and the requirements of this Chapter.

605.2 Floors. In buildings having floors immediately above usable space in basements, the area above heating equipment shall have 1-hour fire protection, except where an automatic sprinkler system is installed.

**SECTION 606
SPECIAL REQUIREMENTS—
TYPE VI CONSTRUCTION**

606.1 Structural elements. The structural elements of buildings of Type VI construction may be any material permitted by this Code.

606.2 Enclosure of vertical openings. In buildings of Type VI construction, chutes and dumbwaiter shafts with cross-sectional areas of not more than 9 square feet may be lined with approved fire-resistive materials covered with not less than 26-gauge metal with all joints locklapped.

TABLE 6.2 FIRE PROTECTION REQUIREMENT FOR THE TYPES OF CONSTRUCTION^a

	TYPE I		TYPE II		TYPE III HT		TYPE IV				TYPE V				TYPE VI						
	Fire-Resistive Time Period (hr)	Opening Permitted %/Wall	Fire-Resistive Time Period (hr)	Opening Permitted %/Wall	Fire-Resistive Time Period (hr)	Opening Permitted %/Wall	Fire-Resistive Time Period (hr)	Opening Permitted %/Wall	Protected Construction NC	Opening Permitted %/Wall	Fire-Resistive Time Period (hr)	Opening Permitted %/Wall	Protected Construction NC	Opening Permitted %/Wall	Fire-Resistive Time Period (hr)	Opening Permitted %/Wall	Protected Construction NC	Opening Permitted %/Wall	Fire-Resistive Time Period (hr)	Opening Permitted %/Wall	
STRUCTURAL MEMBER OR ELEMENT PROTECTED	3 NC	0	2 NC	0	2 NC	0	1 NC	0	2 NC	0	1 NC	0	2 NC	0	1 NC	0	1 NC	0	1	0	
	3 NC	10	2 NC	10	2 NC	10	1 NC	10	2 NC	10	1 NC	10	2 NC	10	1 NC	10	1 NC	10	1	10	
	2 NC	20	1 NC	20	1 NC	20	1 NC	20	1 NC	20	1 NC	20	0	N.L.							
	2 NC	30	1 NC	30	1 NC	30	1 NC	30	1 NC	30	1 NC	30	0	N.L.							
	1 NC	40	1 NC	40	1 NC	40	1 NC	40	1 NC	40	1 NC	40	0	N.L.							
	1 NC	50	1 NC	50	1 NC	50	1 NC	50	1 NC	50	1 NC	50	0	N.L.							
Exterior nonbearing walls with approved horizontal separation ^b	2 NC	0	1 NC	0	1 NC	0	1 NC	0	1 NC	0	1 NC	0	1	0							
From 0' - 5'	1 NC	10	1 NC	10	1 NC	10	1 NC	10	1 NC	10	1 NC	10	0	N.L.							
over 5' - 10'	1 NC	20	1 NC	20	1 NC	20	1 NC	20	1 NC	20	1 NC	20	0	N.L.							
10' - 20'	1 NC	30	1 NC	30	1 NC	30	1 NC	30	1 NC	30	1 NC	30	0	N.L.							
20' - 30'	1 NC	40	1 NC	40	1 NC	40	1 NC	40	1 NC	40	1 NC	40	0	N.L.							
30' - 50'	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	0	N.L.	
over 50'	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	NC	N.L.	0	N.L.	
For inner court walls see Subsection 701.4 ^b																					
Penthouse walls ^d	NC		NC		NC		NC		NC		NC		NC		NC		NC				
Partitions																					
Interior bearing	2 NC		1 NC		1 or HT		1 NC		1 NC		1 NC		1 NC		1 NC		1 NC		1 ^e	Note e	
Interior nonbearing ^e	1 NC		1 NC		1 or HT		1 NC		1 NC		1 NC		1 NC		1 NC		1 NC				
Vertical openings ^{m, o}	1 NC		1 NC		1		1 NC		1 NC		1 NC		1 NC		1		1		1		

(continued)

TABLE 6.2—continued
FIRE PROTECTION REQUIREMENTS FOR THE TYPES OF CONSTRUCTION^a

STRUCTURAL MEMBER OR ELEMENT PROTECTED	TYPE I		TYPE II		TYPE III HT		TYPE IV				TYPE V				TYPE VI							
	Fire-Resistive Construction (hr)	Opening Permitted %/wall	Fire-Resistive Construction (hr)	Opening Permitted %/wall	Fire-Resistive Construction (hr)	Opening Permitted %/wall	Fire-Resistive Construction (hr)	Opening Permitted %/wall	Protected		Unprotected		Protected		Unprotected		Protected		Unprotected			
									Time Period (hr)	Opening Permitted %/wall												
Columns supporting masonry or bearing walls	3 NC		2 NC		1 ^{f,r} 1 or 6×8 ^g 8×8 ^g		1 NC ^f		1 ^f		NC ^f		1 ^f		Note f		1 ^f		Note f			
Columns supporting Roofs only	1 NC		1 NC				1 NC		1		NC		1				1					
Other columns	2 NC		1 NC				1 NC		1		NC		1				1					
Trusses, girders, beams— Supporting masonry or bearing walls, columns, girders and beams	3 NC		2 NC ⁱ		1 NC ^{h,r}		1 NC ^h		1 ^h		NC		1 ^h				Note h					
Supporting roofs	1 NC ⁱ		1 NC ⁱ		1 or 4×6 ^g 1 or 6×10 ^g		1 NC		1		NC ^h		1		Note l		1					
Supporting floors	2 NC		1 NC				1 NC		1		NC		1									
Arches	2 NC		1 NC		1 ^g		1 NC		1		NC		1									
Floor ceiling assembly ⁿ	2 NC		1 NC		Note k		1 NC		1		NC		1		Note j		1					
Roof ceiling assembly ⁿ	1 NC ⁱ		1 NC ⁱ		Notes g and k		1		1		NC		1				1					
20' or more above floor ^l	1 NC ⁱ		NC ⁱ				NC		NC		NC		NC				1					

HT – Heavy timber construction (for construction requirements, see Chapter 10 and EPCOT Standards 1010-1 and 1010-9).
 n. See Chapter 9 for design load requirements.
 o. See Table 7.2.
 p. See Section 708.
 q. See Subsection 506.3.
 r. See Subsection 1010.2.
 NC – Construction required to be noncombustible.
 N.L. – Not limited in openings permitted.
 a. See Section 701 for requirements for protection of openings because of location on property.
 b. See Subsection 707.5.
 c. See Subsection 604.1.
 d. See Subsection 706.1.
 e. See Subsection 709.1.
 f. See Subsection 702.3.
 g. See Subsection 603.1(b).
 h. See Subsection 702.2(b).
 i. See Subsection 602.2.
 j. See Subsection 605.2.
 k. See Section 1010, and EPCOT Standards 1010-1 and 1010-9.
 l. See Subsection 707.2 and Appendix L.
 m. See EPCOT Standard 5-1 for elevator shaft protection.

CHAPTER 7

GENERAL CONSTRUCTION REQUIREMENTS FOR FIRE SAFETY

SECTION 701 GENERAL REQUIREMENTS

701.1 General requirements.

- (a) Buildings shall adjoin or have access to a public space, yard or street on at least one side.
- (b) Required yards shall be maintained permanently.
- (c) The centerline of an adjoining street or alley shall be considered an adjacent property line for purposes of this Subsection.
- (d) Eaves over windows shall be not less than 30 inches from the side and rear property lines. For fire protection of eaves, see Subsection 707.6.

701.2 Fire resistance of exterior walls.

- (a) Exterior walls shall have the fire resistance and opening protection set forth in Table 6.2 in relation to the types of construction and distances to property lines, and shall comply with the requirements of Appendix B for location within the fire limits.
- (b) Construction and fire resistance of malls and covered walkways shall comply with the requirements of Appendix I.
- (c) Distances between buildings and property lines shall be measured at right angles from the property line. The provisions of this Section shall not apply to exterior walls constructed at right angles to the property line.

701.3 Projections. Projections from the exterior wall shall not extend beyond the following points:

- (a) A point one-third the distance to the property line from an exterior wall, or
- (b) A point one-third the distance from an assumed vertical plane located where fire-resistive protection of openings is first required because of location on property, whichever is the least restrictive.

701.4 Exterior wall openings.

- (a) Openings in exterior walls shall be limited as provided in Table 6.2 and shall be protected by a self-closing, an automatic-closing or fixed opening protective with a rating in accordance with Subsection 704.5 when less than 20 feet from an adjacent property line or from the centerline of the street or public space.

Exceptions:

1. In buildings of Type VI construction, openings not on a street front that are within 10 feet of an adjacent property line shall be protected as required in Paragraph (a).
2. Openings in walls of buildings housing Group R-3 occupancies shall not be required to be

protected, except when within 5 feet of an adjacent property line.

- (b) To determine the required wall and opening protection, buildings on the same property with inner court walls shall be assumed to have a property line between them.
- (c) When a new building is to be erected on the same property with an existing building, the assumed property line from the existing building shall be the distance to the property line for each type of construction, as set forth in Table 6.2.

Exceptions:

1. Two or more buildings on the same property may be considered parts of one building when the aggregate area of the building is within limits specified in Section 712 for a single building of the same occupancy and type of construction.
2. When the building so considered houses mixed occupancies or is of different types of construction, the area shall be as permitted for the most restrictive occupancy or type of construction. Tenant separation shall be provided as required by Subsection 508.3(c) for Group B, Division 1 and 2 occupancies.

701.5 Definitions:

F RATING. The time period that the through-penetration fire-stop system limits the spread of fire through the penetration when tested in accordance with ASTM E814 or UL 1479.

L RATING. The amount of air leakage (cubic feet per minute) through a penetration.

T RATING. The time period that the penetration fire-stop system, including the penetrating item, limits the maximum temperature rise to 325°F above its initial temperature through the penetration on the nonfire side when tested in accordance with ASTM E814 or UL 1479.

SECTION 702 STRUCTURAL ELEMENTS

702.1 Structural elements defined. The structural elements, as referred to herein, shall be considered to be the columns and girders, beams, trusses, joists, braced frames, moment-resistant frames, vertical- and lateral-resisting elements, and other framing members that are designed to carry any portion of the dead or live load and lateral forces, and that are essential to the stability of the building or structure.

702.2 Fire-resistive protection required.

- (a) Fire-resistive protection shall be provided for structural elements as set forth in Chapter 6 and EPCOT Standard 6-1. Thickness of the fire protection shall be the net thickness of the material.
- (b) Trusses, girders and beams supporting all bearing walls, columns, girders and trusses shall have the same fire-resistive rating as the wall, column, girder and truss supported.
- (c) The degree of fire resistance required for external structural members, defined as columns, trusses, girders and beams located beyond the perimeter of the building floor area, may be calculated by using analytical methods in accordance with the provisions set forth in Appendix L.

702.3 Fire protection of masonry.

- (a) Columns supporting masonry walls shall have the fire-resistive rating of the wall supported.
- (b) Where required in unit masonry construction, metal ties shall be embedded in the transverse joints. Such ties shall comply with EPCOT Standard 1006-2 or shall be equivalent to ties required therein.

702.4 Fire protection of steel columns. Cast-in-place concrete used for protecting steel columns shall be reinforced at the edges with wire ties of not less than 0.18 inch diameter wound spirally around the columns on a pitch of not more than 8 inches.

702.5 Attached metal members. The edges of lugs, brackets, rivets and bolt heads attached to structural elements may extend to within 1 inch of the surface of the fire-protective covering.

702.6 Reinforcing. Thickness of fire protection on concrete and masonry members shall be measured to the outside of the reinforcement, except that stirrups and spiral ties may project not more than 1/2 inch into the fire protection.

702.7 Bonded prestressed concrete tendons. Single- or multiple-bonded tendons in prestressed concrete beams, girders and solid slabs shall be fire protected as required in EPCOT Standard 6-1. Unbonded tendons may be accepted when substantiated by test, with the required thickness of fire protection at all locations.

702.8 Embedment of pipes. Conduits and pipes shall not be embedded within the required fire protection, except as approved by the Building Official.

702.9 Column jacketing. Fire-resistive covering of columns, where exposed to injury by moving vehicles, by handling of merchandise or by other means, shall be protected by a method approved by the Building Official.

**SECTION 703
FIRE PROTECTION OF VERTICAL OPENINGS**

703.1 Enclosure of vertical openings. When enclosure of vertical openings is required, the enclosure shall be constructed in accordance with the following provisions:

- (a) **Elevator enclosures.** See EPCOT Standard 5-1.
- (b) **Escalators.** See EPCOT Standard 5-1.

(c) Other vertical openings.

- 1. Shafts, ducts, chutes and other vertical openings not regulated in Paragraphs (a) and (b), shall be enclosed throughout their length with construction of not less than specified in Table 7.2 when penetrating two or more floors. A shaft that does not extend through the roof shall have its top enclosed with construction having a fire rating at least equal to that of the enclosing walls.
- 2. Openings into shaft enclosures shall be limited to those necessary for the purpose of the shaft and shall be protected in accordance with the requirements of Section 704.

(d) Air ducts. Air ducts passing through two or more floors shall be enclosed in a shaft constructed, as required, for other vertical openings in Paragraph (c). Dampers shall conform to the requirements of the *EPCOT Mechanical Code* and EPCOT Standard 7-1.

**SECTION 704
REQUIREMENTS FOR FIRE-RESISTIVE
MATERIALS AND SYSTEMS**

704.1 Criteria.

- (a) Fire-resistive materials and assemblies of materials shall meet the fire-resistive requirements of this Chapter and EPCOT Standard 6-1. Fire-resistive materials, assemblies and systems used shall be limited to those permitted in this Code, unless accepted under the procedure set forth in Subsection 601.3, and shall conform to the EPCOT Standards cited in this Subsection and listed in Appendix A, and to the regulations of materials, assemblies of materials and systems specified in Chapter 10 and this Chapter.
- (b) The construction materials and details for fire-resistive assemblies and systems described shall comply with all other provisions of this Code, except as modified herein.

704.2 Fire-resistive protection of openings.

(a) Where required, opening protectives shall comply with the requirements of EPCOT Standards 7-2 and 7-3.

Exception: Fire-resistance-rated glazing tested as part of a fire-resistance-rated wall assembly in accordance with ASTM E119 or UL 263 and labeled in accordance with Subsection 703.5 shall be permitted where used as a wall or floor/ceiling assembly. Fire-resistance-rated glazing shall be permitted in fire doors and fire window assemblies where tested and installed in accordance with their listings and where in compliance with the requirements of this Subsection.

(b) **General.** Fire dampers shall comply with the requirements of UL 555 and shall bear the label of an approved testing agency. Fire dampers shall be classified and identified for use in either:

- 1. Static systems that are automatically shut down in the event of fire.
- 2. Dynamic systems that are operating in the event of fire.

(c) **Locations.** Fire dampers shall be installed in accordance with the manufacturer's installation instructions in the following locations:

1. Ducts penetrating walls or partitions having a fire-resistance rating of 1 or more hours.
2. Ducts penetrating shaft walls having a fire-resistance rating of 1 or more hours.
3. Ducts penetrating only one floor of a building requiring the protection of vertical openings when the duct is not protected by a shaft enclosure as described.
4. Wall registers penetrating fire-rated walls having a fire-resistance rating of 1 or more hours.

(d) **Exceptions.** Fire dampers are not required under the following conditions:

1. In openings in floors of buildings that do not require protected floor openings.
2. Where branch ducts connect to return risers in which the airflow is upward and subducts, at least 22 inches long, are carried up inside the riser at each inlet.
3. In duct systems of any duct material or combinations thereof allowed by Chapter 6 of the *EPCOT Mechanical Code* penetrating 1-hour walls or partitions, where the duct penetrating the rated wall or partition meets the following minimum requirements:
 - (a) The duct shall not exceed 100 square inches,
 - (b) The duct shall be of 0.0217 inch minimum steel,
 - (c) The duct shall continue with no duct openings for not less than 5 feet from the rated wall, and
 - (d) The duct shall be installed above a ceiling.

704.3 Opening protectives.

- (a) An opening protective is the assembly of a fire door, fire window or fire damper, including the required hardware, anchorage, frames and sills. An opening protective is termed automatic closing when it may remain in an open position and close automatically when subjected to either an increase in temperature or the products of combustion other than heat.
- (b) An opening protective is termed self-closing when it is kept in a normally closed position and is equipped with an approved device to ensure closing and latching.
- (c) Unless otherwise specified, the fire detection device and closer shall meet the following conditions:
 1. The closing device shall be rated at a maximum temperature of 165°F.
 2. When products of combustion other than heat are detected by and activate the closing device, it shall be set to operate before smoke reduces intensity of a 1-foot beam of light by 4 percent or any other detector that will react as quickly.

3. Detection devices activating the closer shall conform to EPCOT Standard 7-4.

(d) Automatic-closing opening protectives for fire doors and fire shutters installed in the following locations shall be automatic closing by the operation of an approved smoke detector installed in accordance with the requirements of NFPA 72 or by loss of power to the smoke detector or hold-open device:

1. Fire doors and fire shutters in walls used to protect the path of egress as identified by Subsection 704.10.
2. Fire doors and fire shutters in walls used to provide occupancy separation as required by Section 502.
3. Fire doors and fire shutters in fire division walls as allowed by Section 708.

Fire doors and fire shutters that are automatic closing by smoke detection shall not have more than a 10-second delay before the door starts to close after the smoke detector is actuated.

704.4 Protection of openings in interior walls. Openings in walls and partitions, except in one- and two-family dwellings, shall be protected in accordance with Table 7.2.

704.5 Approved types of fire windows, doors and shutters.

- (a) Wall openings required to be fire protected by Table 7.2 shall be protected by approved listed and labeled fire doors, windows and shutters, and their accompanying hardware, including all frames, closing devices, anchorage and sills, in accordance with the requirements of NFPA 80, except as otherwise specified in this Code.
- (b) Openings are classified in accordance with the character and location of the wall in which they are situated. Fire protection ratings for products intended to comply with this Section shall be as determined and reported by a nationally recognized testing agency in accordance with ASTM E152 or ASTM E163. All such products shall bear an approved label. In each of the classes in Paragraph (c), the minimum fire protection ratings are shown.

Exception: Doors located in common walls separating guest rooms in Group R-1 hotels and motels may be installed without automatic- or self-closing devices.

(c) Fire doors are classified as 3-hour (A), 1½-hour (B), 1-hour (B), ¾-hour (C), 1½-hour (D), ¾-hour (E) or 20 minutes. The letter designation indicates the classification of opening in a wall or partition assembly for which a door is considered suitable and the relative importance of the door in preventing the spread of fire. These designations are described as follows:

1. Class A—openings in walls that divide a single building into fire areas or fire walls separating buildings.
2. Class B—openings in enclosures of vertical communications through buildings. They are also suitable for certain other openings in walls or partitions.

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- 3. Class C—openings in walls or partitions between rooms and corridors or hallways, except as provided in Paragraph (d) for 20-minute doors.
- 4. Classes D and E—openings in exterior walls subject to severe and moderate fire exposure from outside of the building, respectively.

(d) In corridor walls and smoke barriers, all door openings shall be protected with a tight-fitting smoke and draft assembly (including door frame and hardware), tested in accordance with UL 1784. These doors shall be equipped with approved self-closing or automatic-closing devices. When approved by the Building Official, any door required to have a level of fire resistance that is permitted to be automatic closing by smoke detection or that is self-closing, may not have a delay in closing or reclosing of more than 10 seconds. Door assemblies shall be identified in accordance with their listing. These doors shall not have louvers.

Exception: Doors from classrooms in Group E occupancies, opening directly into a 1-hour fire-rated corridor, may be installed without self-closing devices.

- (e) The size of fire doors shall not exceed that specified in EPCOT Standard 7-6, except as may be modified by Subsection 804.4.
- (f) For 1½-hour (B) and 1-hour (B) doors used in stairway enclosures, the average temperature developed on the unexposed side shall not exceed 450°F at the end of 30 minutes of standard fire test exposure.
- (g) Fire doors shall be equipped with an approved closer.
- (h) Motor-operated overhead doors shall conform to the provisions of Subsection 704.10.

704.6 Hardware.

- (a) Every opening protective required to have a 3-hour fire-resistive rating shall be of fixed or automatic-closing types as specified in Subsection 704.3. Every opening protective required to have a 1½-hour, 1-hour or ¾-hour fire-resistive rating shall be an automatic-closing, fixed or self-closing type as required in Subsection 704.3.

Exceptions:

- 1. Dual-purpose fire exit doors shall have closing devices as required in Chapter 8.
- 2. Heat-activated devices used in automatic-opening protectives providing 3-hour fire protection shall be installed, one on top of each side of the wall opening and one on each side of the wall at ceiling height when the ceiling is more than 3 feet above the opening.
- 3. Opening protectives required to have 1½-hour, 1-hour or ¾-hour fire protection rating that are not classified as exit doors, may be activated as permitted in Exception 2, or by a detector or fusible link incorporated in the closing device.

- (b) Devices detecting products of combustion shall meet the approval of the Building Official for installation and location, and shall be subject to such periodic tests as may be required.
- (c) For exit doors and opening protectives that open onto interior exitways, see Chapter 8.

704.7 Glazed openings in fire doors. One-quarter-inch-thick wired glass, labeled for fire protection purposes, may be used in approved opening protectives with the maximum sizes shown in Table 7.1. Other glazing materials, which have been tested and labeled to indicate the type of opening to be protected for fire protection purposes, may be used in approved opening protectives in accordance with their listing with the maximum sizes tested. For requirements for safety glazing, see Section 1005.

**TABLE 7.1
LIMITING SIZE OF WIRE GLASS PANELS^{a, b, c}**

RATING, OPENING	MAX. AREA (square inches)	MAX. HEIGHT (inches)	MAX. WIDTH (inches)
3-hour, Class A door	0	0	0
1- & 1½-hour, Class B door	100	33	12
¾-hour, Class C door	1,296	54	54
1½-hour, Class D door	0	0	0
¾-hour, Class E door	1,296	54	54

- a. The glass shall be well embedded in putty and all exposed joints between the metal and glass shall be struck and pointed.
- b. Devices used to view through fire doors rated at 1½ hours or less shall be labeled.
- c. Wired glass in 20-minute doors shall be limited to the amount of glass tested in a door.

704.8 Glazed openings in fire windows. Three-fourths-hour fire-resistive-rated windows may have an area not more than 84 square feet with neither width nor height exceeding 12 feet. Fire windows shall be either fixed or automatic closing.

704.8.1 Fire-protection-rated glazing. Glazing in fire window assemblies shall be fire-protection-rated in accordance with this Section and Table 7.2. Glazing in fire door assemblies shall comply with Subsection 704.7. Fire-protection-rated glazing shall be tested in accordance with, and shall meet the acceptance criteria of, NFPA 257 or UL 9. Fire-protection-rated glazing shall also comply with NFPA 80. Openings in nonfire-resistance-rated exterior wall assemblies that require protection in accordance with Subsection 707.3, shall have a fire-protection rating of not less than ¾ hour.

Exception: Wired glass in accordance with Subsection 704.7.

**TABLE 7.2
MINIMUM FIRE RESISTANCE OF WALLS, PARTITIONS AND OPENING PROTECTIVES**

COMPONENT	WALLS AND PARTITIONS (hours)	OPENING PROTECTIVES (hours)
Elevator hoistways	See Standard 5-1	

(continued)

**TABLE 7.2—continued
MINIMUM FIRE RESISTANCE OF WALLS,
PARTITIONS AND OPENING PROTECTIVES**

COMPONENT	WALLS AND PARTITIONS (hours)	OPENING PROTECTIVES (hours)
Vertical shafts	2 (See Sections 703 and 809)	1½B
Fire division walls	3 (See Section 708)	3A (See Subsection 708.2)
Occupancy separations	See Section 502	
Tenant separations Walls within tenant spaces	1 (See Subsection 502.5) See Note a	¾C
Exit enclosures	See Section 809	See Subsection 809.3
Exterior stairways	See Subsections 806.10 and 806.12(b)	
Smoke-protected enclosures	See Section 810	
Horizontal exits	2 (See Section 808)	1½B
Corridors	1 (See Subsection 805.7)	20 minutes
Refuse chute access room	1	¾C
Hazardous use separations	See Section 511	
High-rise buildings	See Section 718	
Bathrooms and restrooms	See Note b	

- a. Partitions dividing off stores, offices or similar places occupied by one tenant only that do not establish a corridor serving an occupant load of 30 or more persons may be movable, partial or full height, temporary or permanent and may be constructed of any material approved by this Code provided that:
1. They do not block required exits (without providing alternative conforming exits) and they do not establish an exit corridor.
 2. Their location is restricted by means of permanent tracks, guides or other approved methods.
 3. Flammability shall be limited to materials having a flame spread classification as set forth in Table 7.4 for rooms or areas.
- b. Fire-rated bathroom/restroom doors are not required when opening onto fire-rated halls, corridors or exit access provided:
1. No other rooms open off the bathroom/restroom;
 2. No gas or electric appliances are located in the bathroom/restroom;
 3. The walls, partitions, floor and ceiling of the bathroom/restroom have a fire rating at least equal to the rating of the hall, corridor or exit access; and
 4. The bathroom/restroom is not used for any other purpose than it is designed for.

704.9 Tin-clad doors. When constructed as specified in EPCOT Standard 7-5, tin-clad doors installed on each side of openings requiring protection shall be considered equal to a 3-hour opening protective, provided that each door bears the label of an approved testing agency, showing the classification of the door.

704.10 Power-assisted overhead doors. When installed, power-operated rolling overhead doors shall comply with all of the following:

- (a) Close under power utilizing a minimum closure rate of 6 inches per second and a maximum closure rate of 24 inches per second.

- (b) Be provided with edge protection for the purpose of obstruction cycling. The edge protection shall allow the door to cycle until the obstruction clears or for a maximum of three cycles. After the obstruction is cleared or the maximum three cycles occur, the door shall close or come to rest on the obstruction.
- (c) Include an audible and visual signal to alert occupants when the door is closing.
- (d) Close upon activation of any building alarm notification system, including fire water flow, or initiate the closing operation within 10 seconds of transfer to emergency power.
- (e) Be provided with a power supply complying with Article 701 of the *National Electrical Code*® (NEC®).

704.11 Installation of opening protectives. Opening protectives shall be installed as required in EPCOT Standards 7-5 and 7-6.

SECTION 705 FIRE PROTECTION OF FLOORS, ROOFS AND CEILINGS

705.1 General requirements. Floors and roofs shall be designed and constructed in accordance with Chapters 9 and 10, and this Section.

705.2 Fire protection of floors.

- (a) Floors shall be fire protected as required for the type of construction in Sections 602 through 606, and Table 6.2. (See Subsection 602.1 for firestopping.)
- (b) Combustible insulating boards may be used under finish flooring.
- (c) Exterior loading platforms may be of noncombustible construction of heavy timber, with wood floors not less than 2 inches nominal thickness. Such wood construction shall not extend through exterior walls.

705.3 Fire protection of roofs.

- (a) Roofs shall be fire protected as required for the type of construction in Sections 602 through 606, and Table 6.2, and in accordance with the requirements of EPCOT Standard 7-7.
- (b) Roof covering shall be Class A or B fire retardant as classified in EPCOT Standard 7-7, except that roofs of Type VI buildings housing Group R or S occupancies may be Class C roofing.
- (c) Insulation shall be permitted on all buildings, provided that an approved roof covering is applied over the insulation.
- (d) Fire-resistive roofs may have openings as permitted for floors in Subsection 705.2 and may have openings as permitted by this Code. (See Section 706 for construction of skylights.)
- (e) Where metal roofing or siding is installed over a non-conductive base, provisions shall be made for bonding or grounding such metal roofing or siding in accordance with the *EPCOT Electrical Code*.

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705.4 Attic access. An attic access opening shall be provided in the ceiling of the top floor of all buildings having attics.

- (a) The opening shall be located in a corridor or hallway in buildings of three or more stories and shall be readily accessible in buildings of any height.
- (b) The opening shall be not less than 22 inches by 30 inches in area.
- (c) Attics with a maximum vertical clear height of less than 30 inches need not be provided with access openings.

705.5 Draftstops.

- (a) Any concealed combustible space in which building materials are exposed, which has a flame spread index greater than Class A, shall be draftstopped as follows:
 1. Every unoccupied attic space shall be subdivided by draftstops into areas not to exceed 3,000 square feet.
 2. Any concealed space between the ceiling and the floor or roof above shall be draftstopped for the full depth of the space along the line of support for the floor or roof structural members and, if necessary, at other locations to form areas not to exceed 1,000 square feet for any space between the ceiling and floor, and 3,000 square feet for any space between the ceiling and roof.

Exception: If concealed space is fully sprinklered, the draftstop area may be increased to 9,000 square feet.

- (b) Draftstopping materials shall be not less than 1/2-inch gypsum board, 15/32-inch wood structural panels or other approved materials adequately supported.
- (c) The integrity of all draftstops shall be maintained.

705.6 Ventilation. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of the roof rafters shall have cross ventilation for each separate space by means of protected ventilating openings. The net free ventilating area shall be not less than 1/150 of the ceiling area of the space ventilated. The ratio may be reduced to 1/300 when at least 50 percent of the required ventilating area is provided by ventilators located in the upper part of the space to be ventilated. Ventilators shall be placed at least 3 feet above eave or cornice vents and the remaining 50 percent of the required ventilation shall be provided by eave and cornice vents.

705.7 Duct openings. All ceiling duct openings in fire-resistive construction shall be protected by approved fire dampers in accordance with the requirements of EPCOT Standard 7-1 and the *EPCOT Mechanical Code*.

Exception: Openings may be installed where such openings and protectives have been tested in accordance with the requirements of Subsection 704.2.

705.8 Floor-ceiling and roof-ceiling assemblies.

- (a) Construction systems composed of fire-resistive floor and ceiling or roof and ceiling assemblies shall have the fire-resistance rating set forth in Table 6.2 and

EPCOT Standard 6-1. (For provisions covering design of roof and floor construction, see Chapter 9.)

- (b) Where a ceiling forms a protective membrane for fire-resistive assemblies, the construction and supporting horizontal structural members need not be fire protected individually, except where such members support directly applied loads from one floor or roof. The fire resistance shall be in accordance with the requirements of Table 6.2.
- (c) Ceilings shall form continuous fire-resistive membranes, but may have openings as permitted for floors in Subsection 707.10 where the ceiling openings aggregate is not more than 100 square inches for any 100 square feet of ceiling.
- (d) Where 1-hour fire-resistive construction is required for floor or ceiling assemblies, the fire protection may be omitted from the underside of the floor in the crawl space area at grade and from the attic area of the ceiling where the roof forms the upper surface of the attic.

705.9 Plastic light diffusers in ceilings.

- (a) For the purpose of this Section, a light-diffusing ceiling shall be defined as any light-diffusing or light-transmitting ceiling consisting of transparent, translucent, louvered, eggcrated, mesh or similar materials suspended from a ceiling or structural framework by means of hangers and may include the supporting grid on which the material rests.
- (b) Where walls and ceilings are required to be fire resistive or of noncombustible construction, and walls are set out or ceilings are dropped more than 1 3/4 inches, Class I materials shall be used, except where finish materials are protected on both sides by an automatic sprinkler system.

Exception: Ceiling light diffusers of approved plastics shall not be required to conform to the requirements of Paragraph (b) when the installation meets the following requirements:

1. The ceiling light diffusers, as installed, will fall from their mountings at an ambient temperature of at least 200°F below the ignition temperature of the plastic material, measured in accordance with EPCOT Standard 1008-1, as shown in appropriate tests by a recognized testing laboratory.
2. The plastic light diffusers are mounted in the ceiling so that they will remain in place at an ambient room temperature of 175°F for a period of not less than 15 minutes.
3. Light-diffusing ceilings installed below sprinkler heads shall be installed so that they will not interfere with the effective operation of the automatic sprinkler system, and shall provide ready access to all valves and sprinkler heads of the system.
4. The maximum size of any single plastic light-transmitting panel shall not exceed 10 square feet.

705.10 Plastic light diffusers in electrical fixtures. Light-transmitting and light-diffusing panels made from approved plastic materials installed with approved electric lighting fixtures shall be exempt from the requirements of Section 709 and shall meet the following requirements:

- (a) The light diffusers shall meet the requirements of Subsection 705.9(b), Exceptions 1 and 2.
- (b) Unless the occupancy is protected by an approved automatic fire-extinguishing system, the area of approved plastic materials, when used in exitways, exit passages or corridors, or in Group A and D occupancies, shall not be more than 30 percent of the aggregate area of the ceiling in which they are installed.
- (c) The maximum area of a single plastic light diffuser shall not be more than 30 square feet.

SECTION 706 PENTHOUSES, ROOF STRUCTURES AND SKYLIGHTS

706.1 Penthouses and roof structures.

- (a) Penthouses or other projections above the roof in buildings or structures of Type I or II construction shall be not more than 28 feet high above the roof when used as an enclosure for tanks or for elevators that run to the roof and, in all other cases, shall extend not more than 12 feet above the roof.
- (b) Where penthouse walls are set back less than 5 feet from the exterior wall, they shall conform to the requirements for fire resistance of the exterior wall of the building.
- (c) The aggregate area of penthouses and other roof structures shall not be more than 33¹/₃ percent of the area of the supporting roof.
- (d) No penthouse, bulkhead or similar projection above the roof shall be used for any purpose other than shelter of mechanical equipment or shelter of vertical shaft openings in the roof. Penthouses or bulkheads used for purposes other than permitted by this Subsection shall conform to the requirements of this Code for an additional story.
- (e) Roof structures shall be constructed with walls, floors and roof as required for the main part of the building and shall be fire protected as required in Table 6.2.
- (f) Roof signs shall be designed in accordance with Sections 903 and 904, and shall be constructed in accordance with the requirements of Appendix D.

706.2 Towers and spires.

- (a) Towers and spires, when enclosed, shall have exterior walls as required for the building upon which they are constructed. The framework of unenclosed towers extending more than 75 feet above grade shall be constructed of iron, steel or reinforced concrete. If the area of the tower or spire is more than 100 square feet in any horizontal cross section, its supporting frame shall extend directly to the ground or shall be supported by the structural frame of the building. The roof covering

of towers and spires shall be as required for the roof of the building.

- (b) Skeleton towers used as radio and television masts, located on the roof of a building or structure shall be constructed of noncombustible materials when more than 25 feet high and shall be supported on a noncombustible framework direct to the ground.

706.3 Sloped glazing.

- (a) **Scope.** Sloped glazing includes any installation of glass or other transparent, translucent or opaque glazing material installed at a slope of 15 degrees or more from the vertical plane. Glazing materials in skylights, roofs and sloped walls are included within this definition.
- (b) **Allowable glazing materials.** Sloped glazing shall be any of the following materials, subject to the limitations specified in Paragraph (d) and the exceptions specified in Paragraph (e):
 1. For monolithic glazing systems, the glazing material of the single lite or layer shall be laminated glass with a minimum 30 mil polyvinyl butyral (or equivalent) interlayer, wired glass, approved plastic materials meeting the requirements of Section 1008, heat-strengthened glass or fully tempered glass.
 2. For multiple-layer glazing systems, each lite or layer shall consist of any of the glazing materials specified in Paragraph 1.
- (c) See Subsection 706.4 for additional requirements for plastic skylights.
- (d) **Limitations.** Heat-strengthened glass and fully tempered glass when used in monolithic glazing systems, shall have screens installed below the glazing material, subject to the exceptions in Paragraph (e), 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 of the glass. They shall be constructed of a noncombustible material not thinner than a 0.0808-inch (12 B & S ga) diameter with a mesh not larger than 1 inch by 1 inch. 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.
- (e) In monolithic and multiple-layer sloped glazing systems, the following exceptions apply:
 1. Fully tempered glass may be installed without required protective screens when glazing between intervening floors at a slope of 30 degrees or less from the vertical plane if the highest point of the glass is 10 feet or less above the walking surface.

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2. Any glazing material, including annealed glass, may be installed without required screens if the walking surface or any other accessible area below the glazing material is permanently protected from the risk of falling glass.
3. Any glazing material, including annealed glass, may 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 above grade. Frames may be of wood construction in greenhouses located outside the fire district if the height of the sloped glazing does not exceed 20 feet above grade. In other cases, noncombustible frames shall be used.

- (f) **Sloped glazing framing.** In other than Types III, V and VI construction, all sloped glazing and skylight frames shall be constructed of noncombustible materials. In foundries or buildings where acid fumes deleterious to metal are incidental to the use of the buildings, approved pressure-treated woods or other approved noncombustible materials shall be permitted for sash and frames. All sloped glazing and skylights shall be designed for the tributary roof loads in Section 903. All skylights set at an angle of less than 45 degrees from the horizontal plane shall be mounted at least 4 inches above the plane of the roof on a curb construction as required for the frame. Sloped glazing may be installed in the plane of the roof where the roof pitch is greater than 45 degrees from the horizontal.

706.4 Plastic skylights.

- (a) **General.** Skylight assemblies may be glazed with approved plastic materials in accordance with the provisions of Subsection 706.4. (See Section 1008.)

Exception: These provisions need not be applied if the building on which the skylights are located is not more than one story in height, the building has an exterior separation from other buildings of at least 30 feet and the room or space sheltered by the roof is not classified in a group of high-hazard or institutional uses or as a mean of egress, or the plastic material meets the fire-resistance requirements of the roof.

- (b) The approval of thermoplastic light-transmitting materials without a curb shall include the following considerations:
1. Expansion and contraction.
 2. Durability.
 3. Condensation removal.
 4. Effects of sealants and roofing cements.
- (c) **Mounting.** The glazing shall be mounted at least 4 inches above the plane of the roof on a curb constructed consistent with the requirements for the type of construction classification. Edges of plastic sky-

lights and domes shall be protected by metal or non-combustible material.

Exceptions:

1. Curb requirements for skylights may be omitted when used on roofs with a minimum slope of 3:12 in one- and two-family dwellings or on buildings with an unclassified roof covering.
 2. The metal or noncombustible edge material is not required where unclassified roof coverings are permitted.
- (d) Flat or corrugated plastic skylights shall slope at least 4:12. Dome-shaped 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.
- (e) **Maximum area of skylight unit.** Each skylight unit shall have a maximum area of 100 square feet within the curb.

Exception: The area of skylight units shall not be limited in buildings equipped with an automatic fire suppression system or if the skylight is serving as an approved fire venting system.

- (f) **Aggregate area.** The aggregate area of skylights shall not exceed $33\frac{1}{3}$ percent when CC 1 materials are used, and 25 percent when CC 2 materials are used, of the floor area of the room or space sheltered by the roof in which they are installed.

Exception: The aggregate area of skylights may be increased 100 percent provided the skylight is serving as an approved fire venting system.

- (g) **Separation.** Skylights shall be separated from each other by a distance of not less than 4 feet measured in a horizontal plane.

Exceptions:

1. The separation shall not be required provided the skylight is serving as an approved fire venting system.
 2. In one- and two-family dwellings or on buildings with an unclassified roof covering, skylights shall be separated from each other by a distance of not less than 16 inches measured in a horizontal plane.
- (h) **Location.** Where exterior wall openings are required to be fire-resistance rated, a skylight shall not be installed within 6 feet of such exterior wall.

SECTION 707 FIRE PROTECTION OF WALLS AND PROJECTIONS

707.1 Fire-resistive rating required. Bearing and nonbearing walls required to be fire protected by the provisions of this Code shall have the fire-resistive ratings established by criteria specified in EPCOT Standard 6-1. [See Subsection 705.2(c).]

707.2 Combustible members. Combustible members framed into a wall shall be end-protected by not less than one-half the thickness of protection required for the fire-resistive wall.

707.3 Exterior walls.

- (a) **Fire resistance.** Exterior walls shall have the fire resistance required in Table 6.2 for the type of construction and shall conform to the requirements of this Section and Section 701 for the protection for walls and openings in walls because of location on property.
- (b) **Exterior openings.** Exterior openings located vertically above one another in buildings over two stories high shall have not less than 3 feet vertical separation provided by an assembly of noncombustible material having a fire-resistive rating as required for the type of construction (see Table 6.2) between the top of one opening and the bottom of the next opening above; or the exterior openings shall be separated by such an assembly extending outwardly from the building wall a distance of not less than 30 inches, unless an automatic sprinkler system is installed throughout the building.
- (c) **Exterior wall panels of plastic.** Approved light-transmitting plastic materials, as defined in Chapter 10, may be used as wall panels or as components of wall panels in all types of buildings equipped with an automatic sprinkler system or in wall openings not required to be fire resistive or fire protected. Such installations shall comply with the following requirements:
 - 1. **Area.** The aggregate area of the wall surface in which the plastic panels are installed shall not exceed 30 percent of the wall area of each story.
 - 2. **Height.** In buildings more than one story, individual plastic panels shall be not more than 10 feet high.
 - 3. **Separation.** Single assemblies or runs of continuously mounted plastic wall panels up to 100 feet long shall be separated longitudinally by a section of noncombustible wall construction at least 4 feet long. Assemblies or runs of plastic wall panels shall be separated vertically by a section of noncombustible wall construction at least 4 feet long. Assemblies or runs of plastic wall panels shall be separated vertically by a section of noncombustible wall construction 4 feet high or 50 percent of the height of the highest panel in the next lower assembly or run.

Exception: Area limitation and separation requirements shall not be applicable to the use of approved plastic wall panels in Type VI unprotected construction.

- 4. **Continuous projections.** In buildings or structures having continuous architectural projections on each floor above the first floor, meeting the requirements of Subsection 707.6 and extending 30 inches or more from the surface of the walls in which plastic panels are installed, no vertical separation shall be required except that provided by the vertical thickness of the projection.

- 5. **Fire Department entry and venting.** Plastic panels installed in exterior walls shall be of materials easily removed by fire fighters to permit venting of a fire or entry of a building by fire fighters, or clearly marked access panels shall be provided in compliance with the provisions of Paragraph (f).

- (d) **Combinations.** Combinations of light-transmitting plastic glazing and plastic wall panels shall be subject to limitations as to height and area, and requirements for separation applicable to the class of plastics as specified for wall panel installations.
- (e) **Glazing.** Doors, sash and framed openings in exterior walls of all buildings and structures shall be glazed with glass or with approved plastics, and the installation shall be as specified for glass in Section 1005 and for plastics in Section 1008.
- (f) **Access panels in windowless walls.**

- 1. An access door or covered opening with suitable hardware and identifying marking shall be installed in the exterior wall on each floor above the main floor, with free access into the building.
- 2. Such access shall have a minimum net clear opening width dimension of 32 inches and a minimum net clear opening height dimension of 48 inches and with the bottom of the opening not more than 32 inches above the floor.
- 3. The exterior of the opening shall have distinctive markings for purpose of ease in locating panels.
- 4. Such access opening(s) shall open into a fire aisle within the building and no shelving, loose or fixed, no containers or equipment of any description, nor any loose merchandise shall be placed to block the aisleway.
- 5. Openings shall be so placed that there will be one opening in each 50 feet of exterior wall on each accessible side of the building. Buildings equipped with an automatic sprinkler system throughout shall have access panels as set forth in Paragraph 4 for each 200 feet of wall.

707.4 Lintels. Fire protection may be omitted from the bottom flange of lintels spanning not more than 6 feet; shelf angles or plates that are not part of the structural frame.

707.5 Parapet walls.

- (a) Parapet walls shall be provided on the exterior of all buildings except as follows:
 - 1. Walls not required to be of fire-resistive construction.
 - 2. In Types III, V and VI construction, exterior fire-retardant-treated wood may be used in lieu of required noncombustible material.
 - 3. Walls where unprotected openings are permitted.
 - 4. Where the roof sloped more than 4 inches in 12 inches from the back of the exterior wall of the building.

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5. Where the exterior wall of the building is located 20 feet from the property line, or on an alley or public way 20 feet or more wide.

- (b) Parapets shall have the same degree of fire resistance as required for the wall upon which they are erected. Parapets shall extend not less than 26 inches above any part of the roof that is within 10 feet of the parapet wall.
- (c) All parapet walls shall have coping of approved materials.

707.6 Projections.

- (a) Projections from exterior walls of buildings shall comply with the requirements of Subsection 701.3 for location on property.
- (b) Cornices, architectural appendages, eave overhangs, marquees, awnings and other projections extending beyond the exterior wall shall be supported by the building and shall be constructed of materials where required for the type of construction (see Table 6.2). Exterior fire-retardant-treated wood may be used for cornices, architectural appendages, eave overhangs, marquees and similar projections.
- (c) Cornices, architectural appendages, eave overhangs, marquees and similar projections extending over public property shall be designed for live loads in accordance with Chapter 9 and shall be constructed as specified in Section 402.
- (d) Awnings shall be constructed as required in Chapter 4, Subsection 402.6.

707.7 Walls fronting on a public way. Regardless of fire-resistive requirements for exterior walls, wall components facing the public way may be constructed as follows:

- (a) Show-window frames, aprons and showcases located at grade level may be of combustible materials when the height of the construction is not more than 15 feet above grade.
- (b) Exterior-type wood veneer not less than $3/4$ -inch nominal thickness or exterior-type plywood not less than $3/8$ -inch nominal thickness may be applied to two-story buildings to a height of 15 feet. The wood shall be placed directly against noncombustible surfaces or furred out $1\ 5/8$ inches maximum, with all concealed spaces firestopped in accordance with the requirements of Subsection 707.9. Where exterior fire-retardant-treated wood is used, the height may be increased to 35 feet.

707.8 Bays, porches and balconies.

- (a) Construction of walls and floors in bays and oriels shall conform to the type of construction and degree of fire resistance permitted for exterior walls and floors of buildings to which they are attached. The roof covering of a bay or oriel window shall conform to the requirements for roof covering of the building.
- (b) Exterior balconies attached to or supported by walls required to be of masonry shall have brackets or beams constructed of noncombustible material. Railings shall

be provided for balconies, landings or porches more than 36 inches above grade, and such railings shall be constructed as required in Subsections 503.11 and 902.2(h).

707.9 Firestops.

- (a) Firestopping shall be provided to cut off all vertical and horizontal concealed openings. Firestopping, when of wood, shall be not less than 2 inches thick and shall effectively fill all spaces for the entire width of depth of the framing or structural member. Firestopping shall be securely and tightly fitted into place. In the case of spaces between chimneys and wood framing, such spaces shall be solidly filled with mortar or loose noncombustible matter on noncombustible supports. Fire-stopping shall be installed in the following locations:
 - 1. In exterior and interior stud walls, at ceiling and floor levels.
 - 2. In combustible stud walls and partitions, including furred spaces, placed so that the maximum dimension of a concealed space is 8 feet.
 - 3. At all interconnections between concealed vertical and horizontal spaces, such as occur at soffits, drop ceilings, cove ceiling, etc.
 - 4. In concealed spaces between stair stringers at the top and bottom of the run.
 - 5. At openings around vents, pipes, ducts, chimneys and fireplaces at ceiling and floor levels with noncombustible materials.
 - 6. In concealed spaces created by an assembly of floor joists, firestopping shall be provided for the full depth of the joists at the ends and over the supports.
- (b) Except as provided in Subsection 707.9(a)4, firestopping shall consist of 2-inch nominal lumber, or two thicknesses of 1-inch nominal lumber with broken lap joints, or one thickness of $2\ 3/32$ -inch plywood with joints backed by $2\ 3/32$ -inch plywood or other approved materials.

707.10 Scope. The provisions of this Section shall govern the materials and methods of construction used to protect through penetrations and membrane penetrations of horizontal assemblies and fire-resistance-rated wall assemblies.

707.10.1 Ducts and air transfer openings. Penetrations of fire-resistance-rated walls by ducts that are not protected with dampers shall comply with Subsections 707.10.2 through 707.10.3.3. Penetrations of horizontal assemblies not protected with a shaft as permitted by Subsection 703.1, and not required to be protected with fire dampers by other sections of this Code, shall comply with Subsections 707.10.4 through 707.10.4.2.2. Ducts and air transfer openings that are protected with dampers shall comply with the requirements of UL 555.

707.10.2 Installation details. Where sleeves are used, they shall be securely fastened to the assembly penetrated. The space between the item contained in the sleeve and the

sleeve itself and any space between the sleeve and the assembly penetrated shall be protected in accordance with this Section. Insulation and coverings on or in the penetrating item shall not penetrate the assembly unless the specific material used has been tested as part of the assembly in accordance with this Section.

707.10.3 Fire-resistance-rated walls. Penetrations into or through fire walls, fire barriers, smoke barrier walls and fire partitions shall comply with Subsections 707.10.3.1 through 707.10.3.3. Penetrations in smoke barrier walls shall also comply with Subsection 707.10.5.

707.10.3.1 Through penetrations. Through penetrations of fire-resistance-rated walls shall comply with Subsection 707.10.3.1.1 or 707.10.3.1.2.

Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space between the penetrating item and the fire-resistance-rated wall is permitted to be protected as follows:

1. In concrete or masonry walls where the penetrating item is a maximum 6-inch nominal diameter and the area of the opening through the wall does not exceed 144 square inches, concrete, grout or mortar is permitted where it is installed the full thickness of the wall or the thickness required to maintain the fire-resistance rating; or
2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 (EPCOT Standard 6-1) or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

707.10.3.1.1 Fire-resistance-rated assemblies. Penetrations shall be installed as tested in an approved fire-resistance-rated assembly.

707.10.3.1.2 Through-penetration firestop system. Through penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E814 (EPCOT Standard 7-24) or UL 1479, with a minimum positive pressure differential of 0.01 inch of water and shall have an F rating of not less than the required fire-resistance rating of the wall penetrated.

707.10.3.2 Membrane penetrations. Membrane penetrations shall comply with Subsection 707.10.3.1. Where walls or partitions are required to have a fire-resistance rating, recessed fixtures shall be installed such that the required fire-resistance will not be reduced.

Exceptions:

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches in area, provided the aggregate

area of the openings through the membrane does not exceed 100 square inches in any 100 square feet of wall area. The annular space between the wall membrane and the box shall not exceed $\frac{1}{8}$ inch. Such boxes on opposite sides of the wall or partition shall be separated by one of the following:

- 1.1. By a horizontal distance of not less than 24 inches where the wall or partition is constructed with individual noncommunicating stud cavities;
 - 1.2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation;
 - 1.3. By solid firestopping in accordance with Subsection 707.9;
 - 1.4. By protecting both outlet boxes with listed putty pads; or
 - 1.5. By other listed materials and methods.
2. Membrane penetrations by listed electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the wall membrane and the box shall not exceed $\frac{1}{8}$ inch unless listed otherwise. Such boxes on opposite sides of the wall or partition shall be separated by one of the following:
 - 2.1. By the horizontal distance specified in the listing of the electrical boxes;
 - 2.2. By solid firestopping in accordance with Subsection 707.9;
 - 2.3. By protecting both boxes with listed putty pads; or
 - 2.4. By other listed materials and methods.
 3. Membrane penetrations by electrical boxes of any size or type, which have been listed as part of a wall opening protective material system for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.
 4. Membrane penetrations by boxes other than electrical boxes, provided such penetrating items and the annular space between the wall membrane and the box, are protected by an approved membrane penetration firestop system installed as tested in accordance with ASTM E814 (EPCOT Standard 7-24) or UL 1479, with a minimum positive pressure differential of 0.01 inch of water, and shall have an F

rating and T rating of not less than the required fire-resistance rating of the wall penetrated and be installed in accordance with their listing.

5. The annular space created by the penetration of an automatic sprinkler, provided it is covered by a metal escutcheon plate.

707.10.3.3 Dissimilar materials. Noncombustible penetrating items shall not connect to combustible items beyond the point of firestopping unless it can be demonstrated that the fire-resistance integrity of the wall is maintained.

707.10.4 Horizontal assemblies. Penetrations of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly not required to be enclosed in a shaft by Subsection 703.1 shall be protected in accordance with Subsections 707.10.4.1 through 707.10.4.2.2.

707.10.4.1 Fire-resistance-rated assemblies. Penetrations of the fire-resistance-rated floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall comply with Subsections 707.10.4.1.1 through 707.10.4.1.3. Penetrations in horizontal smoke barriers shall also comply with Subsection 707.10.5.

707.10.4.1.1 Through penetrations. Through penetrations of fire-resistance-rated horizontal assemblies shall comply with Subsection 707.10.4.1.1.1 or 707.10.4.1.1.2.

Exceptions:

1. Penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete or masonry items through a single fire-resistance-rated floor assembly where the annular space is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 (EPCOT Standard 6-1) or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated. Penetrating items with a maximum 6-inch nominal diameter shall not be limited to the penetration of a single fire-resistance-rated floor assembly, provided the aggregate area of the openings through the assembly does not exceed 144 square inches in any 100 square feet of floor area.
2. Penetrations in a single concrete floor by steel, ferrous or copper conduits, pipes, tubes or vents with a maximum 6-inch nominal diameter, provided the concrete, grout or mortar is installed the full thickness of the floor or the thickness required to maintain the fire-resistance rating. The penetrating items shall not be limited to the penetration of a single concrete floor, provided the area

of the opening through each floor does not exceed 144 square inches.

3. Penetrations by listed electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and installed in accordance with the instructions included in the listing.

707.10.4.1.1.1 Installation. Through penetrations shall be installed as tested in the approved fire-resistance-rated assembly.

707.10.4.1.1.2 Through-penetration firestop system. Through penetrations shall be protected by an approved through-penetration firestop system installed and tested in accordance with ASTM E814 (EPCOT Standard 7-24) or UL 1479, with a minimum positive pressure differential of 0.01 inch of water. The system shall have an F rating and T rating of not less than 1 hour but not less than the required rating of the floor penetrated.

Exceptions:

1. Floor penetrations contained and located within the cavity of a wall above the floor or below the floor do not require a T rating.
2. Floor penetrations by floor drains, tub drains or shower drains contained and located within the concealed space of a horizontal assembly do not require a T rating.

707.10.4.1.2 Membrane penetrations. Penetrations of membranes that are part of a horizontal assembly shall comply with Subsection 707.10.4.1.1.1 or 707.4.1.1.2. Where floor/ceiling assemblies are required to have a fire-resistance rating, recessed fixtures shall be installed such that the required fire resistance will not be reduced.

Exceptions:

1. Membrane penetrations by steel, ferrous or copper conduits, pipes, tubes or vents, or concrete or masonry items where the annular space is protected either in accordance with Subsection 707.10.4.1.1 or to prevent the free passage of flame and the products of combustion. The aggregate area of the openings through the membrane shall not exceed 100 square inches in any 100 square feet of ceiling area in assemblies tested without penetrations.
2. Ceiling membrane penetrations of maximum 2-hour horizontal assemblies by steel electrical boxes that do not exceed 16 square inches in area, provided the aggregate area of such penetrations does not exceed 100 square inches in any 100 square feet of ceiling area, and the annular space between the ceiling membrane and the box does not exceed 1/8 inch.

3. Membrane penetrations by electrical boxes of any size or type, which have been listed as part of an opening protective material system for use in horizontal assemblies and are installed in accordance with the instructions included in the listing.
4. Membrane penetrations by listed electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the ceiling membrane and the box shall not exceed $\frac{1}{8}$ inch unless listed otherwise.
5. The annular space created by the penetration of a fire sprinkler, provided it is covered by a metal escutcheon plate.
6. Noncombustible items that are cast into concrete building elements and that do not penetrate both top and bottom surfaces of the element.
7. The ceiling membrane of 1- and 2-hour fire-resistance-rated horizontal assemblies is permitted to be interrupted with the double wood top plate of a fire-resistance-rated wall assembly, provided that all penetrating items through the double top plates are protected in accordance with Subsection 707.10.4.1.1.1 or 707.10.4.1.1.2. The fire-resistance rating of the wall shall not be less than the rating of the horizontal assembly.

707.10.4.1.3 Dissimilar materials. Noncombustible penetrating items shall not connect to combustible materials beyond the point of firestopping unless it can be demonstrated that the fire-resistance integrity of the horizontal assembly is maintained.

707.10.4.2 Nonfire-resistance-rated assemblies. Penetrations of nonfire-resistance-rated floor or floor/ceiling assemblies or the ceiling membrane of a nonfire-resistance-rated roof/ceiling assembly shall meet the requirements of Subsection 703.1(c) or shall comply with Subsection 707.10.4.2.1 or 707.10.4.2.2.

707.10.4.2.1 Noncombustible penetrating items. Noncombustible penetrating items that connect not more than five stories are permitted, provided that the annular space is filled to resist the free passage of flame and the products of combustion with an approved noncombustible material or with a fill, void or cavity material that is tested and classified for use in through-penetration firestop systems.

707.10.4.2.2 Penetrating items. Penetrating items that connect not more than two stories are permitted, provided that the annular space is filled with an approved material to resist the free passage of flame and the products of combustion.

707.10.5 Penetrations in smoke barriers. Penetrations in smoke barriers shall be protected by an approved through-penetration firestop system installed and tested in accordance with the requirements of UL 1479 for air leakage. The L rating of the system measured at 0.30 inch of water in both the ambient temperature and elevated temperature tests, shall not exceed:

1. 5.0 cfm per square foot of penetration opening for each through-penetration firestop system; or
2. A total cumulative leakage of 50 cfm for any 100 square feet of wall area, or floor area.

707.11 Fire-resistant joint systems. Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which it is installed. Fire-resistant joint systems shall be tested in accordance with Subsection 707.11.3.

Exception: Fire-resistant joint systems shall not be required for joints in all of the following locations:

1. Floors within a single dwelling unit.
2. Floors where the joint is protected by a shaft enclosure in accordance with Subsection 703.1(c).
3. Floors within atriums where the space adjacent to the atrium is included in the volume of the atrium for smoke control purposes.
4. Floors within malls.
5. Floors and ramps within open and enclosed parking garages or structures constructed in accordance with Subsection 508.5.
6. Mezzanine floors.
7. Walls that are permitted to have unprotected openings.
8. Roofs where openings are permitted.
9. Control joints not exceeding a maximum width of 0.625 inch and tested in accordance with ASTM E119 (EPCOT Standard 6-1) or UL 263.

707.11.1 Curtain wall assembly. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Subsection 707.11.4.

707.11.2 Installation. A fire-resistant joint system shall be securely installed in accordance with the listing criteria in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of fire and hot gases.

707.11.3 Fire test criteria. Fire-resistant joint systems shall be tested in accordance with the requirements of either ASTM E1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned fire-resistance rating shall be the shortest duration obtained from the two tests. When evi-

dence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the Building Official, the wall need not be subjected to tests from the opposite side.

Exception: For exterior walls with a horizontal fire separation distance greater than 5 feet, the joint system shall be required to be tested for interior fire exposure only.

707.11.4 Exterior curtain wall/floor intersection. Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E2307 to provide an F rating for a time period at least equal to the fire-resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Subsection 707.3(b).

Exception: Voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies where the vision glass extends to the finished floor level shall be permitted to be sealed with an approved material to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 (EPCOT Standard 6-1) time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water column for the time period at least equal to the fire-resistance rating of the floor assembly.

707.11.4.1 Exterior curtain wall/nonfire-resistance-rated floor assembly intersections. Voids created at the intersection of exterior curtain wall assemblies and nonfire-resistance-rated floor or floor/ceiling assemblies shall be sealed with an approved material or system to retard the interior spread of fire and hot gases between stories.

707.11.5 Spandrel wall. Height and fire-resistance requirements for curtain wall spandrels shall comply with Subsection 707.3(b). Where Subsection 707.3(b) does not require a fire-resistance-rated spandrel wall, the requirements of Subsection 707.11.4 shall still apply to the intersection between the spandrel wall and the floor.

707.11.6 Fire-resistant joint systems in smoke barriers. Fire-resistant joint systems in smoke barriers, and joints at the intersection of a horizontal smoke barrier and an exterior curtain wall, shall be tested in accordance with the requirements of UL 2079 for air leakage. The L rating of the joint system shall not exceed 5 cfm per linear foot of joint at 0.30 inch of water for both the ambient temperature and elevated temperature tests.

SECTION 708 FIRE DIVISION WALLS

708.1 Fire division walls defined. For the purpose of this Code, the terms area separation, fire wall and fire division

wall are synonymous and shall have the meaning as defined in Chapter 2 for fire division wall.

708.2 Requirements for fire division walls. Each part of a building separated by one or more fire division walls may be considered a separate building when the fire division wall meets the following requirements:

- (a) Fire division walls shall be of not less than 3-hour fire-resistive construction in buildings of all types of construction.
- (b) The total width of all openings in fire division walls shall not exceed 25 percent of the length of the wall in each story. No single opening shall exceed 120 square feet.
- (c) All openings shall be protected by an approved opening protective having a 3-hour fire-resistive rating.
- (d) Fire division walls need not extend to the outer edges of horizontal projecting elements, such as balconies, roof overhangs, canopies, marquees or architectural projections, when the exterior wall at the terminus of the area fire division wall and projecting elements above are not less than 1-hour fire-resistive construction without openings for a width equal to the depth of the projecting elements, with a minimum of 5 feet projection.
- (e) Fire division walls shall extend from the foundation to a point at least 36 inches above the roof. Alternative methods may be used as follows:
 1. Fire division walls may terminate tight against the underside of noncombustible sheathing when the roof is of at least 2-hour fire-resistive construction.
 2. Where a fire division wall separates parts of a building having different heights, such wall may terminate at a point 36 inches above the lower roof level when the exterior wall for a height of 10 feet above the lower roof is 1-hour fire-resistive construction with openings protected by a $3/4$ -hour-fixed or automatic-opening protective.
 3. As an alternative to the requirement of Paragraph 2, the fire division wall may terminate at the sheathing of the lower roof when the wall is without openings and when the roof is of at least 1-hour fire-resistive noncombustible construction for a width of at least 10 feet, measured from the wall.
- (f) See Chapter 5 for special occupancy requirements. See Chapter 6 for requirements for the types of construction. See EPCOT Standard 7-1 for regulations covering fire dampers in air ducts penetrating area separations.

708.3 Hazardous utilities.

- (a) Each building having fire division walls, or occupancy or tenant separations shall have individual feeders, switches and shutoff valves for each part of the building as required by the *EPCOT Electrical Code*, the *EPCOT Plumbing Code* and the *EPCOT Mechanical Code* unless otherwise approved by the Building Official.
- (b) Other utilities that may constitute a hazard shall be regulated by the applicable requirements of this Code and shall be subject to additional requirements as the Building Official may specify.

SECTION 709 PARTITIONS

709.1 Permanent and partial partitions.

- (a) All bearing and nonbearing partitions shall be constructed as required in Table 6.2 and shall be of materials consistent with the type of construction of the building. Partitions shall provide the fire protection required for use as exit access corridors, exit enclosures, exit passageways, horizontal exits, vertical enclosures, and tenant and occupancy separations. When partitions are required to have a fire-resistance rating and protected openings, they shall be permanently identified with signs or stenciling located above any decorative ceiling and in concealed spaces. Such identification shall be provided at least every 20 feet in a horizontal direction along the partition and shall contain words to the effect "FIRE AND SMOKE BARRIER PROTECT ALL OPENINGS" in letters 2 inches high minimum. Interior nonbearing partitions of Types I, II and IV construction may be approved fire-retardant-treated wood.
- (b) Interior-bearing partitions of combustible construction shall support not more than two floors and a roof.
- (c) Regardless of the requirements for fire-resistive protection of bearing and nonbearing, partial or full-height partitions dividing an area occupied by a single tenant and which does not establish a corridor serving an occupant load of 30 or more, may be constructed of the following materials:
 1. Noncombustible materials.
 2. One-hour fire-resistive construction.
 3. Approved fire-retardant-treated wood.
 4. Wood panels or similar light construction up to three-fourths the height of the room in which they are located. When more than three-fourths the height of the room such partitions shall have not less than the upper one-fourth of the partition of glass.
 5. Approved plastics as provided in Section 1008 and as defined in Subsection 1008.3.

709.2 Folding, portable, sliding or collapsing partitions.

Approved folding, portable, sliding or collapsing partitions without a fire-resistive rating may be used as room dividers when such partitions comply with the requirements of this Subsection.

- (a) The partitions shall not establish an exit corridor. Exits complying with the requirements of Chapter 8 shall be provided for each section or division.
- (b) All elements shall be equivalent of materials required for permanent partitions.
- (c) Interior wall finish shall comply with the requirements of EPCOT Standard 6-3 and Section 711.
- (d) Location shall be restricted by permanent tracks or guides.
- (e) Uses shall be restricted to rooms occupied by one tenant only.

- (f) Relocation shall be impossible without the use of tools.
- (g) Installation shall not violate or conflict with other provisions of this Code.

709.3 Combustible materials in concealed spaces.

Combustible materials may be installed in concealed spaces.

Exception: Combustible materials located within concealed spaces in Type I, II or IV construction must comply with the following:

1. Materials complying with Subsection 609.1.2 of the *EPCOT Mechanical Code*.
2. Class I interior finish materials.
3. Fire-retardant-treated wood used in accordance with Table 6.2 and wood used in accordance with Section 709.
4. Floor finish complying with Subsections 705.2 and 711.9.
5. Conduit or raceway systems complying with Subsection 707.10.
6. Foam plastic insulation complying with Section 717.
7. Thermal insulation materials complying with Section 1011.
8. Combustible piping within partitions or enclosed shafts installed in accordance with the provision of this Code. Combustible piping may also be used within concealed ceiling spaces when approved.

709.3.1 Combustibles in plenums. The use of combustible materials in plenums shall be restricted in accordance with the *EPCOT Mechanical Code*.

SECTION 710 VENEER

710.1 Scope. All veneer and its application shall conform to the requirements of this Code and EPCOT Standard 7-8. Wainscots not more than 4 feet high, measured above the finish floor elevation for interior veneer, may be exempted from the provisions of this Section, when approved by the Building Official.

710.2 Design. The design of veneer shall comply with the requirements of Subsection 904.2 and with the following provisions:

- (a) Veneer shall support no load other than its own weight and the vertical dead load of the veneer above.
- (b) Surfaces to which veneer is attached shall be designed to support the additional vertical and lateral loads imposed by the veneer. Consideration shall be given for differential movement of supports, including that caused by temperature changes, shrinkage, creep and deflection.
- (c) Exterior veneer shall not be attached to wood frame construction at a point more than 20 feet above the adjacent ground elevation, except when approved by the Building Official, and considering special construction designed to provide for differential settlement.

710.3 Materials.

- (a) Materials used in the application of veneer may be any material approved by the Building Official. Such material shall conform to the applicable requirements for the material as specified in Chapter 10 and EPCOT Standard 7-8.
- (b) Anchors, supports and ties shall be noncombustible and corrosion resistant.

710.4 Application. Application of veneer shall conform to the requirements of EPCOT Standard 7-8.

710.5 Definitions. For the purpose of this Section and EPCOT Standard 7-8, terms used shall have the following meanings:

- (a) **Backing.** Surface or assembly to which veneer is attached.
- (b) **Veneer.** Nonstructural facing of brick, concrete, stone, tile, metal, glass, plastic or other approved material attached to a backing for ornamentation, weather protection or insulation.
 1. **Adhered veneer.** Veneer secured and supported through adhesion to an approved bonding material applied over an approved backing.
 2. **Anchored veneer.** Veneer secured to and supported by approved mechanical fasteners attached to an approved backing.
 3. **Exterior veneer.** Veneer applied to weather-exposed surface.
 4. **Interior veneer.** Veneer applied to surfaces other than weather-exposed surfaces.

710.6 Adhered veneer.

- (a) Backing shall be continuous and may be of any material permitted by this Code. It shall have surfaces prepared to secure and support the imposed loads of the veneer. Exterior veneer, including the backing, shall provide a weather-protected covering. (For additional requirements for weather protection, see Subsection 503.10.)
- (b) The height and length of adhered veneered areas shall be unlimited, except as required to control expansion and contraction, and as limited in Subsection 710.2(c).
- (c) Veneer units shall not exceed 36 inches in the longest dimension, nor more than 720 square inches in total area and shall weigh not more than 15 pounds per square foot (psf), except as approved by the Building Official.

Exception: Veneer units weighing less than 3 psf shall not be limited in dimension or area.

710.7 Anchored veneer.

- (a) Backing may be of any material permitted by this Code. Exterior veneer, including its backing, shall provide a weather-protected covering.
- (b) Anchored veneer shall be supported on footings, foundations or other noncombustible supports. Where anchored veneer is applied more than 20 feet above the adjacent ground elevation, it shall be supported by noncombustible, corrosion-resistant structural framing

having horizontal supports spaced not more than 12 feet vertically above the 20-foot height.

- (c) Noncombustible, corrosion-resistant lintels and non-combustible supports shall be provided over all openings where the veneer unit is not self-spanning. The deflections of all structural lintels and horizontal supports required by this Subsection shall not exceed $1/500$ of the span under full load of the veneer.
- (d) The area and length of anchored veneer walls shall be unlimited, except as required to control expansion and contraction, and by Subsection 710.2(c).

**SECTION 711
INTERIOR FINISHES**

711.1 Scope. Provisions of this Section shall govern the use of materials used as interior finishes, trim and decorative materials.

711.2 Conforming materials. Materials used for wall and ceiling interior finishes shall conform to the requirements of this Section and EPCOT Standard 6-3 and 6-4.

711.3 Definitions:

- (a) **Decorative materials.** All materials applied over the building interior finish for decorative, acoustical or other effect (such as curtains, draperies, fabrics, streamers and surface coverings), and all other materials utilized for decorative effect (such as batting, cloth, cotton, hay, stalks, straw, vines, leaves, trees, moss, and similar items), including foam plastics and materials containing foam plastics. Decorative materials do not include floor coverings, ordinary window shades, interior finish and materials 0.036 inch or less in thickness applied directly to and adhered tightly to a substrate.
- (b) **Interior finish.** Interior finish includes interior wall and ceiling finish and interior floor finish.
- (c) **Interior floor finish.** The exposed floor surfaces of buildings including coverings over a finished floor or stair, including risers.
- (d) **Interior wall and ceiling finish.** The exposed interior surfaces of buildings including, but not limited to, fixed or movable walls and partitions; toilet room privacy partitions; columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or for decoration, acoustical surface insulation, structural fire resistance or similar purposes, but not including trim.
- (e) **Smoke-developed index.** A comparative measure, expressed as a dimensionless number, derived from measurements of smoke obscuration versus time for a material tested in accordance with EPCOT Standard 6-3 or 6-4.
- (f) **Trim.** Picture molds, chair rails, baseboards, handrails, door and window frames and similar decorative or protective materials used in fixed applications.

711.4 Decorative materials and trim. Decorative materials and trim shall be restricted by the combustibility and flame propagation performance criteria of NFPA 701, in accordance with Subsection 711.5.

711.5 Material testing.

- (a) Tests shall be made by an approved testing agency to establish flame spread characteristics and shall substantiate that materials, when cemented or otherwise fastened in place, will not become detached readily when subjected to room temperatures of 300°F for 25 minutes.
- (b) Flame spread characteristics of wall and ceiling finishes shall be determined by one of the following methods:
 1. The tunnel test as specified in EPCOT Standard 6-3 or 6-4.
 2. Any other nationally recognized test procedure for determining the flame spread characteristics of finish materials that will give comparable results to that specified in Paragraph (1).
- (c) Material classification based on the tunnel test shall meet the requirements of Table 7.4. All interior finish materials regulated by this Section shall be approved by the Building Official. In determining the acceptability of a material, the Building Official may consider the toxicity of the materials according to such evidence as he considers appropriate to the approval.

711.6 Application of interior finish. Interior finish materials applied to walls and ceilings shall be tested as specified in Subsection 711.3 and shall conform to the requirements of this Subsection.

- (a) When walls and ceilings are required by provisions of this Code to be of fire-resistive or noncombustible construction or fire-retardant-treated wood, the finish material shall be applied directly against the surface. Intervening spaces between furring strips shall be filled with inorganic or Class I finish materials (see Tables 7.3 and 7.4) or shall be firestopped not to exceed 8 feet in any direction.
- (b) Where walls and ceilings are required to be of fire-resistive or noncombustible construction or fire-retardant-treated wood and walls are set out or ceilings are dropped distances greater than specified in Paragraph (a), Class I finish materials (see Tables 7.3 and 7.4) shall be used, except where the finish materials are protected on both sides by an automatic sprinkler system or are attached to a noncombustible backing, or the furring strips installed as specified in Paragraph (a). Hangars and assembly members of such dropped ceilings that are below the main ceiling line shall be of noncombustible materials. The construction of each set out wall shall be of fire-resistive construction as required elsewhere in this Code. (See Subsections 705.5 and 707.9 for draftstops and firestops, respectively.)
- (c) All finish materials may be installed directly against wood decking, heavy timber, planking or to wood furring strips applied as specified in Paragraph (b).
- (d) All interior finish, other than Class I materials, less than 1/4 inch thick, shall be applied directly against a

noncombustible backing, unless the qualifying tests were made with the material suspended from the noncombustible backing.

**TABLE 7.3
FLAME SPREAD CLASSIFICATION
Material Qualified By:**

CLASS	TUNNEL TEST ^a
I	0 – 25
II	26 – 75
III	76 – 200
IV	200 – 500

a. Smoke developed index: 0 – 450.

**TABLE 7.4
MINIMUM INTERIOR FINISH CLASSIFICATION^a**

OCCUPANCY GROUP	ENCLOSED VERTICAL EXITWAYS	OTHER EXITWAYS	ROOMS OR AREAS
A-1 – A-6	I	II	III
B	I	II	III
D	I	I	I
E	I	II	III
H	I	II	III
R-1 – R-2	I	II	III
R-3	III	III	III
S	No Restrictions		

a. See Subsection 719.11.

711.7 Finishes based on occupancy.

- (a) The minimum interior flame spread classification as determined by tests shall be based on use or occupancy as set forth in Table 7.4.
- (b) Except in Group D occupancies and in enclosed vertical exitways, Class III finishes may be used as wainscoting and for tack and bulletin boards. In such applications, the wall finish shall extend not more than 48 inches above the floor and shall cover not more than 5 percent of the gross wall area of the room.
- (c) The exposed faces of structural members in buildings of Type III construction, and decking and planking, where permitted by other provisions of this Code, are exempted from flame spread requirements.

711.8 Interior trim. Material, other than foam plastic used as interior trim, shall have a minimum Class III flame spread and smoke developed index when tested in accordance with Standard 6-3 or 6-4. Combustible trim, excluding handrails and guardrails, shall not exceed 10 percent of the specific wall or ceiling area in which it is attached. Unprotected wood doors and windows may be used, except where openings are required to be fire protected.

711.9 Carpet on walls and ceilings. Carpeting and similar materials having a napped, tufted, looped or similar surface may be used as interior finish on walls and ceilings only when it has a flame spread rating of 25 or less in accordance with ASTM E84.

711.10 Floor finish.

- (a) In buildings of Type I or II construction, floor finish, if of combustible material, shall be applied directly upon the floor construction, except that a floor finish of wood, linoleum, rubber, tile or cork may be secured to a subfloor of wood. Where wood sleepers are used for laying wood floors or subfloors in such buildings, they shall be firestopped so that there will not be an open space extending under any permanent partition. Where wood sleepers are used and the space between the floor slab and the underside of the floor or subfloor is more than 2½ inches, such space shall be filled with non-combustible material so that such space is not more than 2½ inches.
- (b) Combustible insulating boards may be used for sound deadening or insulating of floors, except that in buildings required to be of Type I or II construction, such insulating boards shall not be more than ½ inch thick and cemented directly to the floor slab or secured to wood sleepers firestopped as called for in Paragraph (a) and covered with approved finish flooring.

711.11 Floor covering.

- (a) 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. Carpet-type floor coverings shall be tested as proposed for use including underlayment.
- (b) Carpet materials used on floors of exit access corridors and enclosed exits, shall satisfactorily withstand a minimum critical radiant flux of 0.22 watts per square centimeter when tested in accordance with NFPA 253.
- (c) All carpet required by this Code to meet critical radiant flux limits established by NFPA 253 shall have been tested by an approved laboratory. A copy of the test report representing the style shall be provided to the Building 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.
- (d) The carpet shall be identified by a hang tag or other suitable method as to manufacturer or supplier and style, and shall indicate the critical radiant flux level.

711.12 Combustible decorative materials. The permissible amount of decorative materials meeting the flame propagation performance criteria of NFPA 701 shall not exceed 10 percent of the specified wall or ceiling area to which it is attached.

**SECTION 712
MAXIMUM FLOOR AREAS**

712.1 Areas of buildings.

- (a) The area of buildings shall not exceed the limits set forth in Table 7.5, except as permitted in this Subsection.
- (b) Basements of one-story buildings need not be included in the total area permitted when such basement is not a story as defined in Chapter 2. The area of a basement

shall not exceed that permitted for a one-story building permitted for the type of construction and occupancy.

- (c) The area of a single floor of a multiple-story building shall not exceed the area permitted for a one-story building.
- (d) Where two or more types of construction not separated by fire walls occur in the same building, the area of the entire building shall not exceed the least area permitted based on occupancy for the types of construction used in the building.

712.2 Area increases permitted. The floor areas specified in Subsection 712.1 may be increased under the conditions specified in this Subsection. Such increases shall not exceed 100 percent, except in buildings of more than two stories housing Group I occupancies and one-story buildings housing aircraft storage hangars, and as further limited in Section 511 for aircraft repair hangars.

For the purposes of determining an increase in allowable floor area, permanent open yards include a public street, fire lane, public way, or public space providing direct access to a public street, fire lane, or public way. For the purposes of this Subsection, waterways and service courts shall not be considered to be part of a permanent open yard.

- (a) **Separation on two sides.** Where public space, streets or permanent open yards more than 20 feet wide extend along and adjoin two sides of the building, but not less than 50 percent of the perimeter of the building, floor areas may be increased at the rate of 1.25 percent for each foot by which the minimum width exceeds 20 feet. The increase shall be not more than 50 percent.
- (b) **Separation on three sides.** Where public space, streets or permanent open yards more than 20 feet wide extend along and adjoin three sides of the building, but not less than 75 percent of the perimeter of the building, floor areas may be increased at the rate 2.5 percent for each foot by which the minimum width exceeds 20 feet. The increase shall be not more than 100 percent.
- (c) **Separation on all sides.** Where public space, streets or permanent open yards more than 20 feet wide extend on all sides of the building and adjoin the entire perimeter, floor areas may be increased at the rate of 5 percent for each foot by which the minimum width exceeds 20 feet. The increase shall be not more than 100 percent.
- (d) **Automatic vents.** In one-story buildings, the area specified in Table 7.5 for Group B-1 and I occupancies may be increased 25 percent when at least 75 percent of the building and all rooms with an area more than 10,000 square feet are provided with venting systems complying with EPCOT Standard 7-9. The area increases permitted in this Subsection may be compounded with area increases permitted in other Subsections of this Section.
- (e) **Fire-retardant-treated wood.** One-story buildings of Types V and VI construction, with all structural wood members of approved fire-retardant-treated lumber, may have a 25-percent increase in the basic area.

TABLE 7.5
BASIC FLOOR AREAS AND HEIGHTS OF BUILDINGS
FOR TYPES I, II, III, IV, V and VI CONSTRUCTION^a

Occupancy Group	TYPE I			TYPE II			TYPE III			TYPE IV			TYPE V			TYPE VI		
	Number of Stores	Height (feet)	Floor (square feet)	Number of Stores	Height (feet)	Floor (square feet)	Number of Stores	Height (feet)	Floor (square feet)	Number of Stores	Height (feet)	Floor (square feet)	Number of Stores	Height (feet)	Floor (square feet)	Number of Stores	Height (feet)	Floor (square feet)
A-1	NL	NL	40,000	6	110	NP	NP	NP	NP									
A-2	NL	NL	40,000	6	110	NP	NP	NP	NP									
A-3	NL	NL	40,000	6	110	NP	NP	NP	NP									
A-4	NL	NL	80,000	6	110	NP	NP	NP	NP									
A-5	NL	NL	40,000	6	110	NP	NP	NP	NP									
A-6	NL	NL	NA	NA	NA	NP	NP	NP	NP									
A-7	NL	NL	NA	NA	NA	NP	NP	NP	NP									
A-8 ^b	NL	NL	NA	NA	NA	NP	NP	NP	NP									
A-A ^c	NL	NL	NA	NA	NA	NP	NP	NP	NP									
B-1,2	NL	NL	50,000	11	110	NP	NP	NP	NP									
B-3	NL	NL	60,000	9	110	NP	NP	NP	NP									
B-4	NL	NL	100,000	2	110	NP	NP	NP	NP									
D-1	NL	NL	20,000	3	30	NP	NP	NP	NP									
D-2	NL	NL	20,000	4	45	NP	NP	NP	NP									
3																		
E-1,2	NL	NL	60,000	5	60	NP	NP	NP	NP									
E-3	NL	NL	60,000	3	35	NP	NP	NP	NP									
H-1	6	60	16,000	3	35	NP	NP	NP	NP									
H-2	6	60	16,000	3	35	NP	NP	NP	NP									
H-3	NL	NL	30,000	3	40	NP	NP	NP	NP									
H-4	NL	NL	100,000	2	60	NP	NP	NP	NP									
I-1	NL	NL	80,000	7	85	NP	NP	NP	NP									
I-2,1-3	NL	NL	80,000	7	85	NP	NP	NP	NP									
R-1,2	NL	NL	40,000	11	110	NP	NP	NP	NP									
R-3	NL	NL	40,000	11	110	NP	NP	NP	NP									
S ^{d,e}																		

NL = Not limited
 NP = Not permitted
 NA = Not applicable
 a. See Section 712 for area increase permitted.
 b. See Section 507.
 c. See Subsection 516.2.
 d. See Appendix M.
 e. See Appendix Q.

712.3 Unlimited area.

- (a) Except in hazardous locations, the area of one-story buildings housing Group B, Group H, Division 4, and Group I occupancies shall not be limited when the building is surrounded and adjoined by public space, streets or permanent yards not less than 60 feet wide.
- (b) Buildings described in Paragraph (a) used for factories, workshops or warehouses shall be provided with automatic venting systems in accordance with the requirements of Subsections 511.2(b), 512.4(c) and Section 716. Automatic venting systems shall comply with the *EPCOT Mechanical Code* and EPCOT Standard 7-9.

**SECTION 713
MAXIMUM HEIGHT OF BUILDINGS**

713.1 Height and number of stories.

- (a) The maximum height and number of stories of every building shall depend on the use and occupancy of the building and on the type of construction, and shall not exceed the limits specified in Table 7.5, except as provided in this Section.
- (b) The height of a building shall be measured from the highest adjoining sidewalk or ground surface, provided that the height measured from the lowest adjoining surface shall not exceed the maximum height permitted for the building by more than 10 feet.
- (c) Where two or more types of construction occur in the same building, the height of the entire building shall not exceed the least height permitted based on the occupancy for the types of construction used in the building.
- (d) **Mezzanines.** There shall be not more than two mezzanine levels in a room. Clear height above or below a mezzanine floor shall be not less than 7 feet.

713.2 Height increases.

- (a) Towers, spires and steeples erected as part of a building and not used for habitation or storage shall be limited in height only by the requirements of this Code for structural design and when constructed entirely of noncombustible materials, but such structures shall extend not more than 20 feet above the height limit permitted in Table 7.5 when constructed of combustible materials.
- (b) The height of one-story aircraft hangars shall not be limited when the building is surrounded by public space, streets or permanent open yards not less in width than 1½ times the height of the building. (See Chapter 5 for special occupancy requirements.)
- (c) When a one-story automobile parking structure, enclosed or open, of Type I or II construction, or open of Type III construction, with grade entrance, is provided under a building of Group R occupancy, the number of stories to be used in determining the minimum type of construction may be measured from the floor above such parking area. The floor/ceiling assembly shall provide the occupancy separation required in Table 5.2.

**SECTION 714
SMOKE BARRIERS**

714.1 General. Smoke barriers shall comply with this Section.

714.2 Materials. Smoke barriers shall be of materials permitted by the building type of construction.

714.3 Fire-resistance rating. A 1-hour fire-resistance rating is required for smoke barriers.

714.4 Continuity. Smoke barriers shall form an effective membrane continuous from outside wall to outside wall and from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, deck or slab above, including continuity through concealed spaces, such as those found above suspended ceilings, and interstitial structural and mechanical spaces. The supporting construction shall be protected to afford the required fire-resistance rating of the wall or floor supported in buildings of other than Type IV, V or VI unprotected construction.

Exception: Smoke-barrier walls are not required in interstitial spaces where such spaces are designed and constructed with ceilings that provide resistance to the passage of fire and smoke equivalent to that provided by the smoke-barrier walls.

714.5 Openings. Openings in a smoke barrier shall be protected in accordance with Section 704.

Exception: In Group E-3, where doors are installed across corridors, a pair of opposite-swinging doors without a center mullion shall be installed having vision panels with fire-protection-rated glazing materials in fire-protection-rated frames, the area of which shall not exceed that tested. The doors shall be close fitting within operational tolerances, and shall not have undercuts in excess of ¾-inch louvers or grilles. The doors shall have head and jamb stops, astragals or rabbets at meeting edges and shall be automatic-closing by smoke detection in accordance with the *EPCOT Fire Prevention Code*. Where permitted by the door manufacturer's listing, positive-latching devices are not required.

714.6 Penetrations and joints. Penetrations of smoke barriers and joints made in or between smoke barriers, shall comply with Subsection 707.10.

714.7 Ducts and air transfer openings. Penetrations in a smoke barrier by ducts and air transfer openings shall comply with the *EPCOT Mechanical Code*.

**SECTION 715
AUTOMATIC FIRE-EXTINGUISHING SYSTEMS**

715.1 Criteria.

- (a) Fire-extinguishing systems shall be installed and maintained in operating condition in accordance with the requirements for this Section, and EPCOT Standards 7-10 through 7-17 and 7-25.
- (b) Automatic fire-extinguishing systems shall be provided with approved facilities to assure that the system is in proper operating condition. Such facilities shall be subject to review by the Chief of the Fire Department.

ment and shall include, but not be limited to, the following:

1. Electrical connections to a continuously manned central station or fire department headquarters to give notice of any closed water supply or control valve, or other condition that might interfere with operation of the system. The electrical connections shall also give notice of a flow of water in the system.
 2. Provisions for immediate alarm to the fire department in case of fire.
- (c) Hose threads used in connection with fire-extinguishing systems shall be national standard threads.
- (d) Fire-extinguishing systems, including automatic sprinkler systems, combination standpipes, fire department standpipes, wet standpipes and special systems, shall be approved. They shall also be subject to periodic tests as required by the Chief of the Fire Department.
- (e) Above-ground sprinkler piping shall be flushed prior to final acceptance.
- (f) When permitted by the Building Official, a dry-pipe system, complying with EPCOT Standard 7-10, may be installed in areas subject to freezing.
- (g) Hydrostatic test shall be performed prior to installation of sprinkler heads unless otherwise approved by the Building Official.
- (h) In buildings three or more stories in height, sprinkler systems shall be zoned separately for every floor.

➔ **715.2 Definitions.** For the purpose of this Code, the following definitions shall apply to fire-extinguishing systems and their connections:

- (a) **Automatic fire-extinguishing system.** A sprinkler, dry-powder, carbon-dioxide, halon or other system complying with EPCOT Standards 7-10, 7-11, 7-12, 7-13 and 7-16, the use of which is appropriate to the fire hazard involved.
- (b) **Automatic sprinkler system.** A fire-extinguishing system having an approved water supply with all control valves electrically supervised and in compliance with EPCOT Standard 7-10. All underground piping shall be rated a minimum 200 pounds per square inch (psi).
- (c) **Dry-pipe system.** A system employing automatic sprinklers attached to a piping system containing air under pressure.
- (d) **Fire department sprinkler connection.** A connection in an accessible location through which the fire department can pump water into a sprinkler system.
- (e) **Standpipes.**
 1. **Class I system.** A Class I system shall provide a 2½-inch hose outlet to supply water for use by the fire department and those trained in handling heavy streams.
 2. **Class II system.** A Class II system shall provide a 1½-inch hose outlet to supply water for use pri-

marily by the building occupants or by the fire department during initial response.

3. **Class III system.** A Class III system shall provide a 1½-inch hose outlet to supply water for use by building occupants and a 2½-inch hose outlet to supply a larger volume of water for use by the fire department and those trained in handling heavy streams.
4. **Combination standpipe.** An approved system designed and supplied from the automatic sprinkler system.
5. **Dry standpipe.** Not approved in the District.

715.3 Detailed requirements.

- (a) **Water supply.** Automatic sprinkler systems shall be connected to an approved water supply of adequate pressure, capacity and reliability for the requirements of the system.
- (b) **Connections.** Automatic sprinkler systems may be connected to the domestic water supply main when approved by the Building Official, and when the domestic water supply is reliable and has sufficient pressure, capacity and pipe sizing for the combined domestic and sprinkler system requirements. When connected to the domestic water supply, the connection between the public water main and the sprinkler system shall be made between the main or meter and the shutoff valve of the building with no intervening valves or connections.
- (c) **Water flow alarm.** The water flow alarm device required in Subsection 715.1(b) may be omitted when approved by the Building Official if the sprinkler system serves less than six sprinkler heads.

715.4 Where automatic sprinkler systems are required.

- (a) An automatic sprinkler system shall be required throughout every building. The system shall be installed and maintained in operating condition in accordance with EPCOT Standards 7-10 through 7-24. Automatic sprinkler systems shall be installed in the following locations as specified in this Chapter and as set forth in Subsection 503.12.
- (b) In every story and basement of all buildings.
- (c) Sprinkler protection shall be required on every floor of any enclosed exit stairway and in closets and bathrooms of Group R-1, R-2 and R-3 occupancies.

Exceptions:

1. An automatic sprinkler system shall be required for Group R-2 and R-3 occupancies, in accordance with EPCOT Standard 7-10 or 7-10A. Any Group R-3 occupancy where the total floor area of the building is less than 2,000 square feet shall be exempt.
2. Sprinklers installed within sleeping areas of Group R occupancies shall be of the listed residential type.
3. Where an area is used for storage of permanent telephone equipment, computers, transformer vaults or similar installations, fire-extinguish-

ing systems, where required, shall be of a type that the installation or storage will not be damaged. A preaction system shall also be provided in these areas for building structural protection. Sprinklers may be omitted in non-combustible vaults less than 800 square feet if a smoke detection system is installed.

4. In Group D occupancies, increases permitted by Sections 712 and 713 shall apply. In areas used by patients, an approved device for detecting products of combustion other than heat may be installed in lieu of an automatic sprinkler system, but the increases in height and area provided in Sections 712 and 713 for protection by an automatic fire-extinguishing system shall not be permitted. In jails, prisons and reformatories, the sprinkler system may be manually controlled.
5. In Group S occupancies, satellite structures shall be exempt from requirements for automatic sprinkler protection. [See Subsection 503.12(b).]
6. Open parking garages meeting the requirements of Subsection 508.5.

715.5 Fire department standpipes.

- (a) Fire department standpipes, as defined in Subsection 715.2, shall be constructed and installed as required in EPCOT Standard 7-14 and this Subsection.
- (b) All buildings of three or more stories shall be equipped with one or more fire department standpipes. The standpipes may be connected to the automatic sprinkler systems as provided in EPCOT Standard 7-10.
- (c) There shall be one fire department or combination standpipe outlet connection installed at every floor level of every required enclosed stairway or smoke-protected enclosure.
- (d) An approved, durable sign with raised letters at least 1 inch high reading “FIRE DEPARTMENT STANDPIPE” shall be permanently attached to all fire department standpipe connections.
- (e) Fire department standpipes extending from the basement to the top story shall be provided in Group A, Division 1, 2 and 3 occupancies, with an occupant load of more than 1,000; in Group B, D, E, H and I occupancies; and in Group R-1 occupancies more than three stories in height.
- (f) Fire department standpipes shall be located so that all parts of the building are within 20 feet of a nozzle attached to 100 feet of hose. In Group A, Division 1, 2 and 3 occupancies, with an occupant load of more than 1,000, outlets shall be located on each side of the rear of the auditorium and each side of the balcony.
- (g) Fire department standpipes may be supplied by the same main as the fire-extinguishing system.

- (h) Fire department standpipes shall be provided with approved monitoring systems in compliance with Subsection 715.1(b)1.

715.6 Combination standpipes.

- (a) Combination standpipes, as defined in Subsection 715.2, shall be constructed and installed as required in EPCOT Standard 7-14 and this Subsection.
- (b) When a combination standpipe system is installed in accordance with this Subsection, a separate fire department standpipe system need not be installed. One combination standpipe shall be installed for every required stairway or smoke-protected enclosure that extends from the ground floor to the roof in all buildings four or more stories in height.
- (c) Combination standpipe systems outlets may be outside the stair enclosure but shall be immediately adjacent thereto. When a smoke-protected enclosure is provided, the standpipe connection shall be in the vestibule, except as otherwise approved by the Building Official.
- (d) In buildings where more than one combination standpipe system is installed, the system shall be cross connected at the bottom.
- (e) Water supply and construction shall be as required in EPCOT Standard 7-14.
- (f) An approved durable sign with raised letters at least 1 inch high reading “COMBINATION STANDPIPE” shall be permanently attached to all fire department standpipe connections.

715.7 Fire protection of buildings under construction.

- (a) During construction of a building and until the permanent fire-extinguishing system is in service, fire protection shall be provided in accordance with the requirements set forth in this Subsection, Appendix F, EPCOT Standard 7-14 and the *EPCOT Fire Prevention Code*.
- (b) In buildings exceeding three stories, not less than one wet standpipe shall be installed for use of the fire department during construction of the building. When any point in a building shall be more than 100 feet from the standpipe outlet, additional standpipes shall be provided.
- (c) Standpipes of not less than 4 inches shall be installed when the construction has progressed above the third-floor level or 50 feet above grade, whichever is reached first.
- (d) Standpipes shall be equipped with 2½-inch siamese fire department inlet connections at locations accessible to fire department pumping apparatus and serving a stairway that is usable during construction. Standpipe systems shall be extended as construction progresses to within one floor of the highest point where secured decking or flooring has been constructed.
- (e) A 2½-inch valved hose outlet reduced to a 1½-inch hose outlet shall be installed at each floor conforming to the requirements of EPCOT Standard 7-14.

- (f) Free access from the street to fire hydrants, and to outside connections for standpipes, sprinklers or other fire-extinguishing equipment, whether permanent or temporary, shall be provided and maintained at all times. During building operations, free access to permanent, temporary or portable first aid fire equipment, shall be maintained at all times. During construction, when combustibles are brought on to the site in such quantities as deemed hazardous by the Fire Official, access roads and a suitable temporary supply of water acceptable to the fire department shall be provided and maintained.
- (g) All premises, where buildings or portions of buildings other than dwellings are located more than 150 feet from a public street providing access to such premises, shall be provided with approved fire hydrants connected to a water system capable of supplying the fire flow required by the Building Official. The location and number of such hydrants shall be as designated by the Fire Official.
- (h) Each hose outlet shall be equipped with 100 feet of rubber-lined hose and an adjustable nozzle. Hose shall be stored in an approved rack and be preconnected, ready for use at all times during construction. The rack shall be provided with a sign reading: "FIRE HOSE FOR EMERGENCY USE ONLY."
- (i) It shall be unlawful to use, tamper with or attach any type of a device to a fire department standpipe for other than emergency fire-fighting purposes.
- (j) Temporary standpipes may be installed in lieu of permanent standpipes during construction. Temporary standpipes shall remain in service until the permanent system is in service.
- (k) When construction height requires the installation of a fire pump, a fire pump equipped with automatic starting equipment shall be installed to maintain a minimum supply of 75 gallons of water per minute at 50 psi at each standpipe location at all times during construction.

**SECTION 716
SMOKE AND HEAT VENTING**

716.1 Where required.

- (a) Smoke and heat vents shall be installed in accordance with the requirements of EPCOT Standard 7-9 and this Section. Where there is a conflict between this Section and Standard, the requirements of this Section shall apply. Smoke and heat vents shall be located as follows:
 1. In Group B and I occupancies, more than 50,000 square feet in a single floor area.
 2. In Group H occupancies, more than 15,000 square feet in single floor area.
- (b) Smoke and heat vents shall be installed in buildings housing mixed occupancies as required for the specific occupancy being considered.

716.2 Types of vents. Vents shall be fixed in the open position or shall open manually. Vents shall be located at or near the highest elevation of the ceiling, no lower than the upper one-third of the smoke curtain. Where plain glass is used, protection to occupants from glass breakage shall be provided and shall comply with Section 706. Vents shall not be located within 20 feet of the adjoining property line.

716.3 Releasing devices. Manual and/or remote control shall be provided as required by the Building Official.

716.4 Size and spacing of vents.

- (a) The effective venting area shall be the minimum cross-sectional area through which the hot gases pass to the atmosphere, and shall not be less than 16 square feet, with no dimensions less than 2 feet.
- (b) The maximum center-to-center spacing of vents in the building shall be:
 1. In Group B and I occupancies, 120 feet.
 2. In Group H occupancies, 100 feet.
- (c) Ratios of effective area of vent openings to floor area of the occupancy shall be:
 1. In Group B and I occupancies, 1 to 100.
 2. In Group H occupancies, 1 to 50.

**SECTION 717
FOAM PLASTIC**

717.1 General.

- (a) Use of foam plastic shall comply with the smoke density and toxicity requirements of Section 711.

717.2 Specific requirements. The following requirements shall apply to all uses of foam plastics in or on the walls, ceilings or both, unless specifically approved. Such approval shall be based on the acceptable diversified tests such as, but not limited to, tunnel tests conducted in accordance with EPCOT Standard 6-3, full-scale corner tests and an ignition temperature as set forth in EPCOT Standard 7-18.

- (a) Foam plastics having a flame spread classification of 75 or less may be used in the following locations:
 1. Within the cavity of a masonry or concrete wall.
 2. On the room side surface of conforming walls or ceilings, provided the foam plastic is fully protected from the interior of the building by a thermal barrier of 1/2-inch gypsum wallboard or other approved material having a finish rating of not less than 15 minutes as determined by EPCOT Standard 6-1. Thermal barriers shall be installed in a manner that will assure they will remain in place for 15 minutes.
 3. Within the wall cavity of combustible nonfire-resistive wall construction provided the protection is applied as described in Paragraph (b).
 4. Within the cavity of walls classified as combustible fire-resistive construction provided fire tests are conducted in accordance with EPCOT Standard 6-1 and the protection from the interior of

the building is at least equivalent to that required in Paragraph (b).

- (b) Foam plastic insulation having a flame spread classification of 75 or less when tested in a thickness of 4 inches may be used in thicknesses up to 10 inches for use in cold-storage rooms, food processing rooms, ice plant and similar rooms when the room is protected with automatic sprinklers and the insulation is covered with 1/2-inch Portland cement, plaster or other approved material having a finish rating of not less than 15 minutes as determined by EPCOT Standard 6-1. Thermal barriers shall be installed in a manner that will assure they remain in place for 15 minutes.
- (c) Foam plastics insulation on walls having a flame spread classification of 25 or less may be used in a thickness of not more than 4 inches in or on walls when the foam plastic is covered by a thickness not less than 0.032-inch aluminum or 26-gauge galvanized sheet steel and the insulated area is protected with automatic sprinklers. Such walls shall not be used where noncombustible or fire-resistive construction is required.
- (d) Foam plastics may be used as a roof covering if the foam plastic is part of a Class A, B or C roofing assembly.
- (e) Agricultural buildings used exclusively for the storage of farm produce or for the housing of livestock or poultry when such buildings have but intermittent and limited occupancy by humans, may employ the use of unprotected foam plastics having a flame spread classification of 25 or less.

**SECTION 718
SPECIAL PROVISIONS—HIGH-RISE
STRUCTURES**

718.1 Application. These additional requirements shall apply to all buildings having a floor level used for human occupancy located more than 75 feet above the lowest level of fire department vehicle access.

718.2 Structural integrity of exit enclosures and elevator hoistway enclosures. For high-rise buildings that are Risk Category III, IV or more than 420 feet in building height, exit enclosures and elevator hoistway enclosures shall comply with Subsections 718.2.1 through 718.2.4.

718.2.1 Wall assembly. The wall assemblies making up the exit enclosures and elevator hoistway enclosures shall meet or exceed Soft Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.

718.2.2 Wall assembly materials. The face of the wall assemblies making up the exit enclosures and elevator hoistway enclosures that are not exposed to the interior of the exit enclosure or elevator hoistway enclosure shall be constructed in accordance with one of the following methods:

- (a) The wall assembly shall incorporate not less than two layers of impact-resistant construction board each of which meets or exceeds Hard Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.

- (b) The wall assembly shall incorporate not less than one layer of impact-resistant construction material that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.
- (c) The wall assembly incorporates multiple layers of any material, tested in tandem, that meet or exceed Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.

718.2.3 Concrete and masonry walls. Concrete or masonry walls shall be deemed to satisfy the requirements of Subsections 718.2.1 and 718.2.2.

718.2.4 Other wall assemblies. Any other wall assembly that provides impact resistance equivalent to that required by Subsections 718.2.1 and 718.2.2 for Hard Body Impact Classification Level 3, as measured by the test method described in ASTM C1629/C1629M, shall be permitted.

718.3 Sprayed fire-resistant materials (SFRM). The bond strength of the SFRM installed throughout the building shall be in accordance with Table 7.7.

**TABLE 7.7
MINIMUM BOND STRENGTH**

HEIGHT OF BUILDING ^a	SFRM MINIMUM BOND STRENGTH
Up to 420 feet	430 psf
Greater than 420 feet	1,000 psf

a. Above the lowest level of fire department vehicle access.

718.4 Number of sprinkler risers and system design. Each sprinkler system zone in buildings that are more than 420 feet in building height shall be supplied by a minimum of two risers. Each riser shall supply sprinklers on alternate floors. If more than two risers are provided for a zone, sprinklers on adjacent floors shall not be supplied from the same riser.

718.4.1 Riser location. Sprinkler risers shall be placed in exit enclosures that are a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the building measured in a straight line between exit doors or exit access doorways. Interlocking or scissor stairs shall be counted as one exit stairway.

718.5 Fire pump room. Fire pump units serving high-rise buildings shall be protected from surrounding occupancies by a minimum of 2-hour fire-rated construction or physically separated from the protected building by a minimum of 50 feet.

718.6 Water supply to required fire pumps. Required fire pumps shall be supplied by connections to a minimum of two water mains located in different streets. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.

Exception: Two connections to the same main shall be permitted provided the main is valved such that an interruption can be isolated so that the water supply will con-

tinue without interruption through at least one of the connections.

718.7 Smoke detection systems.

(a) At least one approved smoke detector suitable for the intended use shall be installed in:

1. Every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room.
2. Each elevator lobby at each floor, and each detector shall comply with the provisions of EPCOT Standard 5-1.
3. The main return and exhaust air plenum of each air-conditioning system serving more than one story and shall be located in a serviceable area downstream of the last duct inlet.
4. Each connection to a vertical duct or riser serving two or more stories from return ducts or plenums of heating, ventilating and air-conditioning systems, except that in Group R occupancies, an approved smoke detector may be used in each return air riser carrying not more than 5,000 cubic feet per minute (cfm) and serving not more than 10 air inlet openings.

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

718.8 Alarm and communication systems. Three communication systems shall be provided as follows:

(a) **Voice alarm system.**

1. The operation of any smoke detector, sprinkler, water flow device or manual fire alarm system, required by this Section, shall automatically activate a voice alarm system. The voice alarm system shall provide a predetermined message on a selective basis to the area where the alarm originated.
2. The voice alarm shall provide information and give direction to the occupants.
3. The central control station shall contain controls for the voice alarm system so that selective or general voice alarm may be manually initiated.
4. The system shall be electronically supervised continuously against component failure of the audiopath, including amplifiers, speaker wiring, switches and electrical contacts, and shall detect opens and shorts that might impair the function of the system.
5. Activation of the system shall automatically sound an alert signal to the desired areas followed by the voice instructions giving appropriate information.
6. The acceptable level is 15 decibels above the ambient sound level measured 5 feet above the floor in the occupied area.

7. 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.

8. Visual and audible alarms shall be installed and so located as to be heard or seen by all occupants in every occupied space within the building. Visual alarms are required in hallways, lobbies, restrooms, and any other general usage and common use areas. (See the *EPCOT Accessibility Code for Building Construction* for additional requirements.)

(b) **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:

1. Elevators.
2. Elevator lobbies.
3. Corridors.
4. Exit stairways.
5. Rooms and tenant spaces exceeding 1,000 square feet in area.
6. Dwelling units in apartment houses.
7. Hotel guest rooms or suites.

(c) **Fire Department communication system.**

1. 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, entry to enclosed exit stairway and in corridors. The fire department communications system shall be connected to an approved emergency service, which operates continuously.
2. The alarm and communications systems shall be designed and installed such that damage to any terminal unit or speaker will not render more than one zone of the system inoperative.
3. The voice alarm and public address system may be a combined system. When approved, the fire department communications system may be combined with the voice alarm system and the public address system.

718.9 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:

- (a) The voice alarm and public address system panels.
- (b) The fire department communications panel.
- (c) Fire detection and alarm system annunciator panels and firefighter smoke control panel.
- (d) Status indicators showing location of elevators in the hoistways.
- (e) Status indicators and controls for air-handling systems.
- (f) Sprinkler valve and water-flow-detector display panels.

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- (g) Emergency power, light and emergency system controls and status indicators.
- (h) A telephone for fire department use with controlled access to the public telephone system.
- (i) Controls for simultaneously unlocking all locked stairway doors.
- (j) The Central Control Station shall be separated from the building by 1-hour fire resistance rated construction.

718.10 Smoke control. Mechanical ventilation for the removal of products of combustion shall be provided in every story and shall consist of one of the following:

- (a) The mechanical air-handling equipment shall be designed to accomplish smoke removal. Under fire conditions, the return and exhaust air shall be moved directly to the outside without recirculation to other sections of the building. The supply fans shall provide 100 percent outside air. The area involved shall have a minimum of one air change every 10 minutes to meet this requirement.
- (b) A zone-based active smoke control system shall be provided in accordance with Section 720.
- (c) Any other approved design that will produce equivalent results and is acceptable to the Building Official.

718.11 Fire alarm notification zones. Each floor shall be zoned separately. If the floor area exceeds 22,500 square feet, additional zoning shall be provided. The length of any zone shall not exceed 200 feet in any direction. Zoning indicator panels and controls shall be located as approved by the Fire Department. Annunciators shall lock in until the system is reset.

718.12 Standby power. A standby power system complying with the *EPCOT Electrical Code* shall be provided for standby power loads specified in Subsection 718.12.2.

718.12.1 Special requirements for standby power systems. If the standby system is a generator set inside a building, the system shall be located in a separate room enclosed with 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both. System supervision with manual start and transfer features shall be provided at the fire command center.

718.12.2 Standby power loads. The following are classified as standby power loads:

1. Power and lighting for the fire command center required by Subsection 718.8.
2. Standby power shall be provided for elevators in accordance with EPCOT Standard 5-1.
3. Jockey pumps and compressors for dry pipe and pre-action automatic sprinkler systems.

718.13 Emergency power systems. An emergency power system complying with the *EPCOT Electrical Code* shall be

provided for emergency power loads specified in Subsection 718.13.1.

718.13.1 Emergency power loads. The following are classified as emergency power loads.

1. Exit signs and means of egress illumination required by the *EPCOT Building Code*.
2. Elevator car lighting.
3. Ventilation and automatic fire detection equipment for smokeproof enclosures.
4. Smoke control systems.
5. Emergency voice/alarm communications systems.
6. Automatic fire detection systems.
7. Fire alarm systems.
8. Electrically powered fire pumps.

718.14 Means of egress and evacuation. The means of egress in high-rise buildings shall comply with Subsections 718.14.1 through 718.14.5.

718.14.1 Remoteness of exit stairway enclosures. The required exit stairway enclosures shall be separated by a distance not less than 30 feet or not less than one-fourth of the length of the maximum overall diagonal dimension of the building or area to be served, whichever is less. The distance shall be measured in a straight line between the nearest points of the exit stairway enclosures. In buildings with three or more exit stairway enclosures, at least two of the exit stairway enclosures shall comply with this Section. Interlocking or scissor stairs shall be counted as one exit stairway.

718.14.2 Additional exit stairway. For buildings other than Group R that are more than 420 feet in building height, one additional exit stairway meeting the requirements of Sections 806 and 809 shall be provided in addition to the minimum number of exits required by Subsection 803.1. The total width of any combination of remaining exit stairways with one exit stairway removed shall not be less than the total width required by Subsection 803.2. Scissor stairs shall not be considered the additional exit stairway required by this Section.

718.14.3 Stairway door operation. Stairway doors other than the exit discharge doors shall be permitted to be locked from the stairway side. Stairway doors that are locked from the stairway side shall be capable of being unlocked simultaneously without unlatching upon a signal from the fire command center.

718.14.3.1 Stairway communication system. A telephone or other two-way communications system connected to an approved constantly attended station shall be provided at not less than every fifth floor in each stairway where the doors to the stairway are locked.

718.14.4 Smokeproof exit enclosures. Every required level exit stairway serving floors more than 75 feet above the lowest level of fire department vehicle access shall comply with Subsection 720.20.

718.14.5 Luminous egress path markings. Luminous egress path markings shall be installed in accordance with Subsection 718.14.5.1 through 718.14.5.11.

718.14.5.1 Exit stair treads. Exit stair treads shall incorporate a marking stripe that is applied as a paint/coating or be a material that is integral with the nosing of each step. The marking stripe shall be installed along the horizontal leading edge of the step and shall extend the full width of the step. The marking stripe shall also meet the following requirements:

1. The marking stripe shall be not more than $\frac{1}{2}$ inch from the leading edge of each step and shall not overlap the leading edge of the step by more than $\frac{1}{2}$ inch down the vertical face of the step.
2. The marking stripe shall have a minimum horizontal width of 1 inch and a maximum width of 2 inches.
3. The dimensions and placement of the marking stripe shall be uniform and consistent on each step throughout the exit enclosure.
4. Surface-applied marking stripes using adhesive-backed tapes shall not be used.

718.14.5.2 Exit stair landings. The leading edge of exit stair landings shall be marked with a solid and continuous marking stripe consistent with the dimensional requirements for stair treads and shall be the same length as, and consistent with, the stripes on the steps.

718.14.5.3 Exit stair handrails. All handrails and handrail extensions shall be marked with a solid and continuous marking stripe and meet the following requirements:

1. The marking stripe shall be applied to the upper surface of the handrail or be a material integral with the upper surface of the handrail for the entire length of the handrail, including extensions.
2. The marking stripe shall have a minimum horizontal width of 1 inch.
3. The dimensions and placement of the marking stripe shall be uniform and consistent on each handrail throughout the exit enclosure.

718.14.5.4 Perimeter demarcation marking. Stair landings, exit passageways, and other parts of the floor areas within the exit enclosure shall be provided with a solid and continuous perimeter demarcation marking stripe on the floor. The marking stripe shall also meet the following requirements:

1. The marking stripe shall have a minimum horizontal width of 1 inch and a maximum width of 2 inches, with interruptions not exceeding 4 inches.
2. The marking stripe shall be applied within 2 inches of the wall.
3. The marking stripe shall continue in front of all door openings swinging into the exit enclosure. However, the marking stripe shall not be applied

in front of door openings discharging from the exit enclosure.

4. The dimensions and placement of the perimeter demarcation marking stripe shall be uniform and consistent throughout the exit enclosure.
5. Surface-applied marking stripes using adhesive-backed tapes shall not be used.

718.14.5.5 Obstacles. Obstacles that are in the exit enclosure at or below $6\frac{1}{2}$ feet in height, and that project more than 4 inches into the egress path, shall be identified with markings not less than 1 inch in horizontal width comprised of a pattern of alternating equal bands of luminescent material and black; and with the alternating bands not more than 2 inches in horizontal width and angled at 45 degrees.

718.14.5.6 Doors serving exit enclosure. All doors serving the exit enclosure that swing out from the enclosure in the direction of egress travel shall be provided with a marking stripe on the top and sides of the door(s) frame(s). The marking stripe shall also meet the following requirements:

1. The marking stripe shall have a minimum horizontal width of 1 inch and a maximum width of 2 inches.
2. Gaps shall be permitted in the continuity of door frame markings where a line is fitted into a corner or bend, but shall be as small as practicable, and in no case shall gaps be greater than 1 inch.
3. Where the door molding does not provide enough flat surface on which to locate the marking stripe, the marking stripe shall be located on the wall surrounding the frame.
4. The dimensions and placement of the marking stripe shall be uniform and consistent on all doors in the exit enclosure.

718.14.5.7 Door hardware marking. The door hardware for the doors serving the exit enclosure that swing out from the enclosure in the direction of egress travel shall be provided with a marking stripe.

The marking stripe shall also meet the following requirements:

1. The door hardware necessary to release the latch shall be outlined with a marking stripe having a minimum horizontal width of 1 inch.
2. Where panic hardware is installed, the following criteria shall be met:
 - (a) The marking stripe shall have a minimum horizontal width of 1 inch and be applied to the entire length of the actuating bar or touch pad.
 - (b) The placement of the marking stripe shall not interfere with the viewing of any instructions on the actuating bar or touch pad.

718.14.5.8 Emergency exit symbol. An emergency exit symbol with a luminescent background shall be applied on all doors serving the exit enclosure that swing out from the enclosure in the direction of egress travel. The emergency exit symbol shall also meet the following requirements:

1. The emergency exit symbol shall meet the requirements of NFPA 170, *Standard for Fire Safety and Emergency Symbols*.
2. The emergency exit symbol applied on the door shall be not higher than 18 inches above the finished floor.

718.14.5.9 Uniformity. Placement and dimensions of the marking stripes shall be consistent and uniform throughout the same exit enclosure.

718.14.5.10 Materials. Exit stair path markings shall be made of any material, including paint, provided that an electrical charge is not required to maintain the required luminescence. Such materials shall include, but shall not be limited to, self-luminous materials and photo luminescent materials. Materials shall comply with one of the following:

1. ASTM E2073, *Standard Test Method for Photopic Luminance of Photo luminescent (Phosphorescent) Markings*, except that the charging source shall be 1 footcandle of fluorescent illumination for 60 minutes, and the minimum luminance shall be 5 millicandelas per square meter after 90 minutes.
2. UL 1994, *Standard for Luminous Egress Path Marking Systems*.
3. An alternate standard deemed equivalent and approved by the Building Official.

718.14.5.11 Exit stair illumination. Exit enclosures where photo luminescent materials are installed shall be continuously illuminated for at least 60 minutes prior to periods when the building is occupied. Lighting control devices that automatically turn exit enclosure lighting on and off, based on occupancy, shall not be installed.

718.15 Elevators. Elevator installation and operation in high-rise buildings shall comply with EPCOT Standard 5-1 and Subsections 718.14.1 and 718.14.2.

718.15.1 Fire service access elevator. In buildings with an occupied floor more than 120 feet above the lowest level of fire department vehicle access, a minimum of two fire service access elevators shall be provided in accordance with EPCOT Standard 5-1. Each fire service elevator shall have a capacity of not less than 3,500 pounds.

718.15.2 Occupant evacuation elevators. Reserved.

718.16 Acceptance tests. Upon completion of a fire alarm system, the installation shall be subjected to a performance test to demonstrate its efficiency of operation.

SECTION 719 ATRIUMS

719.1 General. Vertical openings through two or more floor levels may be unenclosed in all buildings other than Group H occupancies when meeting the requirements of this Section. Stair enclosures, utility chases, elevator hoistways and escalators shall not be classified as an atrium.

719.2 Use. The floor of the atrium shall not be used for other than low fire hazard uses and only approved materials and decorations may be used in the atrium space.

719.3 Automatic sprinkler protection. An approved automatic sprinkler system shall be installed throughout the entire building.

When the ceiling of the atrium is more than 55 feet above the floor, sprinkler protection at the ceiling of the atrium may be omitted when approved by the Building Official.

719.4 Smoke control. A smoke control system, complying with Section 720, shall be designed to control the migration of products of combustion in the atrium space.

Exception: Smoke control is not required for atriums that connect only two stories.

719.5 Enclosure of atriums. Atrium spaces shall be separated from adjacent spaces by 1-hour fire-resistive construction.

Exceptions:

1. A glass wall forming a smoke partition where automatic sprinklers are spaced 6 feet or less along both sides of the separation wall, or on the room side only if there is not a walkway on the atrium side, and between 4 inches and 12 inches away from the glass and designed so that the entire surface of the glass is wet upon activation of the sprinkler system without obstruction. The glass shall be installed in a gasketed frame so that the framing system deflects without breaking (loading) the glass before the sprinkler system operates. Where glass doors are provided in the glass wall, they shall be either self-closing or automatic-closing.
2. A glass-block wall assembly in accordance with EPCOT Standard 1006-2.301.6 and having a $3/4$ -hour fire protection rating.
3. The adjacent spaces of any three floors of the atrium shall not be required to be separated from the atrium where such spaces are accounted for in the design of the smoke control system.

719.6 Smoke detectors. In addition to such smoke detection as may be required by the *EPCOT Mechanical Code*, smoke detectors shall be provided at the ceiling of the atrium and on the underside edge of portion of the floor area projecting into the atrium space. Detectors shall be located in accordance with their listing. The actuation of any one detector shall cause an alarm to be sounded at a constantly manned location.

719.7 Standby power. All equipment required to provide smoke control shall be connected to a standby power system.

719.8 Smoke control in other than the atrium. When the building containing an atrium is provided with an air-conditioning system, that system shall be so designated as to exhaust smoke from the occupied space as would be required for a high-rise building and shall operate without interruption.

719.9 Acceptance of smoke control system. Before the Certificate of Occupancy is issued, the smoke control system shall be tested by the Department of Building and Safety and the Fire Service to show compliance with the requirements of this Section.

719.10 Inspections. The smoke removal and control systems shall be tested annually by the Department of Building and Safety and the Fire Service, and such inspections shall have a log of the tests and shall be kept by the inspection agency.

719.11 Interior finish. The interior finish of walls and ceilings of the atrium shall not exceed Class II. (See Table 7.4.)

SECTION 720 SMOKE CONTROL SYSTEMS

720.1 Scope and purpose. This Section applies to mechanical or passive smoke control systems when they are required by other provisions of this Code. The purpose of this Section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this Section serve a different purpose than the smoke- and heat-venting provisions found in Section 716. Mechanical smoke control systems shall not be considered exhaust systems under the *EPCOT Mechanical Code*.

720.2 General design requirements. Buildings, structures or parts thereof required by this Code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 720 and the generally accepted and well-established principles of engineering relevant to the design. The construction documents shall include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions.

720.2.1 Smoke control in Group B and R high-rise buildings. The smoke control system shall prevent the migration of smoke from the floor or smoke zone of fire incidence to adjacent smoke zones and stories by pressure differential. The floor or zone of incident shall be exhausted to produce no less than a negative 0.05 inch water column with respect to the adjacent smoke zones and floors above and below.

Exception: Smoke zones on lower floor levels not used for sleeping may be protected by passive or other approved smoke control methods.

720.3 Special inspection and test requirements. In addition to the ordinary inspection and test requirements which buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 720 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the construction documents shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this Section shall be conducted under the same terms in Subsection 306.5.

720.4 Analysis. A rational analysis supporting the types of smoke control systems to be employed, their methods of operation, the systems supporting them and the methods of construction to be utilized shall accompany the submitted construction documents and shall include, but not be limited to, the items indicated in Subsections 720.4.1 through 720.4.6.

720.4.1 Stack effect. The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities. In determining the maximum probable stack effect, altitude, elevation, weather history and interior temperatures shall be used.

720.4.2 Temperature effect of fire. Buoyancy and expansion caused by the design fire in accordance with Subsection 720.9 shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system's capabilities.

720.4.3 Wind effect. The design shall consider the adverse effects of wind. Such consideration shall be consistent with the wind-loading provisions of Chapter 9.

720.4.4 HVAC systems. The design shall consider the effects of the heating, ventilating and air-conditioning (HVAC) systems on both smoke and fire transport. The analysis shall include all permutations of systems status. The design shall consider the effects of the fire on the HVAC systems.

720.4.5 Climate. The design shall consider the effects of low temperatures on systems, property and occupants. Air inlets and exhausts shall be located so as to prevent snow or ice blockage.

720.4.6 Duration of operation. All portions of active or passive smoke control systems shall be capable of continued operation after detection of the fire event for a period of not less than either 20 minutes or 1.5 times the calculated egress time, whichever is greater.

720.5 Smoke barrier construction. Smoke barriers shall comply with Section 714 and shall be constructed and sealed to limit leakage areas exclusive of protected openings. The maximum allowable leakage area shall be the aggregate area calculated using the following leakage area ratios:

1. Walls: $A/A_w = 0.00100$

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- 2. Exit enclosures: $A/A_w = 0.00035$
- 3. All other shafts: $A/A_w = 0.00150$
- 4. Floors and roofs: $A/A_F = 0.00050$

where:

A = Total leakage area, square feet.

A_F = Unit floor or roof area of barrier, square feet.

A_w = Unit wall area of barrier, square feet.

The leakage area ratios shown do not include openings due to doors, operable windows or similar gaps. These shall be included in calculating the total leakage area.

720.5.1 Leakage area. The total leakage area of the barrier is the product of the smoke barrier gross area multiplied by the allowable leakage area ratio, plus the area of other openings such as gaps and operable windows. Compliance shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems. Passive smoke control systems tested using other approved means such as door fan testing shall be as approved by the Building Official.

720.5.2 Opening protection. Openings in smoke barriers shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by fire door assemblies complying with Subsection 704.5.

Exceptions:

1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke detectors listed for releasing service installed in accordance with Section 1418 of the *EPCOT Fire Prevention Code*.
2. Fixed openings between smoke zones that are protected utilizing the airflow method.
3. In Group E-3, where such doors are installed across corridors, a pair of opposite-swinging doors without a center mullion shall be installed having vision panels with fire protection-rated glazing materials in fire protection-rated frames, the area of which shall not exceed that tested. The doors shall be close-fitting within operational tolerances and shall not have undercuts, louvers or grilles. The doors shall have head and jamb stops, astragals or rabbets at meeting edges and shall be automatic-closing by smoke detection in accordance with Subsection 704.3(d). Positive-latching devices are not required.
4. Group D-1.
5. Openings between smoke zones with clear ceiling heights of 14 feet or greater and bank-down capacity of greater than 20 minutes as determined by the design fire size.

720.5.2.1 Ducts and air transfer openings. Ducts and air transfer openings are required to be protected with a

minimum Class II, 250°F smoke damper complying with Subsection 609.3 of the *EPCOT Mechanical Code*.

720.6 Pressurization method. The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.

720.6.1 Minimum pressure difference. The minimum pressure difference across a smoke barrier shall be 0.05-inch water gage (in fully sprinklered buildings).

720.6.2 Maximum pressure difference. The maximum air pressure difference across a smoke barrier shall be determined by required door-opening or closing forces. The actual force required to open exit doors when the system is in the smoke control mode shall be in accordance with Subsection 804.2(c). Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set a side-hinged, swinging door in motion shall be determined by:

$$F = F_{dc} + K(WA\Delta P)/2(W - d) \quad \text{(Equation 9-1)}$$

where:

A = Door area, square feet.

d = Distance from door handle to latch edge of door, feet.

F = Total door opening force, pounds.

F_{dc} = Force required to overcome closing device, pounds.

K = Coefficient 5.2.

W = Door width, feet.

ΔP = Design pressure difference, inches of water.

720.7 Airflow design method. When approved by the Building Official, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design airflow shall be in accordance with this Section. Airflow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to prevent flow reversal from turbulent effects.

720.7.1 Velocity. The minimum average velocity through a fixed opening shall not be less than:

$$v = 217.2 [h (T_f - T_o)/(T_f + 460)]^{1/2} \quad \text{(Equation 9-2)}$$

For SI: $v = 119.9 [h (T_f - T_o)/T_f]^{1/2}$

where:

h = Height of opening, feet.

T_f = Temperature of smoke, °F.

T_o = Temperature of ambient air, °F.

v = Air velocity, feet per minute.

720.7.2 Prohibited conditions. This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the

smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. In no case shall airflow toward the fire exceed 200 feet per minute. Where the formula in Subsection 720.7.1 requires airflow to exceed this limit, the airflow method shall not be used.

720.8 Exhaust method. When approved by the Building Official, mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. Smoke control systems using the exhaust method shall be designed in accordance with NFPA 92B.

720.8.1 Smoke layer. The height of the lowest horizontal surface of the smoke layer interface shall be maintained at least 6 feet above any walking surface that forms a portion of a required egress system within the smoke zone.

720.9 Design fire. The design fire shall be based on a rational analysis performed by the registered design professional and approved by the Building Official. The design fire shall be based on the analysis in accordance with Subsection 720.4 and this Section.

720.9.1 Factors considered. The engineering analysis shall include the characteristics of the fuel, fuel load, effects included by the fire and whether the fire is likely to be steady or unsteady.

720.9.2 Separation distance. Determination of the design fire shall include consideration of the type of fuel, fuel spacing and configuration.

720.9.3 Heat-release assumptions. The analysis shall make use of best available data from approved sources and shall not be based on excessively stringent limitations of combustible material.

720.9.4 Sprinkler effectiveness assumptions. A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.

720.10 Equipment. Equipment including, but not limited to, fans, ducts, automatic dampers and balance dampers, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates and as approved by the Fire Official.

720.10.1 Exhaust fans. Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed by:

$$T_s = (Q_c/mc) + (T_a) \quad \text{(Equation 9-3)}$$

where:

c = Specific heat of smoke at smoke layer temperature, Btu/lb °F.

m = Exhaust rate, pounds per second.

Q_c = Convective heat output of fire, Btu/s.

T_a = Ambient temperature, °F.

T_s = Smoke temperature, °F.

Exception: Reduced T_s , as calculated based on the assurance of adequate dilution air.

720.10.2 Ducts. Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Subsection 720.10.1. Ducts shall be constructed and supported in accordance with the *EPCOT Mechanical Code*. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports.

Exception: Flexible connections (for the purpose of vibration isolation) complying with the *EPCOT Mechanical Code*, that are constructed of approved fire-resistance-rated materials.

720.10.3 Equipment, inlets and outlets. Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

720.10.4 Automatic dampers. Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be listed and conform to the requirements of approved, recognized standards.

720.10.5 Fans. In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty, with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 9. Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.

720.11 Power systems. The smoke control system shall be supplied with two sources of power. Primary power shall be from the normal building power systems. Secondary power shall be from an approved emergency source complying with the *EPCOT Electrical Code*. The emergency source and its transfer switches shall be separate from the normal power transformers and switch gears and, when installed inside the building, ventilated directly to and from the exterior. When installed inside a building, the emergency power source and transfer switch shall be installed in a room enclosed with not less than 2-hour fire-resistance-rated construction in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both. The transfer to full emergency power shall be automatic and within 10 seconds of failure of the primary power system.

720.11.1 Power sources and power surges. Elements of the smoke management system relying on volatile memories or the like shall be supplied with uninterruptable power sources of sufficient duration to span a 15-minute primary power interruption. Elements of the smoke management system susceptible to power surges shall be suitably protected by conditioners, suppressors or other approved means.

720.11.2 Variable frequency drives (VFD). VFD or similar devices used in conjunction with any smoke management system shall automatically default to the original settings established at which time the system was originally accepted. If a VFD or similar device is installed after a smoke management system has been tested and accepted, new system testing shall be required.

720.12 Detection and control systems. Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 1418 of the *EPCOT Fire Prevention Code*. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control equipment.

720.12.1 Verification. Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override and the presence of power downstream of all disconnects. A preprogrammed weekly test sequence shall report abnormal conditions audibly, visually and by printed report. The preprogrammed weekly test shall operate all devices, equipment and components used for smoke control.

Exception: Where verification of individual components tested through the preprogrammed weekly testing sequence will interfere with normal building operation and produce unwanted effects to normal building operation, such individual components are permitted to be bypassed from the preprogrammed weekly testing, where approved by the Building Official and in accordance with the following:

1. Presence of power downstream of all disconnects shall be verified weekly by a listed control unit when the operation of components is bypassed by the preprogrammed weekly test.
2. Where components of the smoke control system are bypassed by the preprogrammed weekly test required by this Section, such components shall be tested semi-annually. The system shall also be tested under standby power conditions.

720.12.2 Wiring. In addition to meeting requirements of the *EPCOT Electrical Code*, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.

720.12.3 Activation. Smoke control systems shall be activated in accordance with this Section.

720.12.3.1 Pressurization, airflow or exhaust method. Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.

720.12.3.2 Passive method. Passive smoke control systems actuated by approved spot-type detectors listed for releasing service shall be permitted.

720.12.4 Automatic control. Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned automatic sprinkler system complying with Section 715, manual controls that are readily accessible to the fire department and any smoke detectors required by engineering analysis.

720.13 Control air tubing. Control air tubing shall be of sufficient size to meet the required response times. Tubing shall be flushed clean and dry prior to final connections and shall be adequately supported and protected from damage. Tubing passing through concrete or masonry shall be sleeved and protected from abrasion and electrolytic action.

720.13.1 Materials. Control-air tubing shall be hard-drawn copper, Type L, ACR in accordance with ASTM B42, ASTM B43, ASTM B68, ASTM B88, ASTM B251 and ASTM B280. Fittings shall be wrought copper or brass, solder type in accordance with ASME B16.18 or ASME B16.22. Changes in direction shall be made with appropriate tool bends. Brass compression-type fittings shall be used at final connection to devices; other joints shall be brazed using a BCuP5 brazing alloy with solidus above 1,100°F and liquids below 1,500°F. Brazing flux shall be used on copper-to-brass joints only.

Exception: Nonmetallic tubing used within control panels and at the final connection to devices, provided all of the following conditions are met:

1. Tubing shall be listed by an approved agency for flame and smoke characteristics.
2. Tubing and connected devices shall be completely enclosed within a galvanized or paint-grade steel enclosure having a minimum thickness of 0.0296 inch (No. 22 gage). Entry to the enclosure shall be by copper tubing with a protective grommet of neoprene or Teflon or by suitable brass compression to male barbed adapter.
3. Tubing shall be identified by appropriately documented coding.
4. Tubing shall be neatly tied and supported within the enclosure. Tubing bridging cabinets and doors or moveable devices shall be of sufficient length to avoid tension and excessive stress. Tubing shall be protected against abrasion. Tubing serving devices on doors shall be fastened along hinges.

720.13.2 Isolation from other functions. Control tubing serving other than smoke control functions shall be isolated by automatic isolation valves or shall be an independent system.

720.13.3 Testing. Control air tubing shall be tested at three times the operating pressure for not less than 30 minutes without any noticeable loss in gauge pressure prior to final connection to devices.

720.14 Marking and identification. The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

720.15 Control diagrams. Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the Building Official and the Fire Official, and at the fire alarm control panel or the fire command center, in a format and manner approved by the Fire Official.

720.16 Fire-fighter's smoke control panel. A fire-fighter's smoke control panel for fire department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. The panel shall be located in a fire command center complying with Section 718 in high-rise buildings or buildings with smoke-protected assembly seating. In all other buildings, the fire-fighter's smoke control panel shall be installed in an approved location adjacent to the fire alarm control panel. The fire-fighter's smoke control panel shall comply with Subsections 720.16.1 through 720.16.3.

720.16.1 Smoke control systems. Fans within the building shall be shown on the fire-fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by fan and zone, and by pilot-lamp-type indicators as follows:

1. Fans, dampers and other operating equipment in their normal status—WHITE.
2. Fans, dampers and other operating equipment in their off or closed status—RED.
3. Fans, dampers and other operating equipment in their on or open status—GREEN.
4. Fans, dampers and other operating equipment in a fault status—YELLOW/AMBER.

720.16.2 Smoke control panel. The fire-fighter's control panel shall provide control capability over the complete smoke-control system equipment within the building as follows:

1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources within the building. This includes stairway pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes.
2. OPEN-AUTO-CLOSE control over individual dampers relating to smoke control and that are also controlled from other sources within the building.
3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire-fighter's control panel.

Exceptions:

1. Complex systems, where approved, where the controls and indicators are combined to control

and indicate all elements of a single smoke zone as a unit.

2. Complex systems, where approved, where the control is accomplished by computer interface using approved, plain English commands.

720.16.3 Control action and priorities. The fire-fighter's control panel actions shall be as follows:

1. ON-OFF and OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the fire-fighter's control panel, no automatic or manual control from any other control point within the building shall contradict the control action. Where automatic means are provided to interrupt normal, nonemergency equipment operation or produce a specific result to safeguard the building or equipment (i.e., duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices), such means shall be capable of being overridden by the fire-fighter's control panel. The last control action, as indicated by each fire-fighter's control panel switch position, shall prevail. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

Exception: Power disconnects required by the *EPCOT Electrical Code*.

2. Only the AUTO position of each three-position fire-fighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a fire-fighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described above. When directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

720.17 System response time. Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ducts and other equipment. For purposes of smoke control, the fire-fighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed condition reported in the required final report.

720.18 Acceptance testing. Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this Code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.

720.18.1 Detection devices. Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with NFPA 72 in their installed condition. When applicable, this testing shall include verification of airflow in both minimum and maximum conditions.

720.18.2 Ducts. Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.

720.18.3 Dampers. Dampers shall be tested for function in their installed condition.

720.18.4 Inlets and outlets. Inlets and outlets shall be read using generally accepted practices to determine air quantities.

720.18.5 Fans. Fans shall be examined for correct rotation. Measurements of voltage, amperage, revolutions per minute and belt tension shall be made.

720.18.6 Smoke barriers. Measurements using inclined manometers or other approved calibrated measuring devices shall be made of the pressure differences across smoke barriers. Such measurements shall be conducted for each possible smoke control condition.

720.18.7 Controls. Each smoke zone equipped with an automatic-initiation device shall be put into operation by the actuation of one such device. Each additional device within the zone shall be verified to cause the same sequence without requiring the operation of fan motors in order to prevent damage. Control sequences shall be verified throughout the system, including verification of override from the fire-fighter's control panel and simulation of standby power conditions.

720.18.8 Special inspections for smoke control. Smoke control systems shall be tested by a special inspector.

720.18.8.1 Scope of testing. Special inspections shall be conducted in accordance with the following:

1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
2. Prior to occupancy and after sufficient completion for the purposes of pressure-difference testing, flow measurements, and detection and control verification.

720.18.8.2 Qualifications. Special inspection agencies for smoke control shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

720.18.8.3 Reports. A complete report of testing shall be prepared by the special inspector or special inspection agency. The report shall include identification of all devices by manufacturer, nameplate data, design values, measured values and identification tag or mark. The report shall be reviewed by the responsible regis-

tered design professional and, when satisfied that the design intent has been achieved, the responsible registered design professional shall seal, sign and date the report.

720.18.8.3.1 Report filing. A copy of the final report shall be filed with the Building Official and an identical copy shall be maintained in an approved location at the building.

720.18.9 Identification and documentation. Charts, drawings and other documents identifying and locating each component of the smoke control system, and describing its proper function and maintenance requirements, shall be maintained on file at the building as an attachment to the report required by Subsection 720.18.8.3. Devices shall have an approved identifying tag or mark on them consistent with the other required documentation and shall be dated indicating the last time they were successfully tested and by whom.

720.19 System acceptance. Buildings, or portions thereof, required by this Code to comply with this Section shall not be issued a Certificate of Occupancy until such time that the Building Official determines that the provisions of this Section have been fully complied with and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system.

Exception: In buildings of phased construction, a Temporary Certificate of Occupancy, as approved by the Fire Official, shall be allowed provided that those portions of the building to be occupied meet the requirements of this Section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.

720.20 Smokeproof enclosures. Where required by Section 810, a smokeproof enclosure shall be constructed in accordance with this Section. A smokeproof enclosure shall consist of an enclosed interior exit stairway that conforms to Section 809 and an open exterior balcony or ventilated vestibule meeting the requirements of this Section. Where access to the roof is required by Subsection 806.13 walls, such access shall be from the smokeproof enclosure where a smokeproof enclosure is required.

720.20.1 Access. Access to the stair shall be by way of a vestibule or an open exterior balcony. The minimum dimension of the vestibule shall not be less than the required width of the corridor leading to the vestibule, but shall not have a width of less than 44 inches and shall not have a length of less than 72 inches in the direction of egress travel.

720.20.2 Construction. The smokeproof enclosure shall be separated from the remainder of the building by not less than 2-hour fire walls constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both. Openings are not permitted other than the required means of egress doors. The vestibule shall be separated from the stairway by not less than 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both. The open exterior

balcony shall be constructed in accordance with the fire-resistance-rating requirements for floor assemblies.

720.20.2.1 Door closers. Doors in a smokeproof enclosure shall be self- or automatic closing by actuation of a smoke detector in accordance with Section 704 and shall be installed at the floor-side entrance to the smokeproof enclosure. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smokeproof enclosure at all levels. Smoke detectors shall be installed in accordance with the *EPCOT Fire Prevention Code*.

720.20.3 Natural ventilation alternative. The provisions of Subsections 720.20.3.1 through 720.20.3.3 shall apply to ventilation of smokeproof enclosures by natural means.

720.20.3.1 Balcony doors. Where access to the stairway is by way of an open exterior balcony, the door assembly into the enclosure shall be a fire door assembly in accordance with Section 704.

720.20.3.2 Vestibule doors. Where access to the stairway is by way of a vestibule, the door assembly into the vestibule shall be a fire door assembly complying with Section 704. The door assembly from the vestibule to the stairway shall have not less than a 20-minute fire-resistance rating complying with Section 704.

720.20.3.3 Vestibule ventilation. Each vestibule shall have a minimum net area of 16 square feet of opening in a wall facing an outer court, yard or public way that is at least 20 feet in width.

720.20.4 Mechanical ventilation alternative. The provisions of Subsections 720.20.4.1 through 720.20.4.4 shall apply to ventilation of smokeproof enclosures by mechanical means.

720.20.4.1 Vestibule doors. The door assembly from the building into the vestibule shall be a fire door assembly complying with Subsection 805.8. The door assembly from the vestibule to the stairway shall not have less than a 20-minute fire-resistance rating and meet the requirements for a smoke door assembly in accordance with Subsection 805.8. The door shall be installed in accordance with NFPA 105.

720.20.4.2 Vestibule ventilation. The vestibule shall be supplied with not less than one air change per minute and the exhaust shall not be less than 150 percent of supply. 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 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 down from the top of the trap, and shall be entirely within the smoke trap area. Doors 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.

720.20.4.2.1 Engineered ventilation system. Where a specially engineered system is used, the system shall exhaust a quantity of air equal to not

less than 90 air changes per hour from any vestibule in the emergency operation mode and shall be sized to handle three vestibules simultaneously. Smoke detectors shall be located at the floor-side entrance to each vestibule and shall activate the system for the affected vestibule. Smoke detectors shall be installed in accordance with the *EPCOT Fire Prevention Code*.

720.20.4.3 Smoke trap. The vestibule ceiling shall be at least 20 inches 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.

720.20.4.4 Stair shaft air movement system. The stair shaft shall be provided with a dampered relief opening and supplied with sufficient air to maintain a minimum positive pressure of 0.10 inch of water in the shaft, relative to the vestibule, with all doors closed.

720.20.5 Stair pressurization alternative. Where the building is equipped throughout with an automatic sprinkler system in accordance with Subsection 715.4, the vestibule is not required, provided that interior exit stairways are pressurized to a minimum of 0.05 inch of water and a maximum of 0.35 inch of water in the shaft relative to the building measured with all stairway doors closed under maximum anticipated stack effect and wind effect.

720.20.6 Ventilating equipment. The activation of ventilating equipment required by the alternatives in Subsections 720.20.4 and 720.20.5 shall be by smoke detectors installed at each floor level at an approved location at the entrance to the smokeproof enclosure. When the closing device for the stair shaft and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall activate and operate at the required performance levels. Smoke detectors shall be installed in accordance with the *EPCOT Fire Prevention Code*.

720.20.6.1 Ventilation systems. Smokeproof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment, control wiring, power wiring and ductwork shall comply with one of the following:

1. Equipment, control wiring, power wiring and ductwork shall be located exterior to the building and directly connected to the smokeproof enclosure or connected to the smokeproof enclosure by ductwork enclosed by not less than 2-hour fire walls constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both.
2. Equipment, control wiring, power wiring and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by not less than 2-hour fire walls constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both.

3. Equipment, control wiring, power wiring and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by not less than 2-hour fire walls constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both.

Exceptions:

1. Control wiring and power wiring utilizing a 2-hour fire-resistance-rated cable or cable system.
2. Where encased with not less than 2 inches of concrete.

720.20.6.2 Standby power. Mechanical vestibule and stair shaft ventilation systems and automatic fire detection systems shall be powered by an approved standby power system conforming to the *EPCOT Electrical Code*.

720.20.6.3 Acceptance and testing. Before the mechanical equipment is approved, the system shall be tested in the presence of the Building Official to confirm that the system is operating in compliance with these requirements.

720.21 Elevator hoistway pressurization alternative. Where elevator hoistway pressurization is provided in lieu of required enclosed elevator lobbies, the pressurization system shall comply with Subsections 720.21.1 through 720.21.11.

720.21.1 Pressurization requirements. Elevator hoistways shall be pressurized to maintain a minimum positive pressure of 0.10 inch of water and a maximum positive pressure of 0.25 inch of water with respect to adjacent occupied space on all floors. This pressure shall be measured at the midpoint of each hoistway door, with all elevator cars at the floor of recall and all hoistway doors on the floor of recall open and all other hoistway doors closed. The pressure differentials shall be measured between the hoistway and the adjacent elevator landing. The opening and closing of hoistway doors at each level must be demonstrated during this test. The supply air intake shall be from an outside, uncontaminated source located a minimum distance of 20 feet from any air exhaust system or outlet.

Exceptions:

1. On floors containing only Group R occupancies, the pressure differential is permitted to be measured between the hoistway and a dwelling unit or sleeping unit.
2. Where an elevator opens into a lobby enclosed in accordance with Subsection 5-1.401.2, the pressure differential is permitted to be measured between the hoistway and the space immediately outside the door(s) from the floor to the enclosed lobby.
3. The pressure differential is permitted to be measured relative to the outdoor atmosphere on floors other than the following:

- 3.1. The fire floor.
- 3.2. The two floors immediately below the fire floor.
- 3.3. The floor immediately above the fire floor.
4. The minimum positive pressure of 0.10 inch of water and a maximum positive pressure of 0.25 inch of water with respect to occupied floors are not required at the floor of recall with the doors open.

720.21.1.1 Use of ventilation systems. Ventilation systems, other than hoistway supply air systems, are permitted to be used to exhaust air from adjacent spaces on the fire floor, two floors immediately below and one floor immediately above the fire floor to the building's exterior where necessary to maintain positive pressure relationships as required in Subsection 720.21.1 during operation of the elevator shaft pressurization system.

720.21.2 Rational analysis. A rational analysis complying with Subsection 720.4 shall be submitted with the construction documents.

720.21.3 Ducts for system. Any duct system that is part of the pressurization system shall be protected with the same fire-resistance rating as required for the elevator shaft enclosure.

720.21.4 Fan system. The fan system provided for the pressurization system shall be as required by Subsections 720.21.4.1 through 720.21.4.4.

720.21.4.1 Fire resistance. Where located within the building, the fan system that provides the pressurization shall be protected with the same fire-resistance rating required for the elevator shaft enclosure.

720.21.4.2 Smoke detection. The fan system shall be equipped with a smoke detector that will automatically shut down the fan system when smoke is detected within the system.

720.21.4.3 Separate systems. A separate fan system shall be used for each elevator hoistway.

720.21.4.4 Fan capacity. The supply fan shall be either adjustable with a capacity of not less than 1,000 cfm per door, or that specified by a registered design professional to meet the requirements of a designed pressurization system.

720.21.5 Standby power. The pressurization system shall be provided with standby power in accordance with Section 2702.

720.21.6 Activation of pressurization system. The elevator pressurization system shall be activated upon activation of either the building fire alarm system or the elevator lobby smoke detectors. Where a building fire alarm system and elevator lobby smoke detectors are present, each shall be independently capable of activating the pressurization system.

720.21.7 Testing. Testing for performance shall be required in accordance with Subsection 720.18.8. System acceptance shall be in accordance with Subsection 720.19.

720.21.8 Marking and identification. Detection and control systems shall be marked in accordance with Subsection 720.14.

720.21.9 Control diagrams. Control diagrams shall be provided in accordance with Subsection 720.15.

720.21.10 Control panel. A control panel complying with Subsection 720.16 shall be provided.

720.21.11 System response time. Hoistway pressurization systems shall comply with the requirements for smoke control system response time in Subsection 720.17.

CHAPTER 8

MEANS OF EGRESS, OCCUPANT LOADS

SECTION 801 GENERAL REQUIREMENTS

801.1 Scope. The provisions of this Chapter establish minimum standards of egress and maximum occupant loads for the safety of the occupants of buildings and structures in the District.

801.2 Means of egress. Every building and structure, or part thereof, shall be provided with means of egress as required in this Chapter.

801.3 Maximum occupant loads. The maximum occupant loads established in this Chapter shall not be exceeded in any building or structure.

801.4 Definitions. For the purpose of this Code, terms used relating to a means-of-egress system shall be defined as follows:

- (a) **Egress court.** Yard or court that provides access to a public way for one or more exits.
- (b) **Exit passageway.** An exit component that is separated from all other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a horizontal direction to the exit discharge or the public way.
- (c) **Exterior exit balcony.** A landing, veranda or porch, the long side of which is at least 50 percent open, projecting from the building and serving as a required exit. The open area above the guardrail shall be constructed to prevent the accumulation of smoke and toxic gases.
- (d) **Horizontal exit.** A way of passage from one building to an area of refuge in another building on approximately the same level, or a way of passage through or around a fire wall or fire partition to an area of refuge on approximately the same level in the same building. Either passage shall afford a calculated degree of safety from fire or smoke from the area of escape and areas communicating therewith.
- (e) **Means of egress.** A means of egress is a continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit and the exit discharge, defined as follows:
 1. **Exit.** That part of a means-of-egress system that is separated from all other spaces of a building or structure by fire-resistant-rated construction and opening protectives as required to provide a protected path of egress travel between the exit access and the exit discharge. Exits include exterior exit doors at ground level, exit enclosures, exit passageways, exterior exit stairs, exterior exit ramps and horizontal exits.

2. **Exit access.** That part of a means-of-egress system leading from any occupied portion of a building or structure to an exit.
 3. **Exit discharge.** That part of the means-of-egress system between the termination of an exit and a public way.
- (f) **Occupant load.** Total number of persons that may occupy a building or a part thereof.
 - (g) **Panic hardware – paddle hardware.** A door-latching assembly incorporating a device that releases the latch upon the application of a force in the direction of exit.
 - (h) **Public way.** A street, ally or other parcel of land open to the outside air leading to a street, which has a clear width and height of not less than 10 feet, used for the free passage of the public.
 - (i) **Seating, continental.** Means of providing fixed seating in a Group A occupancy without having intervening aisles between the two side aisles. Spacing between rows of seats is wide enough to permit free passage of the audience, and all entrance doors are located in the sidewalls of the auditorium.
 - (j) **Seating, modified-continental.** Means of providing fixed seating in a Group A occupancy as an alternative to standard or continental seating requirements. Spacing between rows of seats shall comply with requirements of continental seating. Entrance and exit doors are provided in sidewalls in addition to intervening aisles leading to rear or front exits.
 - (k) **Stairway, private.** A stairway serving one tenant only. Such stairway need not be enclosed.

801.5 Changes in elevation. Except in Group R-3 occupancies, changes in elevation of less than 12 inches along any means of egress serving a tributary occupant load of 10 or more shall be by means of a ramp.

801.6 Means-of-egress continuity. The path of egress travel along a means of egress shall not be interrupted by any building element other than a means-of-egress component as specified in this Chapter. Obstructions shall not be placed in the required width of a means of egress, except as permitted by this Chapter. The required capacity of a means-of-egress system shall not be diminished along the path of egress travel.

SECTION 802 OCCUPANT LOADS

802.1 Occupant load permitted.

- (a) The occupant load permitted in a building or part thereof shall be computed at the rate of one occupant per unit of area as prescribed in Table 8.1.

Exceptions:

1. The occupant load of an area having fixed seats shall be determined by the provisions of Subsection 802.3. Aisles serving the fixed seats, not used for any other purpose, shall not be assumed to add to the occupant load.
 2. When approved by the Building Official, the occupant load permitted in a building or part thereof may be increased above that specified in this Section if all other requirements of the EPCOT Codes are also met based on the modified number, and the occupant load shall not exceed one occupant per 5 square feet of occupiable floor space. An aisle or seating diagram may be required by the Building Official to substantiate an increase in occupant load. Where required by the Building Official, such diagram shall be posted.
- (b) When the square feet per occupant is not given for a specific occupancy in Table 8.1, the square feet per occupant shall be determined by the Building Official, and shall be based on the area given for the most nearly similar occupancy.
- (c) In determining the occupant load, all parts of a building shall be assumed to be occupied at the same time. Accessory areas normally used by the primary occupancy shall be provided with exits as though the accessory areas were completely occupied, but their occupant load need not be included in the total occupant load of the building.

802.2 Overcrowding. The number of occupants in a building or part thereof shall not exceed the capacity specified in Subsection 802.1, or as posted as required in Subsection 802.5.

802.3 Fixed seating. For areas having fixed seats and aisles, the occupant load shall be determined by the number of fixed seats installed therein. For areas having fixed seats without dividing arms, the occupant load shall be not less than the number of seats based on one person for each 18 inches of seating length. The occupant load of seating booths shall be based on one person for each 24 inches of booth seat length measured at the backrest of the seating booths.

802.4 Mixed occupancies.

- (a) The occupant load of a building housing mixed occupancies shall be determined by adding the number of occupants in the various occupancies set forth in Table 8.1.
- (b) Where a building contains two or more occupancies, the means-of-egress requirements shall apply to each portion of the building based on the occupancy of the space. Where two or more occupancies utilize portions of the same means-of-egress system, those egress components shall meet the more stringent requirements of all occupancies that are served.

802.5 Posting of room capacity. The capacity of a classroom, assembly room or similar room shall be posted in a conspicuous place near the main exit. Occupant load signs shall be approved by the Building Official and shall be maintained in legible condition by the owner of the building or by his authorized agent.

**SECTION 803
REQUIRED EXITS**

803.1 Number of means of egress.

- (a) Every building or story used for human occupancy shall have at least one means of egress, and shall have not less than two means of egress where required by Table 8.1.

All rooms and spaces within each story of a building used for human occupancy shall have at least one means of exit access, and shall have at least two means of exit access where required by Table 8.1.

- (b) In all occupancies, floors above the first story having an occupant load of more than 10 shall have access to not less than two independent exits for each tenant area.

Exception: Group R-3 occupancies may have one exit serving each tenant area within a single tenancy provided the unit is equipped with a smoke detection alarm device, does not exceed three stories or 35 feet in height, and the distance to an approved exit does not exceed 20 feet.

- (c) Each mezzanine used for other than storage, when more than 2,000 square feet in area or more than 60 feet in any dimension, shall have not less than two stairways to an adjacent floor.
- (d) For special exit requirements in Group A, B, D, E, H and R occupancies, see Sections 816 through 822.
- (e) Every story or part thereof having an occupant load of 500 to 999 shall have access to not less than three independent exits.
- (f) Every story or part thereof having an occupant load of 1,000 or more shall have access to not less than four independent exits.
- (g) The number of exits required from any story of a building shall be calculated by using the occupant load (see Table 8.1) of the story under consideration and adding percentages of the occupant loads of floors that exit through the level under consideration, as follows:
 1. Fifty percent of the occupant load on the first adjacent story above and on the first adjacent story below when the story below exits through the floor under consideration.
 2. Twenty-five percent of the occupant load on the story immediately above or below the first adjacent story.
- (h) The maximum number of exits required for any story and the maximum width required for any story shall be maintained until the exterior of the building is reached.
- (i) Basements or cellars, and occupied roofs, shall have means of egress as required for stories. Basements and cellars used for other than building service shall have not less than two means of egress.
- (j) Two exit access doorways are required in boiler, incinerator and furnace rooms where the area is over 500 square feet and any fuel-fired equipment exceeds 400,000 British thermal units (Btu) input capacity. Where two exit access doorways are required, one is permitted to be a fixed ladder or an alternating tread

device. Exit access doorways shall be separated by a horizontal distance equal to one-half the length of the maximum overall diagonal dimension of the room. (See Subsection 503.18.)

- (k) Where cellulose nitrate is handled in film laboratories, projection rooms and film processing rooms, two means of egress shall be provided. Doors shall be self-closing or automatic closing and shall have a 1-hour fire-resistive rating, not to exceed 100 square inches of wired glass set in steel frames.

**TABLE 8.1
NUMBER OF EXITS AND SQUARE FEET PER OCCUPANT**

USE	MINIMUM OF 2 MEANS OF EGRESS REQUIRED WHERE NUMBER OF OCCUPANTS IS OVER	AREA PER OCCUPANT ^b (square feet)
Aircraft hangars (no repair)	10	500 gross
Assembly areas Auditoriums Bowling lanes (assembly areas only) Churches and chapels Dance floors Lodge rooms	50	7 net
Assembly areas (less concentrated use) Banquet rooms Conference rooms Dining rooms Drinking establishments Exhibit rooms Gymnasiums Lounges Skating rinks Stages	50	15 net 10 net 15 net
Auction rooms	30	7 net
Children's homes and homes for aged	5	80 gross
Classrooms	50	20 net
Dormitories	10	50 net
Garages, parking	30	200 gross
Hospitals, sanitariums and nursing homes	5	80 gross
Hotels and apartments	10	200 gross
Library reading rooms	50	50 net
Locker rooms	30	50 net
Maintenance facilities	50	200 gross
Mechanical equipment rooms	30	300 gross
Nurseries for children (day care)	5	50 net
Offices	30	100 gross
Queue		4.5 net
Reviewing stands and Stadiums		[See 817.4(c)]
School shops and vocational rooms	50	50 net
Storage, stock, shipping areas	30	300 gross
Stores and retail salesrooms Basement ^a Ground floor Upper floors	50 10	30 gross 30 gross 60 gross

(continued)

**TABLE 8.1—continued
NUMBER OF EXITS AND SQUARE FEET PER OCCUPANT**

USE	MINIMUM OF 2 MEANS OF EGRESS REQUIRED WHERE NUMBER OF OCCUPANTS IS OVER	AREA PER OCCUPANT ^b (square feet)
Swimming pools ^c Water surface Deck	50 50	50 gross 30 gross
Warehouses	30	500 gross
All Others	50	100 gross

- a. See Subsection 803.1(i) for exit requirements for basements, cellars and occupied roofs.
- b. See Section 202 for definitions of area, gross and net floor.
- c. Outdoor swimming pools enclosed within barriers shall be provided with exits as required by Section 803.

803.2 Means-of-egress width.

- (a) The width (in feet) of any component of a means of egress shall be not less than the number of occupants served by that component divided by 50. Such width shall be divided approximately equally among the separate exits, except for specific requirements found in Section 816.
- (b) The total width required for the exit from any story shall be determined by using the occupant load of that story, plus the percentages of the occupant loads of floors that exit through the level under consideration, as specified for number of exits in Subsection 803.1(g).
- (c) When parts of a building are normally used at the same time, exits shall have the capacity to serve the total occupant load. When parts of a building are normally used at different times, exits shall have the capacity to serve the largest occupant load.

803.3 Arrangement of exits and exit access doorways.

- (a) When only two exits or exit access doorways 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, measured in a straight line between the exits or exit access doorways from nearest edge to nearest edge.

Exception: Where a building is equipped throughout with an automatic sprinkler system in accordance with Section 715, the separation distance of the exits or exit access doorways shall not be less than one-third the length of the maximum overall diagonal dimension of the area served.

- (b) Where three or more exits or exit access doorways are required, they shall be located so that at least two are placed a distance apart equal to that required in Subsection 803.3(a). The others shall be placed a reasonable distance apart.

803.4 Exit access travel distance. Exits shall be located so that the maximum length of exit access travel distance, measured from the most remote point within a story to the entrance to an exit along the natural and unobstructed path of egress travel, shall not exceed 200 feet. Where the path of exit access includes unenclosed stairways or ramps, the distance of travel on such means-of-egress components shall also be included in the travel distance measurement.

Exceptions:

1. Exit access travel distance in a Group B-1 occupancy shall not exceed a maximum 150 feet.
2. Exit access travel distance in an open parking garage shall not exceed 400 feet to a protected exit or an unprotected stair allowed in Subsection 818.3(b).
3. Exit access travel distance in a Group H-1 or H-2 occupancy shall not exceed 75 feet in accordance with Subsection 821.2(b).
4. Exit access travel distance in a temporary structure, such as a tent or membrane structure classified as an assembly occupancy, shall not exceed 150 feet.

803.5 Egress through adjoining or accessory areas.

- (a) Exit access from a room may be provided through an adjoining or intervening room or area when the adjoining room is accessory to the area served, is not a room or area of a high-hazard occupancy and provides a direct, discernible means of egress to an exit.
- (b) Foyers, lobbies and reception rooms constructed as for corridors shall not be construed as intervening rooms.
- (c) Egress is not permitted through any room that can be locked to prevent egress, service corridors, kitchens, closets, restrooms, store rooms or similar areas.
- (d) Where more than one tenant occupies any floor of a building or structure, each tenant space shall be provided with access to the required exits without passing through adjacent tenant spaces.

**SECTION 804
EXIT AND EXIT ACCESS DOORS**

804.1 Scope. The provisions of this Section shall apply to every exit and exit access door serving a means of egress having an occupant load of more than 10, or serving hazardous rooms or areas. The provisions of Subsections 804.3, 804.8 and 804.9 shall apply to all doors regardless of occupant load. Buildings or structures used for human occupancy shall have at least one exterior exit door that meets the requirements of Subsection 804.4.

804.2 Swing.

- (a) Doors shall swing in the direction of exit travel when serving an occupant load of 50 or more or when serving hazardous areas.
- (b) Sliding doors shall not be used as required exit or exit access doors.
- (c) Swinging doors shall not require more than 5 pounds of force for opening when the force is applied at the normal knob position when the door is unlatched.
- (d) Double-acting doors shall not be used in a means of egress serving a tributary occupant load of more than 100; nor shall they be used as a part of an opening protective, nor shall they be equipped with panic hardware. A double-acting door shall have a viewing panel of not less than 100 square inches.
- (e) Where required doors are operated by power that is activated by a photo-electric device, floor mat, wall

switches or other approved device, as well as doors with power-assisted manual operation, the design, installation and maintenance shall be such that, in the event of power failure, the door may be manually opened to permit exit travel. These doors shall be openable as is required for other nonpower-operable doors.

- (f) Power-operating sliding doors may be used provided the sliding leaf is equipped with an emergency swing (panic release) feature. The force to set the door into motion shall not exceed 50 pounds force.

A readily visible, durable sign in letters not less than 1 inch high on a contrasting background that reads as follows shall be located on the egress side of each door opening:

IN EMERGENCY, PUSH TO OPEN

804.3 Hardware.

- (a) Exit, exit access doors and gates required to serve as exit doors or exit access, shall be openable from the inside without the use of a key, tool or any special knowledge or effort. Manually operated flush bolts or surface bolts are prohibited. All hardware must be direct acting requiring no more than one operation. Double-cylinder dead bolts, requiring a key for operation on both sides, are prohibited on required means-of-egress doors unless the locking device is provided with a key that cannot be removed when the door is locked from the inside. A night latch, dead bolt or security device may be used on exit or exit access doors from a dwelling unit, hotel guest room or suite provided such devices are openable from the inside without the use of a key, tool, or any special knowledge or effort, and the device is mounted at a height not to exceed 48 inches above the finished floor. (See Section 814 for panic and fire exit hardware.)

Door handles, pulls, latches, locks and other operating devices on doors required to be accessible by the *EPCOT Accessibility Code for Building Construction* shall not require tight grasping, tight pinching or twisting of the wrist to operate.

Exception: A key-locking or twist/turn locking device may be used from the egress side on the main exterior exit door on Group A-3, A-4, A-5, B and I occupancies subject to all of the following:

1. There is a readily visible durable sign on or adjacent to the door stating “THIS EXIT TO REMAIN UNLOCKED WHEN THIS BUILDING IS OCCUPIED.” The sign shall be in letters no less than 1 inch high on a contrasting background.
2. The locking device must be of a type that will be readily distinguishable as locked.
3. The main exit door is a single door or one pair of doors.
4. When unlocked, the door or both leaves of the pair must be free. The use of the key-locking device may be revoked by the Building Official for due cause.

- (b) **Hardware height.** Door handles, pulls, latches, locks and other operating devices shall be installed 34 inches minimum and 48 inches maximum above the finished floor in compliance with the *EPCOT Accessibility Code for Building Construction*.

Exception: Access doors or gates in barrier walls and fences protecting pools, spas and hot tubs shall be permitted to have operable parts of the release of latch on self-latching devices at 54 inches maximum above the finished floor or ground, provided the self-latching devices are not also self-locking devices operated by means of a key, electronic opener or integral combination lock.

- (c) **Special egress-control devices.** When approved by the Building Official, exit and exit access doors in A, E and H occupancies may be equipped with approved, listed special egress-control devices of the time-delay type, provided the building is protected throughout by an approved automatic sprinkler system and an approved automatic smoke detection system. Such devices shall conform to all of the following:

1. Automatically deactivate the egress-control device upon activation of either the sprinkler system or the detection system.
2. Automatically deactivate the egress-control device upon loss of electrical power to any one of the following:
 - (a) The egress-control device.
 - (b) The smoke detection system.
 - (c) Exit illumination as required.
3. Be capable of being deactivated by a signal from a switch located in an approved location.
4. Initiate an irreversible process that will deactivate the egress-control device whenever a manual force of not more than 15 pounds is applied for two seconds to the panic bar or other door-latching hardware. The egress-control device shall deactivate within an approved time period not to exceed a total of 15 seconds. The time delay established for each egress-control device shall not be field adjustable.
5. Actuation of the panic bar or other door-latching hardware shall activate an audible signal at the door.
6. The unlatching shall not require more than one operation.
7. On the door adjacent to the release device, there is a readily visible, durable sign in letters at least 1 inch high and at least $\frac{1}{8}$ inch in stroke width on contrasting background that reads "PUSH UNTIL ALARM SOUNDS DOOR CAN BE OPENED IN 15 SECONDS."

804.4 Width and height. Every exit or exit access doorway shall permit the installation of a door not less than 3 feet wide and not less than 6 feet, 8 inches high. The door shall be capable of opening at least 90 degrees and the clear width shall be

not less than 32 inches. In computing the means-of-egress width required by Subsection 803.2, the net dimension of any intervening door shall be used. Door closers and stops shall not reduce headroom to less than 78 inches.

804.5 Door leaf width. The width of a leaf of a pair of exit or exit access doors shall not exceed 4 feet.

804.6 Special doors. Sliding, revolving and overhead doors shall not be used as required exit or exit access doors, except as otherwise provided.

804.7 Egress from doors. Every required door shall have immediate access to an approved means of egress.

804.8 Change in floor level at doors. Regardless of the occupant load, there shall be a floor or landing on each side of an exit or exit access door. The floor or landing shall be at the same elevation on each side of the doorway, and the length and width of the landing shall be at least equal to the width of the doorway it serves. Thresholds for doorways required to be accessible shall comply with Subsection 503.9.

Exceptions:

1. Variations in elevation due to differences in finish materials, but not more than $\frac{1}{2}$ inch.
2. Exterior decks, patios or balconies that are part of a Group R-1 or R-2 occupancy and are not required to be accessible shall be not more than 2 inches below the finished floor level of the adjacent interior space of the guest room or dwelling unit.
3. In Group R-3 occupancies, a door may open inward at the top step of a flight of stairs or on an exterior landing when the first step or the exterior landing is not more than $7\frac{1}{2}$ inches below the floor level.
4. A maximum $\frac{3}{4}$ inch threshold is permitted for sliding glass doors serving any guest room. The height is measured from the top of the interior finished floor. Typical allowances for carpeted finishes are $\frac{1}{4}$ inch for padding and $\frac{1}{4}$ inch for carpet. The interior floor must be ramped to the threshold with a slope that does not exceed 1:20 in order to provide the $\frac{3}{4}$ inch maximum height described above. The Building Official, where space limitations prohibit the use of a 1:20 slope or less, may approve greater slopes. [See *EPCOT Accessibility Code for Building Construction* Section 405.] A slope between 1:10 and 1:12 will be considered for a maximum rise of 6 inches. A slope between 1:8 and 1:10 will be considered for a maximum rise of 3 inches. A slope steeper than 1:8 is not allowed. The maximum height difference between the top of the interior finished floor (interior of the door to the exterior) cannot exceed 2 inches as required in Subsection 804.8 of the *EPCOT Building Code*. The Building Official may permit a greater step-down where it is necessary to protect the integrity of the unit from wind/water damage. Accessible door thresholds and changes in level shall comply with *EPCOT Accessibility Code for Building Construction* Section 404.

- 5. Exterior doors providing roof access to normally unoccupied roofs may have a threshold not exceeding 7 inches in height.

804.9 Identification. Glass doors shall conform to the requirements of Section 1005, and EPCOT Standards 1005-1 and 1005-2, and shall be identified in accordance with Subsection 1005.1.

804.10 Additional doors. Exterior doors not required as exits, but normally used as such, shall comply with the requirements of Subsections 804.2 and 804.3.

804.11 Fire doors in heater and equipment rooms. See Subsection 503.18(e).

804.12 Revolving doors.

- (a) Each revolving door shall be capable of collapsing into a book-fold position with parallel egress paths providing an aggregate width of not less than 36 inches.
- (b) A revolving door shall not be located within 10 feet of the foot of or top of stairs or escalators. A dispersal area shall be provided between the stairs or escalators and the revolving doors.
- (c) The revolutions per minute for a revolving door shall not exceed the following:

INSIDE DIAMETER (feet and inches)	POWER-DRIVEN TYPE SPEED CONTROL (RPM)	MANUAL-TYPE SPEED CONTROL (RPM)
6-6	11	12
7-0	10	11
7-6	9	10
8-0	9	10
8-6	8	9
9-0	8	9
9-6	7	8
10-0	7	8

- (d) Each revolving door shall have a conforming side-hinged swinging door in the same wall as the revolving door and within 10 feet.

Exception: A revolving door may be used without an adjacent swinging door 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 elevators and street.

- (e) A revolving door to be credited as a component of a means of egress shall comply with Paragraphs (a) through (d) and the following conditions:

- 1. Revolving doors shall not be given credit for more than 50 percent of the required exit capacity.
- 2. Each revolving door shall be credited with not more than 50 persons capacity.
- 3. Each revolving door shall be capable of being collapsed when a force of not more than 130

pounds is applied within 3 inches of the outer edge of a wing.

- (f) A revolving door not used as a component of a means of egress shall have a collapsing force of not more than 180 pounds.

Exception: A revolving door may have a collapsing force set in excess of 180 pounds if the collapsing force is reduced to not more than 130 pounds when at least one of the following is satisfied:

- 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 that is installed to provide coverage in all areas within the building, which are within 75 feet of the revolving doors.
- 4. There is the actuation of a manual control switch, which reduces the holding force to below the 130-pound level. Such switch shall be in an approved location and shall be clearly identified.

804.13 Closing devices for exit and exit access corridor doors.

- (a) Exit doors, including doors that protect openings in horizontal exits, exit passageways and exit enclosures, and doors in fire-resistance-rated exit access corridors, shall normally be in the closed position. Such doors shall be self-closing or automatic closing in accordance with Paragraph (b). Closing devices shall comply with NFPA 80.

Fire-rated doors shall not be secured in such a manner to prevent the self-closing or automatic-closing devices from providing the required opening protection.

- (b) When approved by the Building Official, doors shall be permitted to be automatic closing provided that each of the following are met:

- 1. Upon release of the hold-open mechanism, the door becomes self-closing.
- 2. The release device is designed so that the door instantly releases manually and upon release becomes self-closing, or the door can be readily closed.
- 3. The automatic-closing mechanism or medium is activated by the operation of approved smoke detectors installed in accordance with the requirements for smoke detectors for door-release service in NFPA 72.
- 4. Upon loss of power to the hold-open device, the hold-open mechanism is released and the door becomes self-closing.
- 5. The release by means of smoke detection of one door in a stair enclosure results in closing all doors serving that stair enclosure.

SECTION 805 CORRIDORS AND EXTERIOR EXIT BALCONIES

805.1 Scope.

- (a) This Section shall apply to every corridor and exterior exit balcony used as a means of egress for an occupant load of more than 10. Subsection 805.4 shall apply regardless of occupant load.
- (b) Corridors and exterior exit balconies shall be designed in accordance with Subsection 503.11 and Section 902, and shall be fire protected as required in Chapter 6.

805.2 Width. Corridors and exterior exit balconies shall have a width not less than that required by Subsection 803.2, but in no case be less than 44 inches wide. For special requirements for Group D and E occupancies, see Sections 819 and 820.

805.3 Height. Corridors and exterior exit balconies shall have a clear height of not less than 7 feet.

805.4 Projections.

- (a) The required width of corridors and exterior exit balconies shall be unobstructed. Trim and handrails, and doors when fully open, shall not reduce required width by more than 7 inches. Doors in any position shall not reduce the required width by more than 12 inches.
- (b) Exterior exit balconies shall not project into an area where protected openings are required.

805.5 Dead ends. Length of dead ends of corridors and exterior exit balconies shall be not more than 20 feet.

805.6 Availability of exits. Where more than one exit or exit access doorway is required, the exits or exit access doorways shall be arranged so that it is possible to go in either direction from any point in a corridor or exterior exit balcony to a separate exit or exit access doorway, except from dead ends permitted in Subsection 805.5.

805.7 Construction.

- (a) Corridor walls and ceilings shall be not less than 1-hour fire-resistive construction.

Exceptions:

1. Exterior balcony railings.
2. Corridors in one story, single occupancy Group I.
3. Corridors formed by temporary partitions regulated by Subsection 709.2 that do not exceed 6 feet, 0 inches in height.
4. Corridor walls that are also exterior walls of a building.
5. Single tenant spaces or suites not exceeding 20,000 square feet, limited to Group B office use only. Such spaces shall have either direct exits to the exterior or be served by a protected corridor with a fire-resistance rating of not less than 1-hour, which provides direct access to exits. Each suite shall be separated from other parts of the building by walls constructed as tenant separations in accordance with Subsec-

tion 502.5(b), with a fire-resistance rating of not less than 1-hour.

6. For buildings of unprotected construction Type IV, V, or VI, ceiling construction should be consistent with type of construction.
 7. Where the corridor ceiling is constructed as required for the corridor walls, the walls shall be permitted to terminate at the upper membrane of such ceiling assembly.
- (b) The floors, walls and ceilings of exterior exit balconies shall meet the requirements applicable to the type of construction of the building. Exterior exit balconies shall be separated from the interior of the building by walls and protected openings as required for corridors.

Exception: Separation is not required where the exterior exit balcony is served by at least two stairs and a dead-end travel condition does not require egress past an unprotected opening to reach a stair.

Exterior exit balconies shall have guardrails designed in accordance with Subsection 902.2(h). The open area above the guardrail shall be constructed to prevent the accumulation of smoke and toxic gases.

805.8 Openings.

- (a) Where corridor walls are required to be 1-hour fire-resistive construction, every interior door opening shall be protected by a tight-fitting smoke and draft assembly having a fire protection rating of not less than 20 minutes when tested in accordance with EPCOT Standard 7-2, without the hose stream test. Wired glass shall be set in steel frame. A closing device shall be required.
- (b) Other openings shall be protected by a fixed wired glass not less than 1/4 inch thick set in steel frame or a 1-hour, fire-rated automatic-closing device or listed window assembly with fire-protection-rated glazing of not less than 3/4 hour. Fire-protection-rated glazing shall be tested in accordance with, and shall meet the acceptance criteria of, NFPA 257 or UL 9. The area of all openings other than doors in any part of a corridor shall not exceed 25 percent of the area of the corridor wall of the room from which the corridor is separated. For occupancy separations, see Section 502, and for fire division wall requirements, see Section 708.

Exception: Fire-resistance-rated glazing tested as part of a 1-hour fire-resistance-rated wall assembly in accordance with ASTM E119 or UL 263 shall be permitted in fire doors and fire window assemblies in accordance with their listings and shall not otherwise be required to comply with this Section.

- (c) Duct penetrations of corridor walls shall be protected with listed smoke dampers in accordance with the *EPCOT Mechanical Code*.

805.9 Use of corridors. Storage, lockers, electronic equipment, panels, electronic panels or other obstructions shall not be permitted in corridors.

Exception: Electrical boxes and fire alarm control panels that meet the requirements of the exception for Subsection

MEANS OF EGRESS, OCCUPANT LOADS

707.10.3.2 and Section 307 of the *EPCOT Accessibility Code for Building Construction*.

805.10 Corridor continuity. Fire-resistance-rated corridors shall be continuous from the point of entry to an exit, and shall not be interrupted by intervening rooms.

Exception: Foyers, lobbies or reception rooms constructed as required for corridors shall not be construed as intervening rooms.

SECTION 806 STAIRWAYS

806.1 Scope. Stairways shall conform to the requirements of this Section, except that stairs or ladders used to access or move equipment may be exempted from these requirements by the Building Official.

806.2 Width.

- (a) The width of stairways shall be determined in accordance with Subsection 803.2 and as required herein. Stairways serving an occupant load of more than 50 shall be not less than 44 inches wide. Stairways serving an occupant load of 50 or less shall be not less than 36 inches wide.
- (b) Trim shall not reduce the required width of a stairway by more than $3\frac{1}{2}$ inches into the required width.
- (c) Handrails may project from each side of a stairway a distance of $3\frac{1}{2}$ inches into the required width.

806.3 Treads and risers.

- (a) Stairway risers shall be not less than 4 inches or more than 7 inches high and treads shall be not less than 11 inches wide.
- (b) Treads shall be of uniform depth and risers of uniform height in any flight of stairs. There shall be no variation exceeding $\frac{3}{8}$ inch in the depth of adjacent treads or in the height of adjacent risers. Tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads. Stair treads and risers shall be of uniform size and shape. The tolerance between the largest and smallest riser or between the largest and smallest tread shall not exceed $\frac{3}{8}$ inch in any flight of stairs.

Exceptions:

1. Where the bottom or top riser adjoins a sloping public way, walk or driveway having an established grade and serving as a landing, a variation in the height of the riser of not more than 3 inches for every 3 feet of stairway width is permitted.
2. Aisle stairs in accordance with Subsection 816.6.
- (c) The slope of the walking surface of treads in any direction shall not exceed $\frac{1}{4}$ inch per foot (a slope of 1 in 48), except that the radius of curvature at the leading edge of the tread shall not be greater than $\frac{1}{2}$ inch. Beveling or rounding of nosings shall not exceed $\frac{1}{2}$ inch in a horizontal dimension. Risers shall be solid and vertical or sloped from the underside of the leading edge of the tread above at an angle not

more than 30 degrees from the vertical. The leading edge (nosings) of treads shall project not more than $1\frac{1}{4}$ inches beyond the tread below. All projections of the leading edges shall be of uniform size, including the leading edge of the floor at the top of a flight of stairs.

Exceptions:

1. Stairways required to be accessible shall comply with the *EPCOT Accessibility Code for Building Construction*.
2. Solid risers are not required for stairways that are not required to be in an enclosure by Subsection 809.1, provided the opening between treads does not permit the passage of a sphere with a diameter of 4 inches.
3. Where access to a performance platform is strictly limited to performers and technicians, an 8-inch stair riser shall be permitted.

806.4 Special stairways.

- (a) Special stairways shall conform to the requirements of this Section. Special stairways include circular (curved) stairways, stairways with winders and spiral stairways. For the purpose of this Section, winders are defined as treads with nonparallel edges.
- (b) A circular (curved) stairway may be used as a component in a means of egress when not less than 4 feet wide, the smallest radius is not less than twice the stair width, and all treads and risers in any one flight between landings have uniform tolerances as provided in Subsection 806.3(b). The minimum tread width at the narrow end shall be not less than 10 inches and the minimum tread depth measured 12 inches from the narrower end shall be not less than 11 inches.
- (c) Except for circular (curved) stairways and spiral stairways as provided for herein, stairways with winders are not permitted as a component in a means of egress, except within dwelling units. Risers on stairways with winders shall conform to Subsection 806.3. The minimum tread width of any winder shall be not less than 10 inches at the narrow end and the minimum tread depth measured 12 inches from the narrow end shall not be less than 11 inches.
- (d) Spiral stairways are stairways having a closed circular form in its plan view with uniform section-shaped treads attached to and radiating from a minimum-diameter supporting column. Spiral stairways are permitted to be used as a component in a means of egress only within dwelling units or from a space not more than 250 square feet in area and serving not more than five occupants, or from galleries, catwalks and gridirons within a Group A occupancy. The minimum stairway width shall be not less than 26 inches. The risers shall be sufficient to provide a headroom of 78 inches minimum, but the riser height shall not exceed $9\frac{1}{2}$ inches. The clear tread depth at a point 12 inches from the narrow end shall be $7\frac{1}{2}$ inches minimum. All treads shall be identical. Handrails complying with Subsection 806.8 shall be provided.

(e) **Industrial stairways.** Fixed industrial interior and exterior stairs around machinery, tanks and other equipment, and stairs leading to or from floors, platforms or pits and where the requirements of Subsection 806.3(a) are technically infeasible shall comply with this Section. This Section does not apply to stairs used for fire exit purposes. The minimum width requirement for fixed industrial stairs shall be 22 inches. Fixed industrial stairs shall be installed at angles to the horizontal of between 30 degrees and 50 degrees. Any uniform combination of rise/tread dimensions may be used that will result in a stairway angle to the horizontal within the permissible range. Riser height and tread width shall be uniform with no variation between adjacent treads or risers exceeding $\frac{3}{8}$ inch (see Table 8.2).

**TABLE 8.2
INDUSTRIAL STAIRWAYS**

ANGLE TO HORIZONTAL	RISE (Inches)	TREAD (Inches)
30 degrees 35'	6 $\frac{1}{2}$	11
32 degrees 08'	6 $\frac{3}{4}$	10 $\frac{3}{4}$
33 degrees 41'	7	10 $\frac{1}{2}$
35 degrees 16'	7 $\frac{1}{4}$	10 $\frac{1}{4}$
36 degrees 52'	7 $\frac{1}{2}$	10
38 degrees 29'	7 $\frac{3}{4}$	9 $\frac{3}{4}$
40 degrees 08'	8	9 $\frac{1}{2}$
41 degrees 44'	8 $\frac{1}{4}$	9 $\frac{1}{4}$
43 degrees 22'	8 $\frac{1}{2}$	9
45 degrees 00'	8 $\frac{3}{4}$	8 $\frac{3}{4}$
46 degrees 38'	9	8 $\frac{1}{2}$
48 degrees 16'	9 $\frac{1}{4}$	8 $\frac{1}{4}$
49 degrees 54'	9 $\frac{1}{2}$	8

(f) **Ship's ladders.** Ship's ladders are permitted to be used as a component of a means of egress from catwalks, control rooms or elevated facility observation stations not more than 250 square feet with not more than three occupants and for access to equipment and unoccupied roofs.

Ship's ladders shall have a minimum tread depth of 5 inches. The ladder shall be sloped such that the total depth of each consecutive two treads, measured horizontally from the nose of the lower tread to the back of the next tread above, is not less than 8 $\frac{1}{2}$ inches. The maximum riser height between treads shall be 9 $\frac{1}{2}$ inches.

Handrails shall be provided on both sides of the ship's ladders. The minimum clear width at and below the handrails shall be 20 inches.

806.5 Landings. The length and width of landings shall be at least equal to the width of the stairway that it serves. The dimension measured in the direction of travel need not be more than 4 feet when the stairway has a straight run. Landings shall not be reduced in width by more than 3 $\frac{1}{2}$ inches by a door when fully open. (See Subsection 804.8.)

806.6 Basement stairways. When a basement stairway and a stairway from an upper story terminate in the same exit enclosure, an approved barrier shall be provided to prevent persons

from unintentionally continuing on into the basement. In addition, directional exit signs shall be provided as specified in Subsection 812.1.

806.7 Distance between landings. There shall be not more than 12 feet vertical distance between landings.

806.8 Handrails.

(a) Stairways shall have handrails on each side, and every stairway more than 88 inches wide shall have intermediate handrails dividing the stairway into sections not more than 88 inches wide.

Exceptions:

1. Stairways within dwelling units, spiral stairways and aisle stairs serving seating only on one side may have one handrail, except that stairways open on one or both sides shall have handrails on the open sides.
2. Stairways serving Group R-3 occupancies having less than four risers need not have handrails.
3. Aisle stairways having a center handrail in accordance with Subsection 817.7(c) need not have additional handrails.

(b) Handrails shall be placed not less than 34 inches, nor more than 38 inches, above the nosing of treads or path of travel. Handrail height shall be uniform. Clear space between a handrail and a wall shall be 1 $\frac{1}{2}$ inches. A handrail and a wall, or other surface adjacent to the handrail, shall be free of any sharp or abrasive elements. Ends of handrails shall be returned smoothly to the floor, wall or post, or shall be continuous to the handrail of an adjacent stair flight. Where handrails are not continuous between flights, the handrails shall extend horizontally at least 12 inches beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser.

Exception: Handrails on stairs required to be accessible shall comply with the *EPCOT Accessibility Code for Building Construction*.

(c) Handrail gripping surfaces shall be continuous, without interruption by newel posts or other obstructions. Handrails with a circular cross section shall have an outside diameter of at least 1 $\frac{1}{4}$ inches and not greater than 2 inches or shall provide equivalent graspability. If the handrail is not circular, it shall have a perimeter dimension of at least 4 inches and not greater than 6 $\frac{1}{4}$ inches with a maximum cross-section dimension of 2 $\frac{1}{4}$ inches.

Exception: Handrails on stairs required to be accessible shall comply with the *EPCOT Accessibility Code for Building Construction*.

806.9 Guardrails. Guardrails shall be provided as required in Subsection 503.11 and designed as required in Subsection 902.2(h).

806.10 Exterior stairway protection. Openings in an exterior wall below or within 10 feet measured horizontally of a required exterior stairway serving a building of more than two stories shall be protected by fixed wired glass, $\frac{3}{4}$ -hour

fire-resistive-rated glazing or a self-closing fire door having a 3/4-hour fire-resistive rating. (See Subsection 704.3.)

Exception: Openings may be unprotected when two separated exterior stairways serve an exterior exit balcony.

806.11 Stairway construction, interior.

- (a) Interior stairways and stair platforms in buildings of Type I construction as specified in Chapter 6 shall be of noncombustible materials.
- (b) In buildings of other than Type I construction, stairways may be constructed of any material permitted by this Code for the specific type of construction, except that in heavy timber buildings, stairways shall be constructed with wood treads and risers of not less than 2-inch nominal thickness. Where built on laminated or plank inclines as required for floors, stairs may be 1-inch nominal thickness or may be constructed as required for Type I buildings.
- (c) In buildings of more than three stories, stairway construction shall be noncombustible.
- (d) The walls and soffits of enclosed usable space under interior stairs shall be protected by 1-hour fire-resistance-rated construction or the fire-resistive rating of the stair enclosure, whichever is greater. Access to the enclosed usable space shall not be directly from within the stair enclosure.

Exception: When located within a dwelling unit.

- (e) In buildings exceeding two stories, stairways shall abut on not more than one side of an elevator enclosure.

806.12 Stairway construction, exterior. Exterior exit stairways shall not be used as an element of a required means of egress for Group D occupancies. For occupancies in other than Group D, exterior exit ramps and stairways shall be permitted as an element of a required means of egress for buildings not exceeding six stories above grade plane or having occupied floors more than 75 feet above the lowest level of fire department vehicle access.

Exterior exit ramps and stairways serving as an element of a required means of egress shall be open on at least one side. An open side shall have a minimum of 35 square feet of aggregate open area adjacent to each floor level and the level of each intermediate landing shall be not less than 50 percent open, whichever is greater. The required open area shall be located not less than 42 inches above the adjacent floor or landing level.

- (a) Exterior stairways shall be constructed as required in Chapter 6, except that in Type IV, V and VI buildings, stairways may be of wood of not less than 2-inch nominal thickness.
- (b) Exterior stairways shall be protected as required for exterior walls where there is exposure to adjacent structures or to property lines.
- (c) Exterior stairways shall not project into an area where openings are required to be protected.
- (d) The walls and soffits of enclosed usable space under exterior stairs shall be protected by 1-hour fire-resis-

tance-rated construction or the fire-resistive rating of the stair enclosure, whichever is greater. Access to the enclosed usable space shall not be directly from within the stair enclosure.

- (e) Exterior stairways shall be arranged to avoid any impediments to their use by persons having a fear of high places. Exterior stairways more than 36 feet above the finished ground level, other than previously approved existing stairs, shall be provided with an opaque visual obstruction not less than 48 inches in height.

806.13 Stairway to roof. In every building of three or more stories, one stairway shall extend to the roof surface, unless the slope of the roof exceeds 4 feet in 12 feet.

806.14 Headroom. Every required stairway shall have a headroom clearance of not less than 6 feet, 8 inches. Such clearance shall be established by measuring vertically from a plane parallel and tangent to the stairway tread nosing to the soffit above at all points.

**SECTION 807
RAMPS**

807.1 Ramps as exits. A ramp conforming to the requirements of this Section may be used as a required exit.

807.2 Width. The width of ramps shall be as required for corridors.

807.3 Slope. The slope of a ramp measured in the direction of travel shall not exceed 1 foot in 12 feet. The slope measured perpendicular to the direction of travel (cross slope) shall not be steeper than one unit vertical in 50 units horizontal.

Exceptions:

1. Ramps complying with Subsection 816.6(j).
2. Ramps required to be accessible shall comply with the *EPCOT Accessibility Code for Building Construction*.

807.4 Handrails. A ramp with slope exceeding 1 foot in 20 feet shall have handrails as required for stairways, except that intermediate handrails shall not be required. If handrails are not continuous, they shall extend at least 12 inches beyond the top and bottom of the ramp segment and shall be parallel with the floor or ground surface.

Exception: Ramps with a rise of 6 inches or less.

807.5 Construction. Ramps shall be constructed as required for stairways.

807.6 Surface. The surface of ramps shall be roughened or shall be of nonslip materials.

807.7 Landings. Ramp runs shall have landings at the bottom and top, at turning points, at doors that open onto the ramp and at other locations so that no ramp run has a rise more than 30 inches. Landings shall be at least as wide as the widest ramp run adjoining the landing. The landing length shall be at least 60 inches minimum. Where changes of direction occur at landings provided between ramp runs, the landing shall be 60 inches by 60 inches minimum. The slope of landings in

any direction shall not be steeper than one unit vertical in 50 units horizontal. Changes in level are not permitted.

Exceptions:

1. Landings on ramps in individual dwelling units of Group R-2 and R-3 occupancies are permitted to be 36 inches by 36 inches minimum.
2. Landings on ramps required to be accessible shall comply with the *EPCOT Accessibility Code for Building Construction*.

**SECTION 808
HORIZONTAL EXITS**

808.1 As required exit. When conforming to the provisions of this Chapter, a horizontal exit may be considered as a required exit.

808.2 Openings. All openings in a wall pierced for a horizontal exit shall have an approved opening protective with a fire-resistive rating of not less than 1½ hours. Such opening protectives shall be maintained in operating condition as self-closing or automatic closing as provided in Subsection 704.3.

808.3 Discharge areas. A horizontal exit shall lead to a floor area having capacity for an occupant load not less than the occupant load served by such exit. The area into which the horizontal exit leads shall be provided with exits other than additional horizontal exits, as required by Section 803. The capacity shall be determined by allocating 3 square feet of net clear floor area for each occupant.

Exception: The net floor area allowable per occupant shall be as follows for the indicated occupancies:

1. Six square feet per occupant for occupancies in Group D-1.
2. Fifteen square feet per occupant for ambulatory occupancies in Group D-3.
3. Thirty square feet per occupant for nonambulatory occupancies in Group D-2.

**SECTION 809
EXIT ENCLOSURES**

809.1 Enclosures required. Every interior stairway, ramp or escalator shall be enclosed as required in this Section. (See Table 6.2.)

Exceptions:

1. In other than Group D occupancies, an enclosure will not be required for a stairway, ramp or escalator serving only one adjacent floor and not connected with corridors, escalators or stairways serving other floors. For enclosure of escalators in Group B and I occupancies, see Chapter 6.
2. Stairs within a single tenancy of Group R-2 and R-3 occupancies need not be enclosed.

809.2 Enclosure construction. Enclosure walls shall be of not less than 2-hour fire-resistive construction in buildings of

four or more stories, and shall be of not less than 1-hour fire-resistive construction in buildings of less than four stories.

809.3 Openings into enclosures. There shall be no openings into exit enclosures except exit doorways and openings in exterior walls. All exit enclosure doors in an exit enclosure shall have an approved opening protective with a fire-resistive rating of not less than 1 hour where 1-hour shaft construction is permitted, and 1½ hours where 2-hour shaft construction is required. Doors shall be maintained self-closing or shall be automatic closing as provided in Subsection 704.3. All stairway doors shall be unlocked and openable from the stairway side at each floor. The maximum transmitted temperature rise shall be not more than 450°F at the end of 30 minutes of the fire exposure specified in EPCOT Standard 7-2.

809.4 Extent of enclosure. Stairway and ramp enclosures shall include landings, parts of floors connecting stairway flights and a corridor on the ground floor leading from the stairway to the exterior of the building. Enclosed corridors or passageways shall not be required from unenclosed stairways.

809.5 Barrier at grade level exit. A stairway in an exit enclosure shall not continue below the grade level exit unless an approved barrier is provided at the ground level to prevent persons from unintentionally continuing to the lower level.

809.6 Prohibited uses. A stair enclosure shall be used for no purpose other than as an exit stairway.

**SECTION 810
SMOKE-PROTECTED ENCLOSURES**

810.1 Smokeproof enclosures and pressurized stairways. In buildings required to comply with Section 718 or 719, each of the exit enclosures serving a story with a floor surface located more than 75 feet above the lowest level of fire department vehicle access shall be a smokeproof enclosure or pressurized stairway in accordance with Subsection 720.20. The support-frame shall be protected as set forth in Table 6.2.

810.1.1 Termination and extension. A smokeproof enclosure or pressurized stairway shall terminate at an exit discharge or a public way. The smokeproof enclosure or pressurized stairway shall be permitted to be extended by an exit passageway in accordance with Section 811. The exit passageway shall be without openings other than the fire door assembly required by Subsection 809.3 and those necessary for egress from the exit passageway. The exit passageway shall be separated from the remainder of the building by 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 705, or both.

Exceptions:

1. Openings in the exit passageway serving a smokeproof enclosure are permitted where the exit passageway is protected and pressurized in the same manner as the smokeproof enclosure, and openings are protected as required for access from other floors.
2. Openings in the exit passageway serving a pressurized stairway are permitted where the exit pas-

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sageway is protected and pressurized in the same manner as the pressurized stairway.

3. The fire barrier separating the smokeproof enclosure or pressurized stairway from the exit passageway is not required, provided the exit passageway is protected and pressurized in the same manner as the smokeproof enclosure or pressurized stairway.

810.1.2 Enclosure access. Access to the stairway within a smokeproof enclosure shall be by way of a vestibule or an open exterior balcony.

Exception: Access is not required by way of a vestibule or exterior balcony for stairways using the pressurization alternative complying with Subsection 720.20.5.

810.1.3 Emergency lighting. The stairshaft and the vestibule shall be provided with emergency lighting. The standby generator, which is installed to operate the mechanical ventilation equipment, may be used for standby emergency lighting power supply.

810.1.4 Air-conditioned buildings. In buildings with air-conditioning systems or pressure air supply, a detector conforming to the requirements of Subsection 704.3(c) shall be placed in the main circulating air supply duct in the downstream side of any filters and so located as to operate and shut off the building system when smoke enters the airstream, or such device may be installed in each room or space served by a return air duct.

810.1.5 Periodic tests of mechanical equipment. The building engineer shall test the mechanical ventilating equipment every 7 days and shall maintain a record of the results. The record shall be available for inspection by the Building Official or his representative.

SECTION 811 EXIT PASSAGEWAYS

811.1 Exit passageways. An exit passageway shall not be used for any purpose other than as a means of egress. Passageways shall have wall, floor and ceiling assemblies of the same construction type as the building, but such assemblies shall be not less than 2-hour fire-resistive construction. Openings in exit passageways shall be limited to those necessary for exit access to the exit passageway from normally occupied spaces and for egress from the exit passageway. Elevators shall not open into an exit passageway. Penetrations into and openings through an exit passageway are prohibited, except for required exit doors, equipment and ductwork necessary for independent pressurization, sprinkler piping, standpipes, electrical raceway for fire department communication and electrical raceway serving the exit passageway and terminating at a steel box not exceeding 16 square inches. Such penetrations shall be protected in accordance with Subsection 707.10.

811.2 Width.

- (a) Every exit passageway shall be at least as wide as the required total width of the tributary exits, but not less than 44 inches. The width shall be based on the occupant load served.

Exception: Exit passageways serving an occupant load of less than 50 shall be not less than 36 inches in width.

- (b) The required width of exit passageways shall be unobstructed. Doors, when fully opened, and handrails shall not reduce the required width by more than 7 inches. Doors in any position shall not reduce the required width by more than one-half.

811.3 Openings. All openings into an exit court less than 10 feet wide shall be protected with self-closing doors having a ³/₄-hour fire-resistive rating or with fixed wired glass.

Exception: All openings more than 10 feet above the floor of the exit court may be unprotected.

SECTION 812 EXIT DISCHARGE

812.1 General. Exits shall discharge directly to the exterior of the building. The exit discharge shall be at grade or shall provide direct access to grade. The exit discharge shall not reenter a building.

Exceptions:

1. A maximum of 50 percent of the number and capacity of the exit enclosures is permitted to egress through areas on the level of discharge when each of the following are met:
 - 1.1. Such exit enclosures shall provide egress to a free and unobstructed way to the exterior of the building that is readily visible and identifiable from the point of termination of the exit enclosure.
 - 1.2. The entire area of the level of discharge is separated from areas below by construction conforming to the fire-resistance rating for the exit enclosure.
 - 1.3. The egress path from the exit enclosure on the level of discharge is protected throughout by an approved automatic sprinkler system.
2. A maximum of 50 percent of the number and capacity of the exit enclosures is permitted to egress through a vestibule when each of the following are met:
 - 2.1. The entire area of the vestibule is separated from areas below by construction conforming to the fire-resistance rating for the exit enclosure.
 - 2.2. The depth from the exterior of the building is not greater than 10 feet and the length is not greater than 30 feet.
 - 2.3. The area is separated from the remainder of the level of exit discharge by construction providing protection at least the equivalent of approved wired glass.
 - 2.4. The area is used only for means of egress and exits directly to the outside.

812.2 Exit discharge capacity. The capacity of the exit discharge shall be not less than the required discharge capacity of the exits being served.

812.3 Exit discharge location. Exterior balconies, stairways and ramps shall be located at least 10 feet from adjacent lot lines and from other buildings on the same lot unless the adjacent building exterior walls and openings are protected in accordance with Table 6.2 and Subsection 701.4 based on fire separation distances.

812.4 Exit discharge components. Exit discharge components shall be sufficiently open to the exterior so as to minimize the accumulation of smoke and toxic gases.

812.5 Exit discharge through egress courts.

- (a) Egress courts shall be at least as wide as the required total width of the tributary exits, but not less than 44 inches. The width shall be based on the occupant load served.

Exception: Egress courts serving an occupant load of less than 50 shall be not less than 36 inches in width.

- (b) The required width of egress courts shall be unobstructed. Doors, when fully opened, and handrails shall not reduce the required width by more than 7 inches. Doors in any position shall not reduce the required width by more than one-half. Where an egress court exceeds the minimum required width and the width of such egress court is then reduced along the path of exit travel, the reduction in width shall be effected gradually by a guardrail at least 42 inches high. The guardrail shall make an angle of not more than 30 degrees with the axis of the egress court.
- (c) Where an egress court is less than 10 feet in width, the egress court walls shall be not less than 1-hour fire-resistance-rated exterior walls for a distance of 10 feet above the floor of the court, and openings therein shall be equipped with fixed or self-closing, $\frac{3}{4}$ -hour opening protective assemblies.

812.6 Access to a public way. The exit discharge shall provide a direct and unobstructed access to a public way.

Exception: Where access to a public way cannot be provided, a safe dispersal area shall be provided where all of the following are met:

1. The area shall be sized to accommodate at least 5 square feet for each person.
2. The area shall be located on the same property at least 50 feet away from the building requiring egress.
3. The area shall be permanently maintained and identified as a safe dispersal area.

The area shall be provided with a safe and unobstructed path of travel from the building.

SECTION 813 EXIT SIGNS AND EGRESS ILLUMINATION

813.1 Exit signs.

- (a) All required exits shall be equipped with approved exit signs in all occupancies with an occupant load of 50 or more persons and at the entrance to all interior stairways that lead to the exterior.

Exception: In Group D and E occupancies, exit signs shall be required with an occupant load of more than 10 persons.

- (b) Where an exit sign or the exit is not visible from the exit access, directional signs indicating the means of egress shall be provided unless otherwise approved by the Building Official. In no case shall directional exit signs be located more than 100 feet from the nearest visible exit sign.
- (c) All exit and exit directional signs shall have letters at least 6 inches high with a minimum stroke of $\frac{3}{4}$ inch and shall be of distinctive, contrasting color and designation as to be readily visible. Signs shall provide a contrast with decoration, interior finish or other signs.
- (d) All exit and exit directional signs shall be illuminated, externally or internally, by a reliable light source. Externally and internally illuminated signs shall be legible in both the normal and emergency lighting mode. Externally illuminated signs shall be illuminated by not less than 5 footcandles at the illuminated surface and shall have a contrast ratio of not less than 0.5. Illumination of exit signs shall be continuously supplied through separate electric circuits or service. Battery-operated electric lights and portable lanterns shall not be used for primary illumination. Fluorescent or reflective materials may be used as a substitute for any required illumination when approved by the Building Official. (Storage batteries in compliance with Article 700 of the *National Electrical Code* are permitted.)

Exceptions:

1. Where a main entrance serves as an exit and is clearly visible to the occupants, an exit sign is not required over the main entrance door.
2. Exit signs located in a show-type installation may not be illuminated at all times when the building is occupied by the public when all of the following conditions are met:
 - (a) Each installation will be reviewed and approved by the Building Official on a show-by-show review.
 - (b) Each exit sign will be illuminated upon activation of any initiating device or notification appliance, including fire water flow, by the building fire alarm system.

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- (c) Each exit sign will be illuminated upon normal power failure.
 - (d) Each exit sign will be illuminated upon activation of the building work lights and/or egress illumination.
 - (e) Each exit sign shall be connected to either the emergency stop switch located on the show ride console for amusement rides and devices or the show control stop switch on the show control console for amusement attractions and special amusement buildings.
- (e) All exit signs shall be located not higher than 12 inches above the door to the bottom of the required exit sign.

Exception: See Subsection 5-12.401.1(b) for special exit sign location requirements for amusement buildings and amusement attractions.

- (f) Regardless of occupant load, in any case where the exit is not visible or the direction of exit is not clear, exit signage shall be provided indicating the means of egress.

813.2 Egress illumination.

- (a) Except in Group R-3 occupancies, the means of egress serving the occupied portion of the building shall be illuminated to a level of not less than 1 footcandle measured at the floor level whenever the building is occupied. During conditions of stair use, the minimum illumination for new stairs shall be at least 10 footcandles measured at the walking surface.

Exception: In assembly occupancies, the illumination of the walking surfaces of exit access shall be at least 0.2 footcandle measured at the floor level during periods of performances or projections involving directed light.

- (b) For the purposes of this requirement, exit access shall include only designated stairs, aisles, corridors, ramps, escalators and passageways leading to an exit. For the purposes of this requirement, exit discharge shall include only designated stairs, aisles, corridors, ramps, escalators, walkways and exit passageways leading to a public way.
- (c) Required illumination shall be arranged so that the failure of a single lighting unit will not result in an illumination level in any designated area of less than 0.2 footcandle.
- (d) In new construction, when required by the Building Official, a lighting analysis prepared by a lighting engineer shall be provided demonstrating compliance with these requirements.
- (e) Exit signs shall be illuminated at all times when the building is occupied, except as noted in Subsection 813.1(d).
- (f) Directional floor lighting shall be permitted in amusement attractions, special amusement buildings, amusement devices or rides.

- (g) Automatic, motion sensor-type lighting switches shall be permitted within the means of egress, provided that the switch controllers comply with all of the following:
 1. The switch controllers are listed.
 2. The switch controllers are equipped for fail-safe operation and evaluated for this purpose.
 3. The illumination timers are set for a minimum 15-minute duration.
 4. The motion sensor is activated by any occupant movement in the area served by the lighting units.
 5. The switch controller is activated by activation of the building fire alarm system, if provided.

813.3 Emergency power.

- (a) The power supply for exit signs and egress illumination required by Subsections 813.1 and 813.2 shall normally be provided by the premise's electrical supply system. In the event of power supply failure, emergency sources of power complying with the *EPCOT Electrical Code* shall be permitted.
- (b) The emergency source of power shall provide power for a duration of not less than 90 minutes. Egress illumination shall be arranged to provide initial illumination with light equivalent of not less than an average of 1 footcandle and a minimum at any point of 0.1 footcandle measured along the path of egress at the floor level.
- (c) Illumination levels shall be permitted to decline to 60 percent of the initial level at the end of the emergency lighting duration. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

SECTION 814 PANIC HARDWARE

814.1 Panic hardware required. Unless otherwise required in this Code, all exit doors serving an occupant load of 50 or more and Group E occupancies shall be provided with panic hardware or fire exit hardware. Such hardware shall release with an unlatching force of no more than 15 pounds applied to the releasing devices in the direction of the exit travel. Panic hardware may be bars or panels extending not less than one-half the width of the door and placed at heights suitable for the service required, but not less than 30 inches, nor more than 44 inches above, the floor. Whenever panic hardware is used on a labeled fire door, the panic hardware shall be labeled as fire exit hardware.

Exception: Doors for individual classrooms located in a Group E occupancy.

814.2 If balanced doors are used and panic hardware is required, the panic hardware shall be of the pushpad type and the pad shall not extend more than one-half the width of the door measured from the latch side.

814.3 See Subsection 804.3 for exceptions.

SECTION 815 EXIT OBSTRUCTIONS

815.1 Obstruction prohibited. No obstruction shall be placed in an aisle, exit, foyer, passageway or corridor, except as permitted by this Chapter.

SECTION 816 SPECIAL EXIT REQUIREMENTS— GROUP A-1 TO A-5 OCCUPANCIES

816.1 General requirements. Buildings housing Group A-1 to A-5 occupancies shall be provided with means of egress in accordance with the requirements of this Chapter and with the provisions of Subsections 816.2 to 816.7 that follow.

Exception: For show/ride occupancies, see Subsection 803.2(a) for exit widths.

816.2 Main exit. Every Group A-1 occupancy shall have a main exit wide enough to accommodate one-half the total occupant load of the auditorium. The main exit shall be not less than the total width of all aisles, exit passageways and stairways leading thereto, and shall connect to a stairway or ramp leading to a public way.

816.3 Side exits. Every auditorium of a Group A-1 occupancy shall be provided with exits on each side, of sufficient width, to accommodate one-third of the total occupant load served. Side exits shall open directly to a public way, or into an egress court, approved stairway or exit passageway leading to a public way. Side exits shall be accessible from a cross aisle.

816.4 Balcony exits. Balconies having an occupant load of more than 10 shall have two exits directly to an exterior stairway or approved stairway or ramp. Where there is more than one balcony, exits from each shall open to an exterior stairway, enclosed stairway or ramp, and shall be accessible from a cross aisle. The number and distribution of exits shall be as specified in Section 803.

816.5 Stage exits. At least one exit not less than 36 inches wide shall be provided from each side of the stage opening directly or by means of a passageway not less than 36 inches wide to a street or egress court. An exit stairway not less than 2 feet, 6 inches wide shall be provided for egress from each fly gallery. Each tier of dressing rooms shall have at least two means of egress not less than 2 feet, 6 inches wide. All stage exits shall be constructed as required in Section 806, but the stairways required in this Subsection need not be enclosed.

816.6 Aisles.

- (a) Every part of buildings in which seats, tables, merchandise, equipment or similar materials are installed shall have aisles with each aisle leading to an exit.
- (b) With standard seating, aisles shall be not less than 3 feet wide if serving only one side, and not less than 3 feet, 6 inches wide if serving both sides, measured at the point farthest from an exit, cross aisle or foyer. The width shall be increased by 1½ inches for each 5 feet of length toward the exit, cross aisle or foyer.
- (c) With continental and modified-continental seating, as defined in Subsection 801.4 and as specified in Subsection 816.7(a), side aisles shall be not less than 44 inches wide.

- (d) With modified-continental seating, the width of intervening aisles shall be based on 50 percent of the total occupant load served, but not less than 3 feet, 6 inches wide. The width shall be increased by 1½ inches for each 5 feet of length toward the exit, cross aisle or foyer.
- (e) In areas occupied by seats and in Group A occupancies without seats, the line of travel to an exit door by an aisle shall be not more than 150 feet.
- (f) With continental and modified-continental seating, the number of seats per row of seats may be increased subject to the conditions of Subsection 816.7(b).
- (g) With continental seating, the number of intervening seats may be increased to 29 when exit doors are provided along each side aisle of the row of seats at the rate of one pair of exit doors for each five rows of seats. Such exit doors shall have a minimum clear width of 66 inches.
- (h) Aisles shall terminate in a cross aisle, foyer or exit. The width of the cross aisle shall be not less than the sum of the required width of the widest aisle plus 50 percent of the total required width of the remaining aisles leading thereto. In Group A and E occupancies, aisles shall not form dead ends more than 20 feet long.
- (i) Vomitories connecting the foyer or main exit with the cross aisles shall have a total net width of not less than the sum of the required width of the widest aisle leading thereto, plus 50 percent of the total required width of the remaining aisles leading thereto.
- (j) Where aisles are sloped, the slope shall be not more than 1 foot in 8 feet.

Exception: In Group A-1, A-2 and A-3 occupancies, the slope of the ramp may be 1 foot in 5 feet without handrails.

816.7 Seats and clear width of rows.

- (a) Where seating rows have 14 or fewer seats, the row minimum clear width shall be not less than 12 inches 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 measurements shall be made with the seat in the down position. For seats with folding tablet arms, row spacing shall be determined with the tablet arm down.
- (b) For rows of seating served by aisles or doorways at both ends, there shall be no more than 100 seats per row and the row minimum clear width of 12 inches shall be increased by 0.3 inch for every additional seat beyond 14, but the minimum clear width need not exceed 22 inches.
- (c) For rows of seating served by an aisle or doorway at one end only, minimum clear width of 12 inches between rows shall be increased by 0.6 inch for every additional seat beyond seven, but the minimum clear width need not exceed 22 inches.
- (d) For rows of seating served by an aisle or doorway on one end only, the path of travel shall not exceed 30 feet

from any seat to a point where a person has a choice of two paths of travel to two exits.

816.8 Continental and modified seating. With continental and modified-continental seating, the spacing of rows of unoccupied seats shall provide a clear width between rows of seats measured horizontally as follows: (automatic or self-rising seats shall be measured in the seat-up position, other seats shall be measured in the seat-down position)

Number of Seats in Row	Clear Space (Inches)
1 to 18	18
19 to 35	20
36 to 45	21
46 to 59	22
60 or more	24

Exit doors shall be provided along each side aisle of the row of seats at a rate of one pair of doors for each five rows of seats. Each pair of exit doors shall provide a minimum clear width of 66 inches discharging into a foyer, lobby or exterior of building. There shall be not more than five seat rows between pairs of doors.

816.9 Foyers and lobbies. In theaters and similar Group A occupancies, where persons are admitted to the building at times when seats are not available and are allowed to wait in a lobby or similar space, such use of lobby or similar space shall not encroach upon the required clear width of exits. Such waiting areas shall be separated from the required exitways by substantial permanent partitions or by fixed rigid railings not less than 42 inches high.

816.10 Stairs and handrails.

- (a) See Subsection 806.3 for stairway riser and tread requirements.
- (b) For the purpose of this Section, 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 ³/₈ 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 wide and a maximum of 2 inches wide.
- (c) Handrails at ramps shall comply with Subsection 807.4. Handrails at aisle stairways shall comply with Subsection 806.8(b), except 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 and not greater than 36 inches, measured horizontally, and the handrail shall have rounded terminations or bends. Where handrails are provided in the middle of aisle stairs, there shall be an additional intermediate handrail located approximately 12 inches below the main handrail.

Exception: Handrails for ramps or stairs required to be accessible shall comply with the *EPCOT Accessibility Code for Building Construction*.

**SECTION 817
SPECIAL EXIT REQUIREMENTS—
GROUP A-6 AND A-7 OCCUPANCIES**

817.1 Scope. In addition to the applicable requirements of Sections 801 to 816, Group A-6 and A-7 occupancies, including stadiums, reviewing stands, grandstands and bleachers constructed or erected in the District prior to and subsequent to the enactment of this Code, shall conform to the provisions of this Section and the *EPCOT Fire Prevention Code*.

817.2 Definitions.

- (a) **Exit.** Point of opening directly into a safe dispersal area of a public way. All measurements shall be made to that point when determining the distance of travel.
- (b) **Safe dispersal area.** An area that will accommodate a number of persons equal to the total capacity of the stadium, reviewing stand, grandstand or bleacher, and the building it is tributary to, in such a manner that no person within the area need be closer than 50 feet to the structure or the building. Dispersal areas shall have not less than 3 square feet per person.
- (c) **Stand.** A reviewing stand, grandstand or bleacher. [See Subsection 506.4(f).]

817.3 Height of stands. Grandstands and similar structures of combustible framing shall be not more than 11 rows or 9 feet high.

Exception: Open-air grandstands and bleachers of Type I, II or IV construction shall not be limited in height or area.

817.4 Spacing of seats.

- (a) The minimum spacing of rows of seats, measured from back to back, shall be as follows:

Seats without backrests in open-air stands	22 inches
Seats with backrests in open-air stands	30 inches
Chair seating	33 inches

There shall be a space of not less than 12 inches between the back of each seat and the front of the seat immediately behind it.

- (b) The maximum rise from one row of seats to the next row shall be not more than 16 inches.
- (c) For determining the seating capacity of a stand, the width of any seat shall be not less than 18 inches, nor more than 19 inches.
- (d) The maximum number of seats between any seat and an aisle shall be as follows:

Seats without backrests in open-air stands	15
Seats with backrests in open-air stands	9
Seats without backrests in buildings	9
Seats with backrests in buildings	6

817.5 Securing of chairs.

- (a) Chairs and benches used on raised stands shall be securely fastened to the platforms on which they are placed. When not more than 25 chairs are used on a single raised platform, the seats need not be fastened.

- (b) When more than 500 loose chairs are used in connection with outdoor athletic events, conventions or other gatherings, the chairs shall be fastened together in groups of not less than three.

817.6 Aisles.

- (a) Aisles shall be provided in all stands as required in Subsection 816.6.
- (b) Aisles may be omitted when all of the following conditions exist:
 1. Seats are without backrests.
 2. The rise from row to row does not exceed 12 inches.
 3. The number of rows does not exceed 11.
 4. The top seating board is not more than 10 feet above grade.
 5. The first seating board is not more than 20 inches above grade.
- (c) When an aisle is elevated more than 8 inches above grade, the aisle shall have a stairway or ramp, the width of which is not less than the width of the aisle.
- (d) No aisle shall have a dead end more than 16 rows deep regardless of the number of seats required.
- (e) Aisles shall be not less than 42 inches wide.

817.7 Stairs and ramps.

- (a) See Subsection 806.3 for stairway riser and tread requirements.
- (b) For the purpose of this Section, 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 $\frac{3}{8}$ 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 wide and a maximum of 2 inches wide.
- (c) Handrails at ramps shall comply with Subsection 807.4. Handrails at aisle stairways shall comply with Subsection 806.8(b), except 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 and not greater than 36 inches, measured horizontally, and the handrail shall have rounded terminations or bends. Where handrails are provided in the middle of aisle stairs, there shall be an additional intermediate handrail located approximately 12 inches below the main handrail.

Exception: Handrails for ramps or stairs required to be accessible shall comply with the *EPCOT Accessibility Code for Building Construction*.

- (d) The slope of a ramp shall be not more than 1 foot in 12 feet. Ramps shall be roughened or shall be of approved

nonslip material. A ramp with a slope of more than 1 foot in 20 feet shall have handrails, and stairways from stands shall have handrails conforming to the requirements of Subsection 902.2(h).

817.8 Guardrails.

- (a) Guardrails shall be required in all locations where the top of a seat plank is more than 4 feet above grade and the front of the stand is elevated more than 2 feet above grade. Guardrails shall be designed in accordance with Subsection 902.2(h).
- (b) Railings shall be 42 inches above the rear of the seat plank or 42 inches above the rear of the steps in an aisle when the guardrail is parallel to and adjacent to the aisle. The height may be reduced to 36 inches when the guardrail is located in front of the grandstand, except at the end of aisles.
- (c) When seats are at the extreme end or at the extreme rear of the bleacher or grandstand adjacent to the guardrail, two midrails shall be provided. The open space between the seat and the lower midrail shall be 10 inches maximum. The space between the guardrail and the lower midrail shall be bisected by the upper midrail.
- (d) Guardrails may be omitted when stands are placed directly against a wall or fence giving equal protection.

817.9 Handrails. Handrails at the front of stands and adjacent to an aisle shall be designed to resist a load of 50 pounds per lineal foot applied at the top rail.

817.10 Footboards. Footboards shall be provided for all rows of seats above the third row, or beginning where the seat plank is more than 2 feet above grade. Where the same level is used for both seats and footboards, and these levels are not less than 22 inches wide, footboards shall not be required.

817.11 Exits from stands.

- (a) **Distance to exit.** The line of travel to an exit from a stand shall be not more than 150 feet. For stands with seats without backrests, this distance may be measured by direct line from a seat to the exit from the stand.
- (b) **Aisle used as exit.** An aisle may be considered as only one exit, unless it is continuous at both ends to a required building exit or to a safe dispersal area.
- (c) **Two exits required.** Two exits shall be required for the following Group A-6 and A-7 occupancies.
 1. Every stand or section of a stand in a building with an occupant load of 50 or more.
 2. A stand with the first seat plank not more than 20 inches above grade or floor level may be considered to have two exits when the bottom of the stand is open at both ends.
 3. Every open-air stand with seats without backrests and with an occupant load of 300 or more.
- (d) **Three exits required.** Three exits shall be required for the following Group A-6 and A-7 occupancies.
 1. Stands within the building, and with an occupant load of 300 or more.

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2. Open-air stands with seats without backrests and with an occupant load of 1,000 or more.
- (e) **Four exits required.** Four exits shall be required for the following Group A-6 and A-7 occupancies.
 1. Stand or sections of stands within the building, and with an occupant load of 1,000 or more.
 2. Open-air stands with seats without backrests, and with an occupant load of 3,000 or more.
- (f) **Determination of exit width.** The total width of exits, in feet, shall be not less than the total occupant load divided by 50, except as follows:
 1. For open-air stands with seats without backrests, the total width, in feet, shall be not less than the total occupant load served divided by 150, when stairways are used as exits, and 200 when horizontal exits or ramps are used.
 2. When both stairways and horizontal exits are used, the total width of exits shall be determined by using either 150 or 200, whichever is applicable.
- (g) **Minimum exit width.** Exits shall be not less than 42 inches wide.
- (h) **Exit arrangement.** Exits shall be placed a reasonable distance apart. When only two exits are provided, they shall be spaced not less than one-fifth of the perimeter apart.
- (i) **Exits from dispersal area.** Each safe dispersal area shall have at least two exits. When 6,000 or more persons are accommodated within a safe dispersal area, there shall be a minimum of three exits, and where 9,000 or more persons are accommodated, there shall be at least four exits. The aggregate clear width of exits from a safe dispersal area shall be determined on the basis of not less than 22 inches (one exit unit) for each 500 persons to be accommodated. The minimum width of the exit shall be 44 inches. Exits shall be located a reasonable distance apart but shall be spaced not less than one-fifth of the perimeter of the area from each other.
- (j) **Locking devices.** Requirements for panic hardware (see Section 814) may be waived on gates surrounding stadiums, when the gates are under constant supervision while the public is present, and when the safe dispersal areas are based on 3 square feet per occupant and are located between the stadium and the fence. The required dispersal area shall be located not less than 50 feet from the stadium.

SECTION 818 SPECIAL EXIT REQUIREMENTS— GROUP B OCCUPANCIES

818.1 Scope. Buildings housing Group B occupancies shall be provided with means of egress in accordance with the requirements of this Chapter and the special provisions in Subsections 818.2 and 818.3.

818.2 Group B, Division 3.

- (a) Where persons other than parking attendants are permitted to enter a Group B-3 occupancy, stairways and

exits shall meet the requirements of Sections 801 and 813 of this Chapter. The occupant load shall be based on 200 square feet per occupant. Where no persons other than parking attendants are permitted to enter, there shall be not less than two stairways, each 3 feet wide. Lifts may be installed for use of employees when meeting the requirements of EPCOT Standard 5-1.

- (b) Enclosure of vertical openings shall not be required, except as provided in Paragraph (a).

818.3 Group B, Division 4.

- (a) Exits and stairways from helistops shall comply with the provisions of Chapter 8, except that landing areas located on buildings or structures shall have two or more exits. For landing platforms or roof areas less than 60 feet long or less than 2,000 square feet in area, the second exit may be a fire escape or ladder leading to the floor below.
- (b) Enclosure of vertical openings shall not be required, except as provided in Paragraph (a).

SECTION 819 SPECIAL EXIT REQUIREMENTS— GROUP D OCCUPANCIES

819.1 Scope. Buildings housing Group D occupancies shall be provided with means of egress in accordance with the requirements of this Chapter and the special provisions in Subsections 819.2 through 819.7, and shall comply with the requirements of EPCOT Standard 5-2.

819.2 Separate access. Every room in a Group D occupancy shall have access to at least two approved means of egress from the building without passage through intervening rooms other than corridors or lobbies. All required exterior exit doors shall open in the direction of exit travel.

819.3 Minimum size of exits. Every opening through which patients are transported in wheelchairs, stretchers or beds shall be wide enough to permit the ready passage of such equipment, but shall be not less than 44 inches in clear width. Projections shall not be permitted within the 44-inch clear width.

819.4 Corridors.

- (a) The minimum clear width of all corridors in Group D occupancies shall be 44 inches, except corridors serving an area housing one or more nonambulatory patients, which shall be not less than 8 feet wide. Where there is a change of elevation, ramps shall be used and shall be constructed in accordance with Section 807. In jails, prisons, reformatories and other places of detention, where open, barred corridors are provided, corridors and cell doors are not required to be fire resistive.
- (b) Corridors in all Group D institutional occupancies shall be subdivided by smoke-protected partitions at intervals of not more than 150 feet. Doors in such partitions shall be tight fitting. Such doors may have wired glass panels of not more than 720 square inches.

Smoke-stop doors [see Subsection 805.8(a)] shall open in the direction of exit travel and shall have

approved door-holding devices of the type that releases the door, causing it to close when products of combustion other than heat are detected by a device complying with the requirements of EPCOT Standard 7-4.

819.5 Basement exits. One exit accessible to every room below grade shall lead directly to the exterior of the building at grade level.

819.6 Ramps. Every room in a Group D-1 occupancy housing bed patients shall have access to a horizontal exit or ramp leading directly to the exterior of the building at the ground-floor level.

819.7 Hardware.

- (a) Exit doors serving an occupant load of more than 50 shall not have latches or locks, except panic hardware.
- (b) Doors to patients' rooms and bathrooms shall be readily openable from either side without the use of a key or tool, or any special knowledge or effort.
- (c) No requirement of this Subsection shall prohibit cell-block construction in jails, or the use of locks or safety devices for forceful restraint of inmates.
- (d) In buildings housing occupancies in which the personal liberties of inmates or patients are restrained within the building, and which are constructed in conformance to the special provisions of Section 509, the exterior doors may be fastened with locks, provided that room doors shall not be fastened except by doorknob latches or similar devices, and can be opened readily from the corridor side without the use of a key or tool, or any special knowledge or effort.

**SECTION 820
SPECIAL EXIT REQUIREMENTS—
GROUP E OCCUPANCIES**

820.1 Scope. Buildings housing Group E occupancies shall be provided with ways of departure in accordance with the requirements of this Chapter and the special provisions of Subsections 820.2 through 820.8.

820.2 Corridors and exterior exit balconies.

- (a) The width of corridors and exterior exit balconies in Group E occupancies shall be as required in Section 805, but not less than 6 feet.

Exception: When the occupant load served is less than 100, the corridor may be 44 inches wide.

- (b) Corridor walls and ceilings shall be of not less than 1-hour fire-resistive construction with openings protected as required in Subsection 510.7, except when each instructional room has at least one ground-level exit and when assembly rooms have at least one-half of the required exits direct to the exterior at ground level.
- (c) Ramps shall be used where there is a change of elevation of less than 2 feet in a corridor or exterior exit balcony.

820.3 Exits direct to the exterior.

- (a) Every room in a Group E-1 occupancy shall have an exit direct to the exterior of the building or to an exte-

rior exit balcony. In lieu of this requirement, corridors, stairways, storage rooms, laboratories and administrative areas shall be protected with an approved automatic fire-extinguishing system that shall be connected to the school fire alarm system.

- (b) Classrooms having openable windows not more than 36 inches above the floor and not more than 6 feet above the adjacent ground level, usable for emergency exit, need not have exits that lead directly to the exterior, nor need they be provided with an approved automatic fire-extinguishing system, unless such system is required by other provisions of this Code.

820.4 Exits serving school auditoriums. Where an auditorium is not used at the same time as other rooms in the building, an exit serving both the auditorium and the other rooms shall comply with the requirements for width calculated for the largest occupant load.

820.5 Stairways. Each floor above or below the ground floor shall have not less than two exit stairways. The required exit width shall be divided equally between such stairways, but no stairway serving an occupant load of more than 100 shall be less than 5 feet in clear width.

820.6 Exit doors.

- (a) The width of exit doors from corridors, halls and stairways shall be sufficient to accommodate the occupant load served.
- (b) Exit doors in classrooms having an occupant load of more than 50 shall swing in the direction of travel.

820.7 Rooms below grade.

- (a) At least one exit accessible to every room below grade shall lead directly to the exterior of the building at grade level.
- (b) Classrooms located in basements shall have one exit opening directly to the exterior of the building from each room.

820.8 Fences and gates. School grounds may be fenced in and gates may be equipped with locks, provided that safe dispersal areas located not less than 50 feet from the buildings are available for escape of persons from the area between buildings and fence. Size of dispersal areas shall be based on an area of not less than 3 square feet per occupant. Gates that comply with exit requirements for dispersal areas in Subsection 817.11, may be permitted across corridors or passageways leading to such dispersal areas.

**SECTION 821
SPECIAL EXIT REQUIREMENTS—
GROUP H OCCUPANCIES**

821.1 Scope. Buildings housing Group H occupancies shall be provided with means of egress in accordance with the requirements of this Chapter and the special provisions of Subsection 821.2.

821.2 Exits required.

- (a) Every part of a Group H occupancy having a floor area of 200 square feet or more shall be served by at least two separate exits.

- (b) In Group H, Division 1 and 2 occupancies, no part of any room shall be more than 75 feet from an exit door.
- (c) Doors leading to a corridor of fire-resistive construction shall have a $\frac{3}{4}$ -hour fire protection rating and shall have not more than 100 square inches of wired glass set in steel frame, shall be maintained self-closing or shall be automatic closing as required by Subsection 704.3 and shall open in the direction of exit travel.

**SECTION 822
SPECIAL EXIT REQUIREMENTS—
GROUP R OCCUPANCIES**

822.1 Scope. Buildings housing Group R occupancies shall be provided with means of egress in accordance with the requirements of this Chapter and with the special provisions in Subsections 822.2 to 822.5.

822.2 Two exits required. Rooms, suites of rooms or floor space above the ground floor shall have access to not less than two independent exits. Exit or exit access doors shall be arranged in accordance with Subsection 803.3.

822.3 Travel distance within a guest room or dwelling unit. In buildings more than one story in height housing Group R, Division 1 and 2 occupancies, the maximum distance of the path of egress travel shall not exceed 50 feet from any point within a guest room or dwelling unit.

822.4 Exit and exit access doors.

- (a) In Group R, Division 1 and 2 occupancies, each independent room, or each suite or apartment shall have at least one exit or exit access door of the swing-type opening into a public corridor or hallway.
- (b) Doors opening from guest rooms to public corridors shall be protected as required in Subsection 805.8.
- (c) Doors opening from a public hall, or from another public space into a bedroom suite or rooms, or an apartment shall be equipped with a substantial lock.
- (d) There shall be one or more exit or exit access doors for dormitories with less than 450 square feet of floor space. Rooms with an area of 450 square feet or more shall have two exit or exit access doors located in accordance with Subsection 801.3.

822.5 Emergency escape and rescue openings for Group R occupancies. In all Group R occupancies, sleeping rooms below the fourth floor of a building shall have at least one openable window or exterior door to permit emergency escape or rescue. Where windows are provided, they shall have a sill height of not more than 44 inches above the floor. Windows having not less than 5.7 square feet of openable area with a clear opening height not less than 24 inches and a clear opening width not less than 20 inches shall be considered to meet the requirements of this Subsection. The door or window shall have direct access to a street, public space, yard or court, or to an exterior exit balcony that opens to a street, public space, yard or court.

Exception: Doors meeting Subsection 822.4.

822.6 Stairways.

- (a) In buildings of not more than five stories with balconies or verandas, where each room, suite or apartment opens direct to the balcony or veranda, required stairways may extend from ground level to the fifth floor on the outside. No window, door or other opening shall be less than 10 feet from any part of the stairway; except that all doors or window openings less than 10 feet from the exit stairway shall be of approved construction and shall have a $\frac{3}{4}$ -hour fire rating. Such doors shall be self-closing and protection from the elements shall be provided as required by the Building Official. Balconies and verandas include galleries, all of which shall be roofed.
- (b) Required exterior stairways of buildings of three stories or more shall be roofed.
- (c) All interior stairways shall have solid risers, except that interior stairways within individual units may have open risers when they are of noncombustible construction or have a 1-hour fire-resistive rating. Exterior stairways may have open risers. A nosing shall overlap any open riser by not less than 1 inch, nor more than 2 inches.
- (d) All openings within 10 feet of exterior stairways or fire escapes shall be protected with approved self-closing fire doors or approved fire windows.
- (e) Exterior stairways, unless required to be enclosed with noncombustible materials in accordance with other provisions of this Code, shall be provided with metal mesh or other rigid guards at least 3 feet high on each unenclosed side of the stairway from any point of tread or railing. All glass used in the construction of such enclosures shall be wired glass.

CHAPTER 9

DESIGN REQUIREMENTS

SECTION 901 GENERAL LOAD REQUIREMENTS

901.1 Definitions. For the purpose of this Chapter, certain terms are defined as follows:

- (a) **Collateral load.** The dead load in a pre-engineered building, which is over and above the weight of the pre-engineered building system.
- (b) **Dead load.** The dead load of a building shall include the weight of the walls, permanent partitions, framing, floors, roofs and all other permanent stationary construction entering into and becoming a part of a building.
- (c) **Live load.** The live load includes all loads except dead and lateral loads.
- (d) **Partition loading.** A dead load that is added to the dead loading (and not to be reduced by live load reduction) where partitions may be erected or rearranged. [See Subsection 902.2(b).]

901.2 Loads. Buildings and all parts thereof shall be of sufficient strength to support estimated or actual imposed loads in addition to their own dead load without exceeding the stresses set forth in this Code, but no building or part thereof shall be designed for loads less than those specified in this Chapter.

901.3 Design.

- (a) Any system or method of construction to be used shall permit a rational analysis in accordance with well established principles of mechanics.
- (b) Permitted stresses and soil-bearing values specified in this Code for working stress design may be increased one-third when considering wind forces either acting alone or when combined with vertical loads. No increase will be allowed for vertical loads acting alone.
- (c) Load factors for ultimate strength design of concrete and plastic design of steel, and load and resistance factor design of steel shall be as specified in Chapter 10, regulations for use of the materials of construction.
- (d) Load combinations on buildings and other structures shall be determined in accordance with EPCOT Standard 9-7, Section 2. Under stated load combinations, increases in allowable stresses of materials shall not be permitted, except that a load duration factor in EPCOT Standard 1010-1 shall be allowed. The effect of the most unfavorable combinations of loads and conditions of loading affecting the design shall be taken into account, except as otherwise provided herein. Crane hook loads need not be combined with the roof live load or with more than three-fourths of the snow load or one-half of the wind load. Buoyancy in the design for uplift shall use the water table at the top of the ground unless a positive method is provided to lower it.

- (e) The dead loads used in the design shall not be less than the actual dead load of construction and shall not be less than the dead loads listed in Appendix P unless specifically approved by the Building Official.
- (f) The design dead load, live load and wind load for all parts of the structure shall be shown on the structural plan. All applicable special loads shall also be indicated.
- (g) In structural design, due allowance shall be made for any material to be removed for the installation of pipes, conduits or other equipment.
- (h) Gypsum shall not be used for shear walls or for horizontal diaphragms.
- (i) Stresses caused by temperature, creep, shrinkage, moisture and/or differential foundation settlement shall be considered in the design.
- (j) The design of structural systems shall include weight of service equipment (heating, ventilation and air conditioning; fire protection; plumbing stacks and risers; and electrical feeders) at roof and floor levels.

901.4 Deflection.

- (a) The deflection of a structural member shall not exceed the value set forth in Table 9.1; criteria representing the most restrictive condition shall apply. Deflection criteria for materials not specified shall be developed in a manner consistent with the provisions of this Subsection.
- (b) All roofs shall be designed with sufficient slope or camber to assure adequate drainage after the dead load deflection due to initial set and long time deformation has taken place, except that roofs may be constructed level if the dead load deflection pockets due to initial set and long time deformation are not over $\frac{1}{2}$ inch deep below the drainage invert and at no point deflect more than $\frac{1}{2}$ inch for a 5-pound-per-square-foot (psf) live load on all or alternate spans. Cantilever members drained at the unsupported end need not meet the deflection requirements.
Roofs with a slope of less than $\frac{1}{4}$ inch per foot shall be designed to prevent instability from ponding loads.
- (c) Deflection of tall buildings or structures shall be limited to a maximum of $h/500$ (h = height) unless specifically permitted by the Building Official.

901.5 Load tests. Where there is reason to doubt the safety of any structural part of a building or structure in the course of construction or before a certificate of occupancy has been issued, the Building Official may require recognized standard load tests or other approved tests to determine the acceptability of the construction. Such tests shall be made under the direction of a Professional Engineer registered in the State of Florida and shall be approved by the Building Official.

DESIGN REQUIREMENTS

TABLE 9.1^{b, c, d, e, f}
MAXIMUM DEFLECTION FOR STRUCTURAL MEMBERS

TYPE OF MEMBER	MEMBER LOADED WITH LL ONLY	MEMBER LOADED WITH LL AND $K \cdot DL$
Roof member or floor member supporting plaster or comparable brittle finish	$L/360$	$L/240$
Roof or floor member with flexible or no finish	Not applicable	$L/150$

- a. For K , see Table 9.2.
 b. Maximum deflection for formed metal sheets
 For structural roofing without covering..... $L/60$
 For wall siding..... $L/60$
 c. Maximum deflection for secondary members supporting formed metal sheets:
 For roof..... $L/150$
 For wall..... $L/90$
 d. For concrete structural members, see EPCOT Standard 1003-1.
 e. For steel structural members, see EPCOT Standards 1009-1, 1009-3 and 1009-4.
 f. For masonry structural members, see EPCOT Standards 1006-1 and 1006-2.

TABLE 9.2
VALUE OF K

WOOD		STEEL
Unseasoned 1.0	Seasoned ^a 0.5	0

- a. Seasoned lumber is lumber having a moisture content of less than 16 percent at the time of installation and used under dry conditions of use, such as in most covered structures.

901.6 Anchorage.

- (a) Walls shall be anchored to floors and roofs that provide lateral support for the wall or are required to provide stability for the wall. Such anchorage shall be capable of resisting the horizontal forces specified in this Chapter. Required anchors in masonry walls of hollow units or cavity walls shall enter a grouted structural element of the wall.
 (b) Lintels, joists, beams, girders or trusses shall be anchored to their supports.

SECTION 902

UNIT LIVE LOADS

902.1 Unit live loads. The unit live loads set forth in Table 9.3 shall be taken as the minimum live loads, in pounds per square foot (psf) of horizontal projection, to be used in the design of buildings for the occupancies listed; and loads, at least equal, shall be assumed for uses not listed in this Subsection, but which create or accommodate similar loadings.

902.2 Special loads. The following special loads shall be considered in the design of buildings and structures:

- (a) **Offices.** Provisions shall be made in designing office floors for a load of 2,000 pounds placed upon an otherwise unloaded space $2\frac{1}{2}$ feet square.
 (b) **Partitions.** In parts of buildings used for offices, and other building occupancies, such as hotels, motels, condominiums, etc., where partitions could be erected or rearranged, provisions shall be made for a minimum partition dead-load weight, whether or not partitions are shown on the plans, known as partition dead

loading, except where the design live load is 100 psf or more. The partition loading shall be:

1. Masonry walls = 20 psf.
2. Metal or wood studs with gypsum board = 10 psf.
3. Lightweight office partitions 6 feet or less = none (included in the floor live load).

In hotels, motels, condominiums, etc., where tenant separation is by structural load-bearing masonry walls, no partition loading is required. (Gypsum tenant separation walls require a design load for partition loading.)

- (c) **Interior partitions.** Interior walls and permanent or temporary partitions more than 6 feet high shall be designed to resist all loads to which they are subjected, but not less than 5 psf applied perpendicular to the walls. The deflection of such walls shall not be more than $\frac{1}{240}$ of the span for walls with plaster or comparable brittle finishes, and $\frac{1}{120}$ of the span for walls with flexible finishes.

(d) **Veneer.**

1. Veneer, exterior and interior, shall support no load other than its own weight and the vertical dead load of the sections of veneer above. Surfaces to which veneer is attached shall be designed to support the additional vertical and lateral loads imposed by the veneer. Consideration shall be given for differential movement of supports, including that caused by temperature changes, shrinkage, creep and deflection.
2. Adhered veneer and its backing shall be designed to have a bond to supporting element sufficient to withstand a shearing stress of 50 pounds per square inch (psi). Anchored veneer and its attachments shall be designed to resist a horizontal force equal to twice the weight of the veneer.

- (e) **Stage floors.** Stage floors shall be designed to support not less than 125 psf, a 2,000-pound concentrated load on a 1-square-foot area, at any point, and shall comply with the requirements of Appendix G.

- (f) **Gridirons and fly galleries.** Gridirons and fly galleries shall be designed in accordance with Subsection G-201.3.

- (g) **Reviewing stands.** The minimum unit live load for reviewing stands, grandstands and bleachers shall be 100 psf of the horizontal projection from the structure as a whole. Seat and footboards shall be designed to resist 120 pounds per lineal foot. Lateral sway bracing loads of 24 pounds per foot parallel and 10 pounds per foot perpendicular to seats and footboards shall be used.

(h) **Railings.**

1. Handrails and guardrails in front of reviewing stands shall be designed to resist a horizontal force of 50 pounds per lineal foot, applied in any direction at the top of the railing. Railings shall also, but not necessarily simultaneously, withstand a minimum 200-pound concentrated load applied in any direction, at any point on the handrail or top rail, to produce the maximum load effect on the element being considered.

- 2. Intermediate rails (all those except the handrail), balusters, and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot, including openings and space between rails.

Reactions due to this loading are not required to be superimposed with those of Subsection 902.2(h)1.

Exception: All handrails, grab bars and tub and shower seats shall comply with the concentrated load requirements of the *EPCOT Accessibility Code for Building Construction*.

- (i) **Truck loads.** Floor systems in public garages and commercial or industrial buildings in which loaded trucks are placed, used or stored, shall be designed to support a concentrated rear wheel load of a loaded truck placed in any position.
- (j) **Passenger cars.** Floor systems in garages used for storage of private passenger cars shall be designed for a concentrated wheel load of not less than 2,000 pounds.

**TABLE 9.3
MINIMUM LIVE LOADS**

PROJECTION ^a	LIVE LOAD, in psf, OF HORIZONTAL TYPE OF LOAD
Apartments	40
Armories	150
Auditorium—fixed seats	50
Auditorium—movable seats	100
Balconies and galleries—fixed seats	50
Cornices	60
Corridors, public	100
Dance halls	100
Drill rooms	100
Dwellings	40
Exterior balconies—R-3 occupancy	60
Exterior balconies—all except R-3 occupancy	100
Fire escapes	100
Garages—storage or repairs	100
Garages—private pleasure cars	50
Gymnasiums	100
Hospitals—wards and rooms	40
Hotels—guest rooms and private corridors	40
Libraries—reading rooms	60
Libraries—stack rooms	125
Loft buildings	100
Manufacturing—light	75
Manufacturing—heavy	125
Marquees	60
Offices	50
Printing plants—press rooms	150
Printing plants—composing and linotype rooms	100
Public rooms	100
Restrooms	50
Reviewing stands and bleachers	100
Roof loads	20
Schools—classrooms	40

(continued)

**TABLE 9.3—continued
MINIMUM LIVE LOADS**

PROJECTION ^a	LIVE LOAD, in psf, OF HORIZONTAL TYPE OF LOAD
Sidewalks	250
Skating rinks	100
Stage floors	125
Stairways	100
Storage—light	125
Storage—heavy not less than (to be determined by occupancy)	250
Stores—retail, light merchandise	75
Stores—wholesale, light merchandise	100
Unbalanced live load—See Subsection 903.2	12

a. Except as regulated by Sections and Subsections of this Chapter.

- (k) **Catwalks.** Catwalks and supports shall be designed for either 50 psf uniform load or a 500-pound concentrated load at any point, whichever results in higher stresses. Catwalk live load need not be considered simultaneously with any other live loads.
- (l) **Sidewalks.** For sidewalks over vaults, areaways and similar structures, the live load shall be 250 psf uniformly distributed; or, where such sidewalks are subject to trucking, they shall be capable of safely sustaining a concentrated load of 8,000 pounds placed on any space 2½ feet square where this load results in higher stresses.
- (m) **Metal or pre-engineered buildings.** The buildings shall be designed to have a minimum of 10 psf collateral load. The frame (purlins and girts are excluded) shall be capable of carrying a minimum 1,000-pound concentrated load at any point (not simultaneously with other live loads).
- (n) **Canvas awning frames.** The frames shall be designed to carry a minimum 500-pound concentrated load at any point. Wind load is required, but no live load is required.
- (o) **Metal awnings and canopies.** Awnings and canopies shall be designed to carry a minimum of 10 psf live load, horizontal dead load and horizontal wind load simultaneously. Also, the design shall carry a minimum of a 300-pound concentrated load on an area 1 foot by 1 foot at any point on the roof surface (including the edge not simultaneous with other loads), the dead load and a 10-psf live load.
- (p) **Concentrated floor live loads.** All probable concentrated loads shall be considered. In the design of floors, where such loads may occur, the supporting beams, girders and slabs shall be designed to carry either the concentrated loads or the uniform live loads required, whichever produces the greater stresses.
- (q) **Fire sprinkler systems.** The standard for the installation of sprinkler systems, NFPA 13, shall be the minimum for supporting sprinkler systems. The following shall also apply:
 - 1. The sway bracing shall be adequate to prevent movement.

DESIGN REQUIREMENTS

2. The building must be able to support the hanger load of the pipe, plus water, plus 250 pounds. The hanging system must be able to support five times the pipe plus water, then add 250 pounds.
3. Risers shall be supported.
4. Risers in vertical shafts or in buildings with ceilings more than 25 feet shall have a minimum of one support for each pipe section.

- (r) **Gymnasium, main floors and balconies.** In addition to vertical loads, main floors and balconies with bleachers shall be designed to resist a horizontal swaying force of 24 pounds per linear foot of seats in the direction parallel to the seats, and of 10 pounds per linear foot of seats in the or a direction perpendicular to the length of the seats.

902.3 Heliports and helistops. In addition to other design requirements of this Chapter, heliport and helistop landing areas shall be designed for the maximum stress induced by the following loads:

- (a) Dead load plus actual weight of the helicopter.
- (b) Dead load plus a single concentrated impact load covering 1 square foot, of 0.75 times the fully loaded weight of the helicopter if it is equipped with hydraulic-type shock absorbers, or 1.5 times the fully loaded weight of the helicopter if it is equipped with a rigid or skid-type landing gear.
- (c) The dead load plus a uniform live load of 100 psf. The required live load may be reduced according to the formula in Subsection 902.4(a).

902.4 Live load reduction.

- (a) For occupancy live loads of 100 psf or less, the design live load on any member supporting a floor area of 150 square feet or more may be reduced in accordance with the method resulting in the least percentage, as follows:

1. By applying the formula $R = [A - 150] 0.08\%$
2. By applying the formula $R = 100 \frac{(D + L)}{4.33L}$

Where:

- R = Reduction, in percent.
 D = Dead load per square foot of area supported by member.
 A = Area, in square feet, supported by the member.
 L = Design live load per square foot of area supported by member.

The reduction shall not exceed 40 percent for members receiving loads from one level only or 60 percent for other members except as set forth in Paragraph (d).

- (b) Where a member supports floors of more than one story, reduction of the design live load on the member by Method 1 in Paragraph (a) shall be made for floors taken one story at a time, starting with the uppermost floor supported by the member.

- (c) For live loads of 100 psf or less, no reduction shall be made for areas occupied as places of public assembly.
- (d) The reduction in live load on floors for storage of private passenger cars shall be in accordance with the requirements of Paragraph (a), but shall not be more than 40 percent.
- (e) There shall be no reduction for live load on the roof in any members.

Exception: Pre-engineered buildings with a collateral load of 10 psf or greater may use the following roof live loads:

ROOF SLOPE	AREAS		
	0 – 200	201 – 600	OVER 600
Less than 4 in 12	20	16	12
4 in 12 to less than 12 in 12	16	14	12
12 in 12 or greater	12	12	12

902.5 Impact loads. The live loads given in this Section include allowance for ordinary impact conditions; however, where uses or loads produce unusual vibrations or impact force, provision shall be made in the structural design for such forces in accordance with the following:

- (a) All moving elevator loads shall be increased 100 percent for impact.
- (b) For the purpose of design, the weight of heavy machinery and moving loads shall be increased as set forth herein to allow for impact: (1) elevator machinery, 100 percent; (2) light machinery, shaft- or motor-driven, 20 percent; reciprocating machinery or power-driven units, 50 percent; and hangers for floor and balconies, 33 percent. All percentages shall be increased where specified by the manufacturer.
- (c) All craneways shall be designed to resist a horizontal transverse force equal to 20 percent of the sum of the crane capacity and the weight of the trolley; one-half of the force to be applied at the top of the runway rail. In addition, all craneways shall be designed to resist horizontal longitudinal force equal to 10 percent of the total of the maximum wheel loads applied at the top of each rail.
- (d) Where moving loads not specified within this Subsection are concerned, the impact load shall be determined by a method satisfactory to the Building Official.
- (e) Hand hoists and monorail hoists shall have the loadings increased 25 percent for impact.

902.6 Retained material loads. Retaining walls shall be designed to resist the lateral pressure of the retained material. Cantilever walls not more than 15 feet high retaining level drained earth may be designed for pressure equivalent to that exerted by a fluid weighing not less than 30 pounds per cubic foot and having a depth equal to that of the retained earth. Any surcharge shall be in addition to the equivalent fluid pressure.

Retaining walls shall be designed to resist sliding and overturning with a minimum factor of safety of 1.5 in each case.

902.7 Posting live loads.

- (a) In buildings, structures or parts thereof, used for business, mercantile, industrial or storage occupancies, the live load for which each floor or part is designed and approved shall be conspicuously posted, using durable metal signs in that part of the story to which it applies. It shall be unlawful to remove or deface such signs.
- (b) No person shall place or cause to be placed on the floor or roof of a building or structure a heavier load than that for which the floor or roof is designed and approved.

902.8 Hydrostatic uplift. All structural components subject to hydrostatic uplift shall be designed to resist the uplift force with a minimum factor of 1.5.

SECTION 903 ROOF LOADS

903.1 Unit live load. Roofs shall be designed for unit live loads not less than those set forth in Table 9.3, applied vertically to the horizontal projection of the surface.

903.2 Special loading.

- (a) Unbalanced loading shall be applied where such loading will require larger members or connections. Trusses and arches shall be designed to resist the stresses caused by unbalanced unit live loads on one-half of the span, when such loading results in reversal of stresses or in higher stresses in any part of the roof than the stresses produced by the required unit live load on the entire span. Roofs whose structure is composed of a stressed shell, framed or solid, wherein stresses caused by a point loading are distributed throughout the area of the shell, the requirements for unbalanced unit live load design may be reduced 50 percent.
- (b) Scuttles and ribs of skylights shall be designed to support a vertical concentrated load of 300 pounds placed anywhere or the loadings specified in Section 902.
- (c) Greenhouses shall be designed for the following:
 1. Live load on film-type, nonrigid greenhouse roofs, 10 psf
 2. Live load on glass or rigid plastic greenhouse roofs, 15 psf
 3. Dead load – allowance for piping, electrical, etc., 10 psf + structure weight
 4. Crop load on structures shall be stated on drawings.

903.3 Roof drainage.

- (a) Except where a roof is sloped to drain over roof edges or is designed to support accumulated water, roof drains shall be installed at each low point of the roof. Roof drains shall be large enough to convey the tributary water to the roof drainage system.
- (b) Where roof drains are required, overflow scuppers having open areas three times the size of roof drains shall be installed in adjacent parapet walls with the inlet flow line located 2 inches above the low point of

the adjacent roof and having a minimum opening height of 4 inches. When permitted by the Building Official, overflow drains of the same size as the roof drains may be installed with the inlet flow line located 2 inches above the low point of the roof. Overflow drains connected to the drain line shall be independent from the roof drains from the overflow inlet to the overflow discharge.

- (c) Roof drains and overflow drains, when concealed within the construction of the building, shall be installed in accordance with the *EPCOT Plumbing Code*.

SECTION 904 WIND LOADS

904.1 Design for wind loads required.

- (a) Buildings and structures, and every part thereof, shall be designed to withstand the forces of wind pressure assumed in any direction. No allowance shall be made for the effect of shielding by other structures. Wind pressures shall be assumed to act normal to the surface considered.

Exception: Fences 6 feet or less in height associated with Group R-3 occupancies are not required to withstand the forces of wind.

- (b) The floor, roof or other horizontal bracing system shall be designed and constructed to transfer horizontal forces to the parts of the structural frame designed to carry the forces to the ground. Where horizontal- or vertical- shear-resisting elements are designed to transfer forces through the diaphragm action, the analysis shall include the design of chord members at or near the extremities of the diaphragm and the method by which the forces are transferred to the resisting elements. The total shear in any horizontal plane shall be distributed to the various elements of the lateral-force-resisting system in proportion to their rigidities, taking into consideration the rigidity of the horizontal bracing system or diaphragm.
- (c) Roofing assemblies (material) shall comply with the requirements of EPCOT Standard 9-7 and FM 4450, FM 4470, UL 580, UL 1897 or ASTM E1592.
- (d) The drawings shall show the following information for wind loads:
 1. Basic wind speed (3-second gust), miles per hour.
 2. Wind importance factor, I , and occupancy category.
 3. Wind exposure, if more than one wind exposure is used, show each wind exposure and its applicable wind direction.
 4. Internal pressure coefficient.
 5. Wind design pressure to be used for the design of components and claddings; if more than one wind exposure is used, show wind design pressure for each exposure.
 6. Wind directionality factor, K_d .

DESIGN REQUIREMENTS

904.2 Determination of wind loads.

- (a) Wind loads on buildings and other structures shall be determined in accordance with EPCOT Standard 9-7, 9-8 or 9-9 in Appendix A. The Ultimate Design Wind Speed shall be 129 mph (Risk Category 1), 139 mph (Risk Category II) and 149 mph (Risk Category III and IV). The Building Official may require evidence to support design pressures used in the design of structures not included in this Section. For buildings or structures with unusual geometry, or subjected to unusual wind responses, the Building Official may require wind tunnel tests or additional nationally recognized data.
- (b) **Wind loads during construction.** Wind loads on structural components and assemblages during erection and construction shall be considered.
- (c) **Wind loads on rooftop equipment.** Rooftop equipment, ductwork and related supporting structures shall be designed for wind load without reduction due to shielding effect by parapet walls or other structures.
- (d) For each wind direction considered, a wind exposure category that adequately reflects the site terrain in accordance with Section 6.5.6 of EPCOT Standard 9-7 shall be provided.
- (e) Ultimate design wind speed used for determining wind loads on temporary structures shall be 94 mph.

904.3 Stability.

- (a) Calculations to determine overturning and the uplift and sliding forces shall be made with provisions set forth in Subsection 904.2(a).
- (b) The overturning moment calculated from the wind pressure shall not exceed two-thirds of the resisting dead load moment unless additional anchorage for excess moment is provided.
- (c) The uplift forces calculated from the wind pressure shall not exceed two-thirds of the resisting dead loads unless additional anchorage for excess uplift is provided.
- (d) The base shear calculated from the wind load shall not exceed two-thirds of the total resisting force due to friction or other factors unless additional anchorage for the excess base shear is provided.
- (e) Anchorage of the roof to walls and columns, and of walls and columns to the foundation to resist overturning, uplift and sliding forces shall be provided. If dead load is used as part of the resistance, the minimum dead load that is likely to remain in place during design wind event shall be used.

SECTION 905 EXCAVATIONS

905.1 Scope.

- (a) The provisions of this Section shall apply to excavations for buildings and structures for which permits are issued by the Building Official. Excavation, grading

and fill operations for which a separate permit is required, or where hazardous conditions exist, or where the cut slope is steeper than two horizontal to one vertical shall be performed under the direction of a Professional Engineer registered in the State of Florida.

- (b) The quality and design of the materials used in foundations, footings and retaining walls shall conform to the requirements of Chapter 10 and to the applicable EPCOT Standard as listed in Appendix A for Chapters 9 and 10.

905.2 Protection of excavations. Until provisions for permanent supports have been made, excavations shall be guarded and protected to prevent them from becoming dangerous to life and property. Excavations, other than minor excavations approved by the Building Official, shall not extend within 1 foot of any plane projecting at an angle of 30 degrees from the horizontal from the bottom of a soil-bearing foundation, unless such footing or foundation is protected against settlement.

905.3 Permanent excavations.

- (a) No permanent excavations shall be made, nor shall construction excavations be left open that will endanger adjoining property or buildings or that will be a menace to public health or safety. Such excavations shall be well drained and the drainage shall function as long as the excavation exists.
- (b) Permanent excavations shall have retaining walls of steel, masonry, concrete or similar approved material of sufficient strength to retain the embankment and any surcharge loads or the embankment shall have safe side slopes as determined by the Building Official.

905.4 Fill.

- (a) All fills shall be compacted to a minimum of 90 percent of maximum density, as determined by laboratory test in accordance with EPCOT Standard 9-2 or as approved by the Building Official.
- (b) The natural ground surface shall be prepared to receive fill by removing vegetation, noncomplying fill and top soil.
- (c) No organic material shall be permitted in fills, and no rock or similar irreducible material larger than 8 inches in one dimension shall be placed in a fill.
- (d) No compacted fill shall be made that would create an exposed surface steeper in slope than two horizontal to one vertical. The Building Official may require that the fill be constructed with an exposed surface flatter than two horizontal to one vertical if he finds this slope necessary for stability and safety.

905.5 Unsafe excavations. Where, in the opinion of the Building Official, an unsafe condition may result or damage may occur as the result of an excavation, he may order the work stopped in accordance with Subsection 104.6, or he may approve the work of excavation subject to such limitations as he may impose.

**SECTION 906
BEARING CAPACITY OF SOIL**

906.1 Classification. As required by the Building Official, classification of the soil under all parts of every building shall be based on examination of test borings or excavations made at the site. Location of the test borings or excavations and the nature of the subsurface materials shall be indicated on the plans.

906.2 Soil investigation. Where the bearing capacity of the soil is not definitely known or is doubtful, or where the load imposed on the soil is unusual, the Building Official may require load tests or examination and evaluation of subsoil conditions by a Professional Engineer registered in the State of Florida. To determine the permitted safe bearing capacity, the soil may be tested by loading an area not less than 2 square feet to not less than twice the maximum bearing capacity desired for use. Such load shall be sustained by the soil until no additional settlement takes place for a period of not less than 48 hours, so that such desired bearing capacity may be used. Examination of subsoil conditions may be required when believed to be necessary by the Building Official.

Exception: A soil investigation report is not required for temporary structures installed on compacted asphalt.

906.3 Presumptive capacities. Where no unusual soil or moist conditions are present, the permitted bearing capacities on supporting soils shall not exceed those set forth in Tables 9.10 and 9.11, unless the design-bearing capacity is substantiated by recognized tests, analysis and procedure as required by the Building Official.

**TABLE 9.10
MAXIMUM SOIL PRESSURES**

CLASS OF MATERIAL	MINIMUM DEPTH OF FOOTING BELOW ADJACENT GROUND (feet)	VALUE PERMITTED IF FOOTING IS AT MINIMUM DEPTH (psf)	INCREASE IN VALUE FOR EACH FOOT OF DEPTH THAT FOOTING IS BELOW MINIMUM DEPTH (psf) ^a	MAXIMUM VALUE (psf) ^a
Compact fine sand	1	1,000 ^b	200 ^b	5,000
Loose sand	2	500 ^b	100 ^b	3,000
Medium stiff clay or sandy clay	1	2,000	200	6,000
Soft sandy clay or clay	2	1,000	50	2,000
Compact inorganic sand and silt mixtures	1	1,000	200	4,000
Loose inorganic sand and silt mixtures	2	500	100	1,000
Loose organic sand and silt mixtures and peat	0	0	0	0

a. These values are considered sufficient to prevent failure of the supporting ground, but not to prevent excessive foundation movement or settlement where unusual soil or moisture conditions are encountered.

b. Values for footings 1 foot wide and may be increased in direct proportion to the width of the footing to a maximum of 2^{1/2} times the designed value.

**TABLE 9.11
MAXIMUM LATERAL SOIL PRESSURE**

CLASS OF MATERIAL	PERMITTED VALUES ^a PER FOOT OF DEPTH BELOW NATURAL GRADE ^b (psf)	MAXIMUM PERMITTED VALUES ^a (psf)
Compact fine sand Medium clay Compact sandy loam Loose coarse sand and gravel	200	2,500
Soft clay Clay loam Poorly compacted sand Clays containing large amounts of silt	100	1,500

a. These values are considered sufficient to prevent failure of the supporting ground, but not to prevent excessive foundation movement or settlement where unusual soil or moisture conditions are encountered.

b. Isolated poles, such as flagpoles or signs, may be designed using lateral bearing valued equal to two times tabulated values.

**SECTION 907
SOIL-BEARING FOUNDATIONS**

907.1 General provisions.

- (a) Footings shall be designed to minimize differential settlement.
- (b) Excavations for continuous footings shall be cut true to line and grade, and the sides of footings shall be formed, except where soil conditions are such that the sides of the excavation stand firm and square. Where earth is the side form, then the sides of the footing shall be a minimum of 1 inch outside of the required dimension line. Excavations shall be made to firm, clean bearing soil.
- (c) Foundations for all buildings shall be level or shall be stepped so that both the top and bottom of the foundation are level. At steps, the foundation shall have a vertical tie of the same cross section and design as the footings or the smaller of the footings so jointed. The maximum step shall be 18 inches and the minimum run between steps shall be 36 inches.

907.2 Design using lateral bearing. Construction using posts or poles as cantilever columns embedded in concrete footings in the earth may be used to resist both axial and lateral loads. The depth to resist lateral loads shall be determined by use of the design criteria established in Subsection 907.3 or by other methods approved by the Building Official.

907.3 Design formula—no constraint. The following formula may be used in determining the depth of embedment required to resist lateral loads where no constraint is provided at the ground surface, such as rigid floor or ground surface pavement:

$$D = (A/2) (1 + B)$$

Where:

$$A = \frac{2.34P}{S_1 b}$$

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$$B^2 = (1 + 4.36h/A).$$

P = Applied lateral force, in pounds.

S_1 = Permitted lateral-soil-bearing pressure as set forth in Table 9.11, based on a depth one-third the depth of embedment.

S_3 = Permitted lateral-soil-bearing pressure as set forth in Table 9.11, based on a depth equal to the depth of embedment.

b = Diameter, in feet, of round post or footing or diagonal dimension of square post or footing.

h = Distance, in feet, from ground surface to point of application of P .

d = Depth of embedment in earth, in feet, but not more than 12 feet for computing lateral pressure.

907.4 Design formula—constrained. The following formula may be used to determine the depth of embedment required to resist lateral loads where constraint is provided at the ground surface, such as a rigid floor or pavement.

$$(d)^2 = 4.25 \frac{Ph}{S_3 b}$$

907.5 Concrete slabs on grade.

- Where concrete slabs are placed directly on the supporting soil, the subgrade shall first have been prepared by removing all organic matter and debris and the subgrade and fill shall be thoroughly compacted by approved mechanical methods. All fill placed under slabs shall be clean soil, free of debris and other deleterious materials and shall be placed in accordance with the requirements of Subsection 905.4.
- Where the floor covering to be placed on the slab is sensitive to moisture, a membrane or other approved method shall be used to control moisture infiltration.
- Concrete floor slabs placed directly on the supporting soil shall be a minimum of 3½ inches thick.

SECTION 908 PILE FOUNDATIONS

908.1 Conditions of use.

- The use of types of piles not specifically mentioned in this Subsection and the use of piles under conditions not specifically covered herein shall be permitted, subject to approval of the Building Official, upon submission of acceptable test data, calculations or other information relating to the properties and load-carrying capacity of such piles.
- All piles standing unbraced in air, water or other material not capable of lateral support, shall conform with the applicable column formula as specified in this Code. Such piles placed in firm ground may be considered fixed and laterally supported at 5 feet below the ground surface and when placed in soft material, at 10 feet below the ground surface, unless otherwise

required by the Building Official after a foundation investigation by an approved agency.

- Where cast-in-place piles are used, reinforcement shall extend 10 feet below the plane where the soil provides lateral support. Sufficient reinforcing for all types of piles shall be provided at the junction of the pile and pile cap or grade beam to make a suitable connection. Shells conforming to the requirements of Subsection 908.8(a)6 may be considered as reinforcement.
- Consideration shall be given to reduction of the permitted pile load when piles are placed in groups. Where soil conditions make such load reductions advisable or necessary, the axial load permitted for a single pile shall be reduced by any method approved by the Building Official.
- Reinforced concrete caps shall be provided for all pile clusters and such caps shall extend laterally not less than 6 inches beyond the extreme pile surface and vertically not less than 4 inches below the pile butt. Pile caps may be omitted when the piles are used to support grade beams, provided that the parts of the grade beams acting in place of the pile cap shall carry the loads as computed by a recognized method of analysis.
- Individual pile or caisson footings shall be interconnected by ties, each of which can carry a horizontal force equal to 5 percent of the larger pile cap loading in tension and compression, unless it can be demonstrated that equivalent restraint can be provided by other approved methods.

908.2 Permitted pile methods.

- Method of determining.** Axial and lateral loads on piles shall be determined by an approved formula, by load tests or by a foundation investigation by an approved agency. A foundation investigation shall be made if required by the Building Official.
- Tests.**
 - Dynamic load tests.** The axial load on a pile shall not exceed the value given by the following formulas, unless such load is determined as specified in Paragraph (a) or in Subsection 908.1(a).

Allowable axial load = $R/4$ for all piles.

Where:

$$R \text{ (for steel piles)} = \frac{12Wh \frac{W + 0.25P}{W + P}}{S + \frac{RL \ 24,000}{AE}}$$
$$R \text{ (for other piles)} = \frac{12Wh \frac{W + 0.1P}{W + P}}{S + \frac{RL \ 24,000}{AE}}$$

Where:

R = Ultimate driving resistance, in tons.

W = Weight of striking parts, in tons.

H	=	Height of striking parts, in feet.
Wh	=	Striking energy, in foot-tons.
P	=	Weight of pile, in tons.
S	=	Permanent settlement of pile under the average of the last 10 blows, in inches.
L	=	Length of pile, in feet.
A	=	Average right cross-sectional area of pile material, in square inches.
E	=	Modulus of elasticity of pile, in pounds per square inch.

2. **Static load test.** Single piles when tested shall be loaded to at least twice the design load, and should pile groups be tested, the test load shall be not less than $1\frac{1}{2}$ times the total design load for the group. All load tests on piles shall be conducted in compliance with procedures set forth in EPCOT Standard 9-3, unless modified with the concurrence of the Building Official.

908.3 Driven piles.

- (a) **Penetration.** Piles supporting buildings or structures shall be driven to a resistance and penetration in accordance with the plans and specifications.
- (b) **Jetting.** Piles may be jetted only when authorized by the Building Official and under supervision of a Professional Engineer registered in the State of Florida. No jetting shall be permitted that may be detrimental to existing structures or piles previously driven.

908.4 Wood piles. Stresses permitted in compression parallel to the grain of wood piles shall comply with the requirements of Section 1010 (see Section 201 of EPCOT Standard 9-4). Wood piles shall comply with the following requirements:

- (a) Wood piles shall be of one piece and shall conform to EPCOT Standard 9-5.
- (b) Untreated piles may be used only when it has been established that the cutoff will be below the lowest ground water level assumed to exist during the life of the structure.
- (c) Pressure preservative treatment for piles as set forth herein shall be in conformance to the requirements of EPCOT Standard 1010-20 for the treatment of wood piles. Preservative treatment required herein may be omitted for rot-and-borer-resistive piles when satisfactory evidence of these characteristics is presented to the Building Official.
- (d) Wood piles supporting structures over the ground may be cut off at any elevation below the ground surface when such piles have been treated with the equivalent of Grade 1 creosote oil under pressure so as to retain not less than 12 pounds of creosote oil per cubic foot. In such cases, the pile butt shall be coated with two applications of hot creosote oil.
- (e) The top of wood piles supporting a structure over water may project above the water to such height as may be necessary, when piles used to support structures have

been treated with the equivalent of Grade 1 creosote oil or 70-30 creosote-coat tar solution under pressure so as to retain not less than 20 pounds of creosote oil or creosote-oil tar solution per cubic foot or to refusal.

- (f) Wood piles shall be driven with a protective driving cap or ring when necessary to prevent brooming or splitting of the butt. When brooming or splitting occurs, such piles shall be cut back to solid wood before the final resistance to penetration is measured.
- (g) If required, when driving through or to hard material or to rock, wood piles shall be fitted with metal protective shoe approved by the Building Official.

908.5 Precast concrete piles. Precast concrete piles shall have a compressive stress in the concrete not to exceed $0.225f_c$ and the stress in the reinforcing steel shall not exceed the values specified in EPCOT Standard 1003-1. Precast concrete piles shall conform to the following requirements:

- (a) The piles shall be cast of concrete having an ultimate compressive strength of not less than 3,000 psi and shall be reinforced with a minimum of four longitudinal steel bars having an area of not less than 1 percent, nor more than 4 percent of the gross concrete area.
- (b) All longitudinal bars shall be of uniform size and shall be tied by not less than No. 2 hoops spaced 8 inches in the body of the pile and not over 3 inches for the first 18 inches from both the butt and the tip.
- (c) All reinforcement shall be protected by 2 inches or more of concrete, except that for piles subjected to the action of open water, waves or other severe exposure, a 3-inch protective covering shall be placed in the zone of such exposure.
- (d) For point-bearing piles, the concrete area of the tip shall be not less than 75 percent of the area of the butt.
- (e) All precast concrete piles shall have their date of manufacture and the lifting points clearly marked on the pile.
- (f) Concrete piles shall not be driven until they have attained their full specification strength as verified by tests, nor shall the piles be removed from the forms until 50 percent of the specification strength has been attained. Piles shall not be transported and not driven until they have been cured for not less than 7 days for Type I cement and 3 days for Type III cement.

908.6 Prestressed precast concrete piles. Prestressed precast concrete piles shall conform to Subsection 908.5 and to Section 1003 (see EPCOT Standard 1003-1, Chapter 26 as amended by EPCOT Standard 1003-2), except as follows:

- (a) Prestressed concrete piles shall be cast of concrete having a compressive strength of not less than 5,000 psi at the time of driving and 3,000 psi before transfer of the prestressing force. The prestressing element shall not be stressed initially in excess of 75 percent of its ultimate strength. Elements shall transfer a compressive stress to the concrete, after losses, of not less than 0.08 of the specified strength at driving. Under loads other than handling, no tension will be permitted in the concrete.

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- (b) Longitudinal reinforcing shall be protected by 2 inches of concrete and shall be tied by No. 2 hoops or No. 5 AS & W gage spirals spaced at 8 inches in the body of piling 14 inches or smaller, 9 inches in the body of piling 16 inches or larger, and not more than 3 inches for the first 18 inches from both the butt and the tip.

908.7 Structural steel shapes. The materials used for structural steel piles shall conform to the requirements of Section 1009 (see EPCOT Standard 1009-5). Sections used may be rolled sections of comparable fully welded built-up sections from plate. No section shall have an average thickness of metal less than $\frac{3}{8}$ inch. The permitted working stress shall not exceed 50 percent of the minimum specified yield stress of the material.

908.8 Cast-in-place concrete piles.

- (a) Metal-cased concrete piles shall consist of a steel shell driven in intimate contact with the surrounding soil and filled with concrete, and shall conform to the requirements of Section 1003 and the following provisions:
1. Steel shells may be uniformly tapered, step tapered, cylindrical or a combination of such shapes and may be laterally corrugated, spirally corrugated, longitudinally fluted or plain.
 2. Pile shells and end closures shall be of sufficient strength and rigidity to permit their being in accordance with the driving method used and to prevent harmful distortion caused by soil pressures or by driving of adjacent piles until filled with concrete. A reduction of cross-sectional area in excess of 15 percent shall be cause for rejection. The shells also shall be sufficiently water tight to exclude water during the placing of concrete. All rejected piles shall be removed or filled with gravel or concrete.
 3. The minimum diameter of a pile shell shall be 8 inches.
 4. Concrete for cast-in-place piles shall develop a compressive strength of not less than 3,000 psi at 28 days. The concrete shall be deposited in a continuous operation to ensure a full-sized pile without voids or separation. Concrete shall be placed in the dry. The pile may be sealed by depositing concrete by tremie or other approved method.
 5. Splices of shell sections shall be designed to ensure the alignment of the shells and to develop the full strength of the shell section.
 6. The load on the shell shall not exceed 12,000 psi multiplied by the area of the shell. Shells having a wall thickness of 0.16 inch or more may be considered as carrying part of the load. The metal for the shells shall conform to the requirements of EPCOT Standards 9-6 and 1009-20.
 7. For friction piles, the allowable load shall be computed at the cross section located at a point two-thirds of the embedded length of the pile, in

material providing suitable lateral support, measured upward from the tip. The load on the concrete shall not exceed 25 percent of the 28-day strength of the concrete, multiplied by the concrete area.

8. For end-bearing piles the concrete area of the critical section shall be such that the unit stress on the concrete does not exceed $0.25f_c$ under the pile load. The area of the shell and the critical section of the concrete shall be taken at the elevation where the pile enters the stratum furnishing end bearing.
- (b) Uncased concrete piles shall consist of concrete cast-in-place against earth in drilled holes with the following requirements:
1. Construction procedure shall be such as to ensure the exclusion of any foreign matter while securing a full-sized shaft.
 2. Concrete shall attain an ultimate compressive strength (f_c) of 3,000 psi at 28 days.
 3. The compressive stress in the concrete shall not exceed $0.25f_c$.

SECTION 909 FOUNDATION WALLS

909.1 General requirements. Foundation walls shall be designed and constructed in accordance with the requirements of Chapter 10 for the specific materials and with the following:

- (a) Where the nature of the soil is such that soil bearing of 1,000 psf or less is used for design, foundation walls or buildings shall be poured-in-place reinforced concrete or reinforced masonry from the footing to the bottom of the first- or ground-floor construction.
- (b) Where the nature of the soil is such that soil bearing more than 1,000 psf is used for design, foundation walls of buildings may be of unit masonry or concrete on continuous concrete footings.
- (c) The Building Official may approve isolated piers under the exterior walls of buildings in locations where extreme dampness exists.
- (d) Isolated piers may be substituted for interior foundation walls for wood frame buildings not more than one story, where the piers are not more than 24 inches high, are a minimum of 12 inches by 12 inches in cross-sectional dimension, and are located at points of concentrated loads not more than 8 feet apart.

SECTION 910 WOOD FOUNDATION SYSTEMS

910.1 General. Wood foundation systems shall be designed and constructed in accordance with the requirements of EPCOT Standard 1010-36.

CHAPTER 10

REQUIREMENTS BASED ON QUALITY, DESIGN AND APPLICATION OF THE MATERIALS OF CONSTRUCTION

SECTION 1001 QUALITY AND DESIGN

1001.1 Criteria.

- (a) The use of the materials of construction in the fabrication and erection of buildings and structures, and their components, shall conform to the requirements of Chapter 9 for design; and to recognized principles of mechanics, to established engineering practice, to the recognized standards of industry referred to herein as listed in Appendix A. The requirements of Chapters 5 through 8 for use of materials for occupancies, fire protection, types of construction and means of egress also shall apply.
- (b) Where the requirements of the EPCOT Standards conflict with the requirements of this Code, the provisions of this Code shall apply.
- (c) Materials and assemblies that perform satisfactorily when tested in accordance with EPCOT Standard 6-1 shall be accepted by the Building Official for use where fire-resistive rating is required. Testing of the materials of construction, when required by the Building Official, shall be in accordance with the requirements of Subsection 311.4.
- (d) Specific materials not mentioned in Sections 1002 to 1010 are subject to the regulations of this Code and may be approved by the Building Official in accordance with the requirements of Section 311, where there is doubt as to the acceptability of a material, method or type of construction under the requirements of this Code or the EPCOT Standards.
- (e) Standards used in the design, and listed on the drawings and in the specifications, shall be specific and not general. References to the latest editions, are not acceptable.

SECTION 1002 ALUMINUM

1002.1 Criteria.

- (a) Quality and design of aluminum used in buildings and structures shall conform to the requirements of the basic standard of the aluminum industry, designated EPCOT Standard 1002-1. Where that standard conflicts with the requirements of this Subsection and Subsection 1002.3, the requirements of those Subsections shall apply. EPCOT Standards listed in Appendix A for Section 1002 also are adopted as part of this Code.
- (b) Use of aluminum alloys and tempers other than those covered by this Section shall be permitted for structural members, provided that standards of performance not lower than required in this Section are substantiated and as approved by the Building Official.

1002.2 Identification.

- (a) Certificates from the manufacturer of the aluminum alloy shall be presented to the Building Official, stating that each lot has been sampled, tested and inspected in accordance with, and has met the requirements of, the applicable EPCOT Standards listed in Appendix A. Aluminum structural elements in the fabricator's plant shall be identified, segregated or otherwise handled at all times so that the separate alloys and tempers are positively identified and, after completion of fabrication identification, shall be as part of or affixed to completed aluminum members and assemblies, or to boxed or bundled shipments of multiple units prior to shipment from the manufacturer's plant.
- (b) If the identity of an aluminum-alloy structural member cannot be established, the Building Official may order tests performed by an approved independent agency in accordance with the appropriate Standard listed in Appendix A for Section 1002.

1002.3 Dissimilar materials.

- (a) Where aluminum parts are in conflict with dissimilar metal other than stainless, aluminized or galvanized steel, the facing surfaces shall have an approved paint or insulated barrier.
- (b) Where aluminum parts are in contact with wood, fiberboard or other porous materials that absorb water and cause corrosion, aluminum surfaces shall be protected with an approved paint. Aluminum in contact with concrete or masonry should be similarly protected when moisture is present.
- (c) Aluminum embedded in concrete shall be protected with approved paint when corrosive components are added to the concrete or when extended extremely corrosive conditions exist.
- (d) Aluminum in contact with water that may carry trace quantities of a dissimilar metal or its corrosion product shall be protected by an approved paint.

SECTION 1003 CONCRETE CONSTRUCTION

1003.1 Criteria.

- (a) All structures of reinforced concrete, including prestressed concrete, shall be designed and constructed in accordance with the provisions of EPCOT Standard 1003-1.
- (b) Structural members of plain concrete shall be designed and constructed in accordance with the provisions EPCOT Standard 1003-2. Concrete that is either unreinforced or contains less reinforcement than the minimum amount specified for reinforced concrete shall be classified as plain concrete.

1003.2 Concrete quality.

- (a) Concrete control of drawings, inspection, materials, proportioning, testing, evaluation, acceptance, mixing and placing, forms and details shall be in accordance with EPCOT Standard 1003-1.
- (b) EPCOT Standard 1003-32 shall be used as a guide for good practice and workmanship.

1003.3 Minimum slab thickness. The minimum thickness of concrete floor slabs supported directly on the ground shall not be less than 3½ inches unless designed by an architect or engineer. An approved vapor barrier shall be installed underneath the slab.

1003.4 Minimum concrete strength.

- (a) The minimum specified compressive strength, *f*^c, for concrete designed and constructed in accordance with this Chapter, shall be 2,500 pounds per square inch (psi).
- (b) Tables 10.1 and 10.2 shall be used when strength data from trial batches or field experience is not available.

1003.5 Anchorage to concrete-strength design. The strength design procedure of anchors installed in concrete, including headed bolts, headed studs, hooked bolts (J-bolts or L-bolts), expansion anchors and undercut anchors shall be in accordance with Chapter 17 of ACI 318. The strength design procedure of anchors not within the scope of Chapter 17 of ACI 318 shall be approved by the Building Official.

**SECTION 1004
GYPSUM CONCRETE AND PRECAST GYPSUM**

1004.1 Criteria.

- (a) Quality and design of materials used in gypsum concrete and precast gypsum shall conform to the requirements of EPCOT Standard 1004-1 and to the Standards listed in Appendix A for Section 1004.
- (b) The provisions of Chapter 9 and this Section shall govern the design and installation of cast-in-place gypsum concrete slabs reinforced with wire mesh and applied over permanent forms that may or may not be supported by purlins; and shall also govern the design and installation of precast gypsum units applied directly to roof or floor framing members.
- (c) Reinforced gypsum concrete shall be designed by methods admitting or rational analysis based on established principles of mechanics. The general assumptions and principles specified for reinforced concrete shall be the basis of design for reinforced gypsum, as they apply.

1004.2 Limitations of use.

- (a) Cast-in-place gypsum concrete used for occupancies producing unusually high humidities, or for ceilings of structures not completely enclosed, shall be constructed with the use of nonabsorptive formboard or surfacing. Precast gypsum shall not be used under these conditions, except as approved by the Building Official.

**TABLE 10.1
MAXIMUM PERMISSIBLE WATER-CEMENT RATIOS AND MINIMUM CEMENT CONTENTS FOR CONCRETE**

SPECIFIED COMPRESSIVE STRENGTH <i>f</i> ^c psi ^a	MAXIMUM PERMISSIBLE WATER-CEMENT RATIO				
	Non-air-entrained concrete			Air-entrained concrete	
	Minimum sacks cement per cu. yd. concrete	Absolute ratio by weight	U.S. gallon per 94-lb. bag of cement	Absolute ratio by weight	U.S. gallon per 94-lb bag of cement
2,500	5	0.65	7.3	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
4,000	6½	0.44	5.0	0.35	4.0
4,500	7	0.38	4.3	0.30	3.4
5,000	7½	0.31	3.5	2 ^b	See Note b

a. 28-day strengths for cements meeting strength limits of ASTM C150, Type I, IA, II or IIA, and 7-day strengths for Types III and IIIA.
 b. For strengths above 4,500 psi with air-entrained concrete, proportions should be selected by the methods of ACI 318-02/318-R05.

**TABLE 10.2
CONCRETE AIR CONTENT FOR VARIOUS SIZES OF CONCRETE AGGREGATE**

NOMINAL MAXIMUM SIZE COARSE AGGREGATE, IN.	TOTAL AIR CONTENT PERCENT BY VOLUME
¾	6 to 10
½	5 to 9
¾	4 to 8
1	3.5 to 6.5
1½	3 to 6
2	2.5 to 5.5
3	1.5 to 4.5

- (b) Concentrated loads, such as water tanks, fan bases, cooling towers, flagpoles and signs, shall be transmitted directly to the walls or to the primary footing.

1004.3 Testing.

- (a) One test of each day's pour of cast-in-place gypsum concrete shall be made and the results thereof presented to the Building Official. Cylinders or cubes shall be cast at the site, with a minimum of two specimens constituting a test. Specimens shall be tested and reported in accordance with EPCOT Standard 1004-2. To conform to the requirements of this Code, the average of any five consecutive strength tests for one class of cast-in-place gypsum shall be equal to or greater than the specified and not more than 20 percent of the strength.
- (b) Full-sized panels of precast gypsum concrete, when tested in accordance with EPCOT Standard 1004-4, shall sustain a load equivalent to five times the total design superimposed vertical dead load plus live load.

1004.4 Identification. All material used in gypsum concrete shall be delivered to the job in the original packages bearing the manufacturer's label.

**SECTION 1005
GLASS AND GLAZING**

1005.1 Labeling. Each light shall bear the manufacturer's label designating the type and thickness of glass. When approved by the Building Official, labels may be omitted from other than tempered glass providing an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with the approved plans and specifications.

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. This type of glass shall be identified with a removable paper label by the manufacturer.

1005.2 Louvered windows or jalousies. Regular plate, sheet or patterned glass in jalousies and louvered windows shall be no thinner than nominal 7/32 inch and no longer than 48 inches. When other glass types are used, design shall be submitted to the Building Official for approval. Exposed glass edges shall be smooth.

Wired glass with wire exposed on longitudinal edges shall not be used in jalousies or louvered windows.

1005.3 Human impact loads. Individual glazed areas in hazardous locations defined in Subsection 1005.4 shall pass the test requirements of EPCOT Standard 1005-1.

Exceptions:

- 1. In other than Group E occupancies, polished wire glass for use in fire doors, fire windows and view panels in 1-hour fire-resistive walls shall be permitted to comply with EPCOT Standard 1005-2.
- 2. Approved plastic materials used as glazing in hazardous locations shall comply with the weathering requirements of EPCOT Standard 1005-2.

- 3. Glass-block walls conforming to EPCOT Standard 1005-3.

1005.4 Hazardous locations. The following shall be considered specific hazardous locations for the purposes of glazing:

- (a) Glazing in ingress and egress doors except wired glass in required fire doors and jalousies;
- (b) Glazing in fixed and sliding panels of sliding-type doors (patio and mall type);
- (c) Glazing in storm doors;
- (d) Glazing in all unframed swinging doors;
- (e) Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, showers and bathtubs, and glazing in any portion of a building wall enclosing such areas where the bottom exposed edge of the glazing is less than 60 inches above a standing surface;
- (f) Glazing, operable or inoperable, adjacent to a door in all buildings and within a 24-inch arc of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface; and
- (g) Glazing in fixed panels having a glazed area in excess of 9 square feet with the lowest edge less than 24 inches above the finished floor level or walking surface within 36 inches of such glazing. In lieu of safety glazing, such glazed panels may be protected with a horizontal member not less than 1 1/2 inches in height when located between 34 and 38 inches above the walking surfaces. The horizontal member shall be capable of withstanding a horizontal load of 50 pounds per lineal foot without contacting the glazing and shall be installed on each side of the glazing that is accessible from a walking surface.

Exception: The following products, materials and uses are exempt from the hazardous locations identified in Paragraphs (a) through (g):

- 1. Openings in doors through which a 3-inch sphere is unable to pass;
- 2. Leaded glass panels where no individual piece of glass has an area greater than 30 square inches;
- 3. Glazing materials used as curved glass panels in revolving doors;
- 4. Commercial refrigerated cabinet glazed doors; and
- 5. Faceted and decorative glass.

1005.5 Glass supports.

- (a) Glass supports, such as sash members, glazing stops or glazing clips, shall be considered firm when deflection of the support at design load does not exceed 1/175 of the span.
- (b) Where other than firm support on all sides is provided, detailed shop drawings, specifications, and rational analysis and/or test data assuring data performance for the specific installation shall be prepared by engineers experienced in this work and shall be submitted for and receive, if warranted, formal approval by the Building Official.

1005.6 Wind loads.

- (a) Glass in windows, curtain and window walls, skylights, doors and other exterior applications shall be chosen to resist the wind loads in Section 904.
- (b) Maximum sizes of single regular (annealed) glass may be determined directly from Table 10.4. Maximum sizes of other glass types may be determined by first dividing the wind load determined in Section 904 by the factors in Table 10.3.
- (c) Table 10.4 is applicable for rectangular glass firmly supported on all four edges.
- (d) When approved by the Building Official, alternative means for selecting glass may be used in place of Tables 10.3 and 10.4.

1005.7 Glazing replacement. The installation or replacement of glass shall be as required for new installations.

**TABLE 10.3
RELATIVE RESISTANCE TO WIND LOAD
(Assuming equal thickness)**

GLASS TYPE	FACTOR ^a
Laminated ^b	0.75
Wired	0.50
Heat strengthened	2.00
Fully tempered	4.00
Insulating glass ^c -2 panes	1.70
-3 panes	2.55
Patterned ^d	1.00
Sandblasted ^e	0.40
Regular (annealed)	1.00

- a. Wind pressure determined from Section 904 should be divided by this factor for use with Table 10.4.
- b. Applies when two plies are identical in thickness and type; use total glass thickness, not thickness of one ply.
- c. Applies when each glass pane is the same thickness and type; use thickness of one pane.
- d. Use minimum glass thickness, i.e., measured at the thinnest part of the pattern; interpolation of Table 10.4 may be required.
- e. Factor varies depending upon depth and severity of sand blasting; value shown is minimum.

1005.8 Glass in handrails and guards.

- (a) **Materials.** Glass used as a handrail assembly or a guard section 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 be of an approved safety glazing material that conforms to the provisions of Subsection 1005.3. For all glazing types, the minimum nominal thickness shall be 1/4 inch. Fully tempered glass and laminated glass shall comply with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1, listed in Chapter 35.
- (b) **Loads.** The panels and their support system shall be designed to withstand the loads specified in Subsection 902.2(h). A safety factor of four shall be used.
- (c) **Support.** Each handrail or guard section shall be supported by a minimum of three glass balusters or shall be otherwise supported to remain in place should one

baluster panel fail. Glass balusters shall not be installed without an attached handrail or guard.

Exception: A top rail shall not be required where the glass balusters are laminated glass with two or more glass plies of equal thickness and the same glass type when approved by the Building Official. The panels shall be designed to withstand the loads specified in Section 902.

- (d) **Parking garages.** Glazing materials shall not be installed in handrails or guards in parking garages except for pedestrian areas not exposed to impact from vehicles.
- (e) **Glass supporting top rail.** When the top rail is supported by glass, the assembly shall be tested according to the impact requirements of ASTM E1996 and ASTM E1886. The top rail shall remain in place after impact.

1005.9 Glazing in athletic facilities. Reserved.

1005.10 Glazing in elevator hoistways and elevator cars.

- (a) **Glass in elevator hoistway enclosures.** Glass in elevator hoistway enclosures and hoistway doors shall be laminated glass conforming to ANSI Z97.1 or CPSC 16 CFR Part 1201.
- (b) **Fire-resistance-rated hoistways.** Glass installed in hoistways and hoistway doors where the hoistway is required to have a fire-resistance rating shall also comply with Section 703.
- (c) **Glass hoistway doors.** The glass in glass hoistway doors shall be not less than 60 percent of the total visible door panel surface area as seen from the landing side.
- (d) **Glass vision panels.** Glass in vision panels in elevator hoistway doors shall be permitted to be any transparent glazing material not less than 1/4 inches in thickness conforming to Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201. The area of any single vision panel shall not be less than 24 square inches and the total area of one or more vision panels in any hoistway door shall be not more than 85 square inches.
- (e) **Glass in elevator cars.** Glass in elevator car enclosures, glass elevator car doors and glass used for lining walls and ceilings of elevator cars shall be laminated glass conforming to Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201.

Exception: Tempered glass shall be permitted to be used for lining walls and ceilings of elevator cars provided:

1. The glass is bonded to a nonpolymeric coating, sheeting or film backing having a physical integrity to hold the fragments when the glass breaks.
2. The glass is not subjected to further treatment such as sandblasting, etching,

heat treatment or painting that could alter the original properties of the glass.

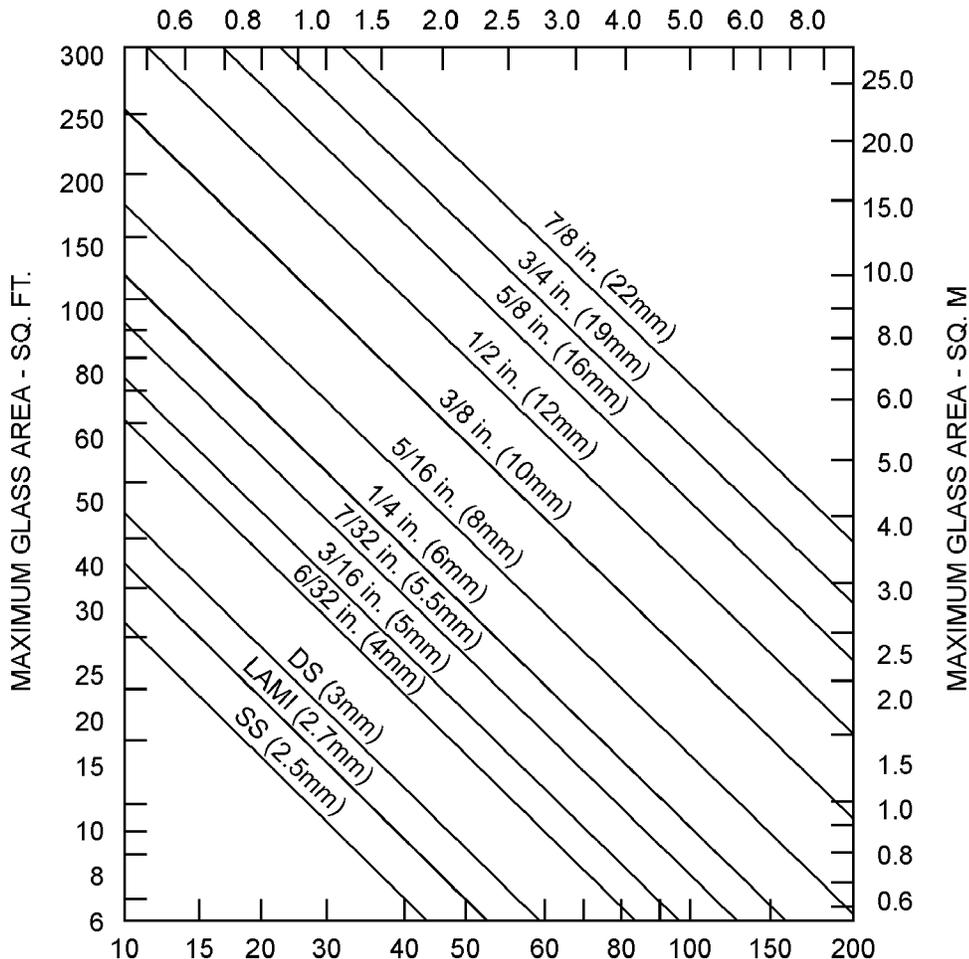
3. The glass is tested to the acceptance criteria for laminated glass as specified for Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201.
- (f) **Surface area.** The glass in glass elevator car doors shall be not less than 60 percent of the total visible door panel surface area as seen from the car side of the doors.

**SECTION 1006
MASONRY**

1006.1 Criteria.

- (a) Quality and design of masonry construction shall comply with the requirements of this Section, Chapter 9 and the following EPCOT Standards:
 1. For brick masonry using solid clay and/or shale, use EPCOT Standards 1006-1 and 1006-2.
 2. For concrete masonry, use EPCOT Standard 1006-1 or 1006-7.

**TABLE 10.4
WIND LOAD CHART
DESIGN WIND LOAD—kPa**



LOADING = psf
 DESIGN WIND LOAD FROM SECTION 904 - LB. psf
 Design factor: 2.5
 Chart applies for Width-to-Length Ratios from 1:5 to 1:1
 Based on Minimum Glass Thickness Allowed in Fed. Spec. DD-G-451D

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3. For glass masonry, use EPCOT Standard 1005-3 and Chapter 7 of ACI 530/ASCE 5/TMS 402.
 4. For other masonry, use EPCOT Standards 1006-1 and 1006-2.
 5. The standards listed in Appendix A for Section 1006 also are adopted as part of this Code.
- (b) Materials used in masonry construction shall comply with the requirements of EPCOT Standards 1006-1, 1006-2, 1006-28, 1006-29 and with the appropriate standards listed in Appendix A for Section 1006, and with the following requirements:
1. Water shall be clean and potable.
 2. Integral waterproofing compounds, accelerators or other admixtures shall not be used, except as approved by the Building Official.
 3. Pure mineral mortar colors shall be used and the quantity and quality shall be approved by the Building Official.
 4. Antifreeze compounds shall not be used to lower the freezing point of mortar.
 5. Secondhand materials shall not be used unless such materials have been cleaned and conform to the requirements of the appropriate standard listed in Appendix A for Section 1006.
- (c) Where no standard or tentative specification is available, the following criteria shall be applied:
1. **Glazed building units.** Building brick or concrete masonry units with glazed faces shall conform to the requirements of specifications listed in Appendix A for brick or concrete masonry units.
 2. **Natural stone.** Stone used in masonry shall be sound, free from friable inclusions, and shall have strength, durability and resistance to impact and abrasion for the intended use. The Building Official may require evidence as necessary to establish suitability of natural stone for conditions of use.

1006.2 Testing. Testing and grading of masonry materials shall comply with the applicable ASTM testing standards listed in Appendix A, with EPCOT Standard 1006-2, Table 1006-2.1, and with EPCOT Standards 1006-1, 1006-28 and 1006-29, as appropriate.

1006.3 Precautions during erection.

- (a) Masonry walls in locations where they may be exposed to high winds during erection shall be braced to withstand the horizontal pressure. Backfill shall not be placed against walls until the walls have been braced.
- (b) Brick made of clay or shale shall be wet when laid unless the gain in weight resulting from partial immersion flatwise in $\frac{1}{8}$ inch of water for 1 minute is less than $\frac{3}{4}$ ounce per 30 square inches of immersed area. Brick shall be prewetted when the initial rate of absorption is

greater than 30 grams per 30 square inches per minute or 0.035 ounce per square inch per minute.

- (c) Structural clay tile having absorption of 12 percent or more shall be wetted before laying.
- (d) Masonry units may be re-used when clean and whole, and when they conform to the requirements of EPCOT Standard 1006-2, except that working stresses shall be 50 percent of those permitted for new material. Salvaged masonry units, which are to be re-used, shall be approved as to the quality, conditions and compliance with the requirements for new masonry units. The units shall be of whole, sound material, free from cracks and other defects that would interfere with their proper laying or use and shall be cleaned free of old mortar before re-use. Masonry units to be re-used as structural units in areas subject to the action of the weather or soil shall not be permitted unless representatives samples are tested for compliance with the applicable requirements.
- (e) Masonry shall be protected against freezing for at least 48 hours after being laid. Unless adequate precautions against freezing are taken, masonry units shall not be laid when the temperature is below 32°F on a rising temperature or below 40°F on a falling temperature at the point where the work is in progress, in accordance with EPCOT Standards 1006-1, 1006-23 and 1006-30.

SECTION 1007 PLASTERING, LATHING AND INSTALLATION OF WALLBOARD

1007.1 Criteria.

- (a) The installation of plaster and lath shall be as specified in EPCOT Standard 1007-1. Wallboard shall meet the specifications of EPCOT Standard 1007-3, and shall be installed and finished as required in EPCOT Standard 1007-4. When required to be fire resistive, lathing, plastering and wallboard shall meet the requirements of EPCOT Standard 6-1 and Chapter 7.
- (b) Lathing, plastering and wallboard materials, and methods of installation, shall conform to the requirements of the applicable EPCOT Standard as listed in Appendix A for Section 1007. The Building Official may require tests to be made to determine compliance with the provisions of this Section and the EPCOT Standard listed when the permit holder has been notified at least 24 hours in advance of the time set for making tests.
- (c) Pneumatically placed Portland cement plaster shall conform to the requirements of EPCOT Standard 1007-2.

1007.2 Inspection. No lath or gypsum wallboard, or their attachments, shall be covered or finished until inspected and approved by the Building Official in accordance with Section 306.

1007.3 Identification. All materials used in the installation of lathing, plastering and wallboard shall be delivered to the job in the original packages bearing the manufacturer's label.

SECTION 1008 PLASTICS

1008.1 Criteria. Plastic materials may be any approved plastic as defined in this Section that complies with the requirements of the EPCOT Standards listed in Appendix A for Section 1008. The Building Official shall require that sufficient technical data be submitted to substantiate the proposed use of a plastic and, when it is determined that the evidence qualified the material for the proposed use, the Building Official may approve the use of the plastic, subject to the requirements of this Section.

1008.2 Identification. Each sheet, roll or piece of plastic for use in building construction or alteration for which a permit is required shall be identified with a mark or decal showing the intended use, acceptable to the Building Official.

1008.3 Definitions. For the purpose of this Code, certain terms are defined and explained as follows:

- (a) **Approved plastics.** Plastics that have a burning rate no more than $2\frac{1}{2}$ inches per minute when tested in nominal 0.060-inch thickness in accordance with EPCOT Standard 1008-2 or that have a flame spread rating of not more than 200 when tested in accordance with EPCOT Standard 6-3 in the manner intended for use. The smoke density rating shall not be more than 450 when tested in accordance with EPCOT Standard 6-3 in the manner intended for use or a smoke density rating not more than 75 when tested in accordance with EPCOT Standard 1008-3 in the thickness intended for use. Products of combustion shall be not more toxic than products of combustion from untreated wood under similar conditions of test.
- (b) **Plastic exterior wall panels.** Plastic panels that are fastened directly to structural members, structural panels or sheathing that are used for light transmission in exterior walls.
- (c) **Plastic glazing materials.** Light-transmitting materials that are set in a frame or sash and not held by mechanical fasteners that pass through the glazing material.

1008.4 Design.

- (a) Plastics used in buildings or structures shall be approved plastics as defined in this Section and shall comply with the following requirements:
 - 1. For interior finish and trim, see Section 711.
 - 2. As exterior veneer, see Section 710 and EPCOT Standard 7-8.
 - 3. For skylights, see Section 706.
 - 4. For light-transmitting assemblies, see Subsection 706.4.
 - 5. For awnings and canopies, see Subsection 402.6.
- (b) Plastic materials shall be of adequate strength and durability to withstand design loads as specified in Chapter 9. Technical data shall be submitted to the Building Official by an approved laboratory or testing agency to establish stresses, maximum unsupported spans and

other information required by the Building Official for the various thicknesses and forms of plastics used.

- (c) Fastenings shall withstand design loads as specified in Chapter 9. Allowance shall be made for expansion and contraction of plastic material in accordance with the coefficient of expansion of the plastic and the materials used with it.

SECTION 1009 STEEL

1009.1 Criteria.

- (a) The quality, design, fabrication, erection and delivery of steel used in buildings and structures shall conform to the provisions, specifications and standards of Section 1009 and Appendix A for Section 1009.
- (b) None of the material standards referred to in this Section or in Appendix A shall exclude the use of material ordered or produced, or other than listed specifications, under the following conditions:
 - 1. The material shall conform to the chemical and mechanical requirements of one of the listed specifications or other published specifications that establishes the properties and suitability of the material for the intended use.
 - 2. The material shall be subject to analysis, tests and other controls as required by the Building Official in accordance with the appropriate listed specification and as provided in Section 311.

1009.2 Identification.

- (a) All steel for structural load-bearing use shall be identified for conformity to the order grade as specified in the appropriate EPCOT Standard listed in Appendix A.
- (b) The fabricator or supplier shall maintain the identity of the material from the point of manufacture to the point of installation, and he shall maintain procedures and records attesting to the fact that the specified grade has been supplied in conformance to the applicable EPCOT Standard listed in Appendix A for Section 1009.

1009.3 Testing. Where steel is not readily identifiable as to grade from marking and test records, tests shall be made to determine conformity to the appropriate EPCOT Standard. The fabricator or supplier shall furnish an affidavit of compliance with the Standard when requested to do so by the Building Official.

SECTION 1010 WOOD

1010.1 Criteria.

- (a) The quality and design of solid sawn wood members, structural glued-laminated wood members and plywood or nonveneer structural panel assemblies and their fastenings shall conform to the requirements of this Section and to the basic standards of the industry listed in EPCOT Standards 1010-1 through 1010-36. Other Standards listed in Appendix A for Section 1010

REQUIREMENTS BASED ON QUALITY, DESIGN AND APPLICATION OF THE MATERIALS OF CONSTRUCTION

also are adopted as part of this Code. For heavy timber standards, see Section 1010-9.801.

- (b) Classification and grading of all species of lumber shall conform to the requirements of Section 1010-1 for the individual species.

1010.2 Limitations of use.

- (a) Wood members shall not be used to support the dead load of masonry or concrete except that nonstructural masonry or concrete floor surfacing not more than 4 inches thick may be supported by wood members and structures may rest on wood piles constructed in accordance with the requirements of Subsection 908.4 and pressure treated in accordance with the requirements of EPCOT Standard 9-5.
- (b) Wood members shall not be used to resist horizontal forces in buildings over one story when constructed with masonry or concrete, except that wood floor and roof members may be used in horizontal trusses and diaphragms to resist horizontal forces imposed by wind. Wood members shall not be used to transmit lateral forces by rotation of the truss or diaphragm in masonry or concrete buildings. Lateral earth pressures shall not be resisted by wood members in buildings.
- (c) The Building Official may deny permission for use of wood members where permissible grade characteristics or defects are present in a combination that will affect the strength of the member for the use intended.

1010.3 Identification.

- (a) Where structures are designed for use of stress grade lumber or where structural glued laminated or plywood is used structurally, the maximum unit stresses for the species and grade shall be shown on the plans filed with the Building Official.
- (b) Structural glued-laminated timber shall be manufactured and identified as required in ANSI/AITC A190.1. (See EPCOT Standard 1010-18.)
- (c) All stress grade lumber shall be identified by grade mark or certificate of inspection issued by an approved agency as conforming to the requirements of EPCOT Standards 1010-11 through 1010-17 for the species used.
- (d) Plywood and other structural-use panels used structurally, including siding, roof sheathing and wall sheathing, subflooring, diaphragms and build-up members, shall be identified and grade marked by an approved agency indicating compliance with the requirements of EPCOT Standards 1010-19 and 1010-32, respectively.
- (e) All lumber, sawn timber, plywood and poles supporting permanent structures are required to be pressure treated as described in the standards listed in Appendix A and shall bear a product identification mark. Quality control inspection agencies for pressure-treated wood shall be certified as to competency of performance by an approved accrediting organization.

All pressure-treated lumber 6 inches or less in thickness and all pressure-treated plywood shall be marked with an indelible ink stamp at the treating facility. The

stamp shall contain, as a minimum, the following information:

1. The treating company and plant location;
2. The American Wood Preservers' Association (AWPA) standards to which the product is treated;
3. The quality mark of an approved inspection agency, which maintains continued supervision, testing and inspection over the quality of the product as described in AWPA standards;
4. The preservative used;
5. The year of the treatment;
6. The amount of retention of the chemical per cubic foot of wood;
7. The quality standard of the inspection agency;
8. Dry or kiln dried after treatment, if applicable; and
9. The purpose for which the wood has been treated (ground contact, above ground or foundation).

Exception: When the pressure-treated material will be used where all four sides are in full view and will not be covered by paint or other opaque finish, a certificate of treatment may be accepted in lieu of a permanent ink stamp. The certificate shall contain the same information as the stamp.

Pressure-treated wood more than 6 inches in width and more than 6 inches thick shall be marked with an indelible ink stamp or tagged at the treating facility.

- (f) Lumber and plywood required to be fire retardant shall be identified by the seal of an approved independent inspection agency, certifying compliance with AWPA C20 and C27. (See EPCOT Standard 1010-21.)
- (g) Wood-based fiberboard and particle board shall be identified by the manufacturer as meeting the appropriate EPCOT Standard as listed in Appendix A.

SECTION 1011 THERMAL INSULATING MATERIAL

1011.1 General. Insulating materials, including vapor barriers, breather papers and similar coverings, shall comply with the requirements of this Section. Where a flame spread rating or a smoke-developed rating is specified in this Section, such rating shall be determined in accordance with ASTM E84. Any material that is subject to an increase in flame spread rating or smoke-developed rating beyond the limits herein established through the effects of age, moisture, or other atmospheric conditions, shall not be permitted.

1011.2 Concealed installation.

- (a) Insulating materials, when concealed as installed, in buildings of any type of construction, shall have a flame spread rating of not more than 75 and a smoke-developed rating of not more than 450.
- (b) When such materials are installed in concealed spaces in buildings of Type III, V or VI construction, the

flame spread and smoke-developed limitations do not apply to facings, provided that the facing is installed in contact with the unexposed surface of the ceiling, wall or floor finish.

1011.3 Exposed installation. Insulating materials when exposed as installed in buildings of any type of construction shall have a flame spread rating of not more than 25 and a smoke-developed rating of not more than 450.

1011.4 Roof insulation. The use of combustible roof insulation shall be permitted in any type of construction provided it is covered with approved roof coverings directly applied thereto.

1011.5 Loose-fill insulation. Loose-fill insulation materials, which cannot be mounted in the ASTM E84 apparatus without a screen or artificial supports, shall comply with the flame spread and smoke-developed limits of Subsections 1011.2 and 1011.3 when tested in accordance with CAN-4-S102.2-M83.

APPENDIX A

ADOPTION OF THE APPENDICES AND REFERENCED STANDARDS OF THE EPCOT BUILDING CODE

SECTION A-101 ADMINISTRATION

A-101.1 Scope. The appendices and Standards identified herein shall be enforced in accordance with the provisions of this Code.

A-101.2 Criteria. The Standards listed herein are sponsored by nationally recognized technical and engineering organizations. Where no national standard is available, the EPCOT compilation as listed shall apply. Where the provisions of this Code and the EPCOT Standards are in conflict, the requirements of this Code shall apply.

SECTION A-201 APPENDICES

A-201.1 Legality. The appendices identified in this Subsection are legally a part of this Code and their provisions shall be enforced by the Building Official.

Appendix A	Adoption of the Appendices and Referenced Standards of the EPCOT Building Code
Appendix B	Fire Limits
Appendix C	Calculated Fire Resistance
Appendix D	Regulation of Signs and Outdoor Advertising Structures
Appendix E	Regulation of Private Swimming Pools
Appendix F	Regulation of Building Construction and Demolition Operations
Appendix G	Regulations for Construction of Stages, Enclosed Platforms, Motion Picture Projection Rooms and Open-Air Event or Performance Platforms
Appendix H	Regulation of Commercial Stables
Appendix I	Regulation of Covered Walkways and Malls
Appendix J	Group S-4 Occupancies and Manufactured Buildings
Appendix K	Tentative Requirements Pertaining to Heat Radiation Between Buildings
Appendix L	Tentative Design Criteria for Fire Protection of Exterior Structural Elements
Appendix M	Regulations for Construction of Motion Picture and Television Soundstages
Appendix N	Regulations for Membrane Structures and Tents
Appendix O	Reserved

Appendix P	Regulations Covering Building Dead Loads
Appendix Q	Regulation of Animal Support Facilities
Appendix R	Swimming Pools and Bathing Places

SECTION A-301 EPCOT REFERENCED STANDARDS

A-301.1 Legality. The Standards listed herein are legally part of this Code and their requirements shall be enforced by the Building Official.

EPCOT Standard Number	Title of Standard	Author Designation and Year of Publication
Chapter 5—Requirements Based On Occupancy		
5-1	Elevators, Dumbwaiters, Escalators, Moving Walks, Manlifts and Transporting Assemblies	EPCOT Compilation
5-2	Health Care Facilities Code	NFPA 99—2015
5-3	<i>EPCOT Accessibility Code for Building Construction</i>	2018 Edition
5-4	Flammable and Combustible Liquids Code	NFPA 30—2015
5-5	Liquefied Petroleum Gas Code	NFPA 58—2014
5-6	Dry Cleaning Plants	NFPA 32—2011
5-7	Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Particulate Solids	NFPA 91—2004
5-8	Grandstands, Folding and Telescopic Seating, Tents and Membrane Structures	NFPA 102—2016
5-9	Heliports	NFPA 418—2011
5-10	Acoustics—Laboratory Measurement of Sound Insulation of Building Elements	ISO 10140-5— 2010
5-11	Spray Application Using Flammable or Combustible Materials	NFPA 33—2018
5-12	Safety Standard for Amusement Attractions and Amusements Buildings	EPCOT Compilation
5-13	Amusement Ride and Devices	EPCOT Compilation

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5-14	Incinerators and Waste and Linen Handling Systems and Equipment	NFPA 82—2014	(b)Sprinkler Systems in Low-Rise Residential Occupancies	NFPA 13R—2013
5-15	Reconstitution of Irradiated Charpy-Sized Specimens	ASTM E1253—2013	(c)Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes	NFPA 13D—2013
5-16	Fire Test of Foamed Plastics Used for Decorative Purposes	UL 1975—2006		
5-17	Standard Method of Fire Tests for Flame-Propagation of Textiles and Films	NFPA 701—2010	7-11 (a)Low Expansion Foam	NFPA 11—2010
5-18	Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source	NFPA 253—2015	(b)Medium- and High-Expansion Foam Systems (Withdrawn)	NFPA 11A—1999
			7-12 Wetting Agents	NFPA 18—2017
			7-13 Dry Chemical Extinguishing Systems	NFPA 17—2013
			7-14 Standpipe and Hose Systems	NFPA 14—2013
			7-15 Portable Fire Extinguishers	NFPA 10—2013
			7-16 Halon 1301 Fire-Extinguishing Systems	NFPA 12A—2009
			7-17 Ventilation Control and Fire Protection of Commercial Cooking Operations	NFPA 96—2004
			7-18 Criteria for Acceptance of Foam Plastics	EPCOT Compilation
			7-19 National Fire Alarm and Signaling Code	NFPA 72—2013
			7-20 Installation, Maintenance and Use of Protective Signaling Devices	NFPA 72—2013
			7-21 Automatic Fire Detectors	NFPA 72—2013
			7-22 Installation, Maintenance and Use of Notification Appliances for Protective Signaling Systems	NFPA 72—2013
			7-23 Household Fire Warning Equipment	NFPA 72—2013
			7-24 Fire Tests of Through-Penetration Firestops	ASTM E814—2013
			7-25 Installation of Private Fire Service Mains and Their Appurtenances	NFPA 24—2019
			7-26 Inspection, Testing and Maintenance of Water-Based Fire Protection System	NFPA 25—2014
			7-27 National Electrical Code	NFPA 70—2014
			7-28 Air Leakage Tests of Door Assemblies—with Revisions through February 2015	UL 1784—2001
			7-29 Smoke Management Systems in Malls, Atria and Large Spaces	NFPA 92 B—2009
Chapter 6—Requirements Based on Types of Construction				
6-1	(a)Part 1—Fire Tests of Building Construction and Materials	ASTM E119—2012A		
	(b)Part 2—Fire-Resistive Time Periods for Building Components	EPCOT Compilation		
6-2	Behavior of Materials in a Vertical Tube Furnace at 750°C	ASTM E136—2012		
6-3	Surface-Burning Characteristics of Building Materials	ASTM E84—2013A		
6-4	Surface Burning Characteristics of Building Materials—with Revisions through September 2013	UL 723—2008		
Chapter 7—General Construction Requirements for Fire Safety				
7-1	Fire Dampers—with Revisions through May 2014	UL 555—2006		
7-2	Fire Tests of Door Assemblies (Withdrawn 1995)	ASTM E152—1981 E2		
7-3	Fire Test of Window Assemblies (Withdrawn 1995)	ASTM E163—1984 E1		
7-4	Smoke Detectors for Fire Alarm Systems	UL 268—2009		
7-5	Tin-Clad Fire Doors—with Revisions through December 2013	UL 10-A—2009		
7-6	Fire Doors and Other Opening Protectives	NFPA 80—2013		
7-7	Fire-Retardant Roof Coverings	EPCOT Compilation		
7-8	Application of Veneer	EPCOT Compilation		
7-9	Smoke and Heat Venting	NFPA 204—2012		
7-10	(a)Installation of Sprinkler Systems	NFPA 13—2013		

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7-30	Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing	ASTM D2898—2010	7-50	Luminous Egress Path Marking Systems—with Revisions through November 2010	UL 1994—2004
7-31	Seamless Copper Pipe, Standard Sizes	ASTM B42—2010	7-51	Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes	ASTM E1996—2005, 2006, 2009, 2012a or 2014a
7-32	Seamless Red Brass Pipe, Standard Sizes	ASTM B43—2009			
7-33	Seamless Copper Tube, Bright Annealed (Metric)	ASTM B68—2011	7-52	Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials	ASTM E1886—2009 or 2005 or 2012 or 2013a
7-34	Seamless Cooper Water Tube	ASTM B88—2009			
7-35	General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	ASTM B251—2010			
7-36	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service	ASTM B280—2008		Chapter 9—Design Requirements	
7-37	Cast Copper Alloy Solder Joint Pressure Fittings	ASME B16.18—2012	9-1	Laboratory Compaction Characteristics of Soil Using Modified Effort	ASTM D1557—2012
7-38	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	ASME B16.22—2001 (Reaffirmed 2010)	9-2	Density and Unit Weight of Soil in Place by the Sand-Cone Method	ASTM D1556—2007
7-39	Smoke Door Assemblies and Other Opening Protectives	NFPA 105—2013	9-3	Deep Foundations Under Static Axial Compressive Load	ASTM D1143/ D1143M—2007e1
7-40	Wet Chemical Extinguishing Systems	NFPA 17A—2013	9-4	Establishing Allowable Stresses for Round Timber Piles	ASTM D2899—2012
7-41	Stationary Pumps for Fire Protection	NFPA 20—2013	9-5	Round Timber Piles	ASTM D25—2012
7-42	Carbon Monoxide (CO) Detection and Warning Equipment	NFPA 720—2015	9-6	Welded and Seamless Steel Pipe Piles	ASTM A252—2010)
7-43	Standard Test Methods for Fire Tests of Building Construction and Materials	ASTM E119—2012a	9-7	Minimum Design Loads for Buildings and Other Structures	ASCE 7—2010
7-44	Fire Tests of Building Construction and Materials	UL 263—2011	9-8	Guide Specifications for Design of Metal Flagpoles	ANSI/ NAAMM FP 1001—1997
7-45	Fire Test for Window and Glass Block Assemblies	NFPA 257—2012	9-9	Structural Standards for Steel Antenna Towers and Antenna Supporting Structures (Revised 2003)	ANSI/ TIA-222F—1996
7-46	Fire Tests of Window Assemblies	UL 9—2009	9-10	Approval Standard for Class 1 Insulated Steel Deck Roofs	FM 4450—1989
7-47	Standard Classification for Abuse-resistant Nondecorated Interior Gypsum Panel Products and Fiber-reinforced Cement Panels	ASTM C1629/ C1629M—2006(2011)	9-11	Approval Standard for Single-Ply Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction	FM 4470—2012
7-48	Fire Safety and Emergency Symbols	NFPA 170—2015	9-12	Tests for Uplift Resistance of Roof Assemblies—with Revisions through October 2013	UL 580—2006
7-49	Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings	ASTM E2073—2010			

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- 9-13 Uplift Tests for Roof Covering Systems—with Revisions through September 2015 UL 1897—2012
- 9-14 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference ASTM E1592—2005(2012)

Chapter 10*—Requirements Based on Quality, Design and Application of the Materials of Construction

*The listing of EPCOT Standards for Chapter 10, because of its length, is subdivided into sections for each material. Except when Test Method is indicated, the Standard is a specification.

Section 1002—Aluminum

- 1002-1 Aluminum Design Manual: Part 1-A Specification for Aluminum Structures ADM1—2015
- 1002-2 Aluminum and Aluminum-Alloy Sheet and Plate ASTM B209—2014
- 1002-3 Aluminum and Aluminum-Alloy Drawn Seamless Tubes ASTM B210—2012
- 1002-4 Aluminum and Aluminum-Alloy Rolled or Cold Finished Bars, Rods and Wire ASTM B211—2012e1
- 1002-5 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes ASTM B221—2014
- 1002-6 Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Surface Condensers, Evaporators and Heat Exchangers ASTM B234—2017
- 1002-7 Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube ASTM B241/B241M—2016
- 1002-8 Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings and Rolled-Ring Forgings ASTM B247—2015
- 1002-9 Aluminum-Alloy 6061-T6 Standard Structural Profiles ASTM B308/B308M—2010
- 1002-10 Structural Welding Code—Aluminum AWS D1.2
- 1002-11 Aluminum and Aluminum Alloy Rivet and Cold-Heading Wire and Rods ASTM B316/B316M—2015
- 1002-12 Aluminum-Alloy Extruded Structural Pipe and Tube ASTM B429/B429M—2010e1

Section 1003—Concrete Construction

- 1003-1 Building Code Requirements for Structural Concrete ACI 318—2014

- 1003-2 Reserved
- 1003-3 Portland Cement ASTM C150/C150M—2012
- 1003-4 Reserved
- 1003-5 Blended Hydraulic Cements ASTM C595—2013
- 1003-6 Concrete Aggregates ASTM C33/C33M—2013
- 1003-7 Lightweight Aggregates for Structural Concrete ASTM C330/C33M—2009
- 1003-8 Organic Impurities in Fine Aggregates for Concrete ASTM C40/C40M—2019
- 1003-9 Air-Entraining Admixtures for Concrete ASTM C260/C260M—2016
- 1003-10 Chemical Admixtures for Concrete ASTM C494/C494M—1999
- 1003-11 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete ASTM C618—2012a
- 1003-12 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement ASTM A615/A615M—2012
- 1003-13 Rail-Steel Deformed and Plain Bars for Concrete Reinforcement (Withdrawn) ASTM A616—1979
- 1003-14 Axle-Steel Deformed and Plain Bars for Concrete Reinforcement (Withdrawn) ASTM A617—1979
- 1003-15 Welded Deformed Steel Bar Mats for Concrete (Withdrawn) ASTM A184/A184M—2017
- 1003-16 Steel Wire, Plain, for Concrete Reinforcement (Withdrawn) ASTM A82—2002
- 1003-17 Steel-Welded Wire Reinforcement, Plain for Concrete ASTM A185—2002
- 1003-18 Steel Strand, Uncoated Seven-Wire for Prestressed Concrete ASTM A416/A416M—2012A
- 1003-19 Uncoated Stress-Relieved Steel Wire for Prestressed Concrete ASTM A421/A421M—2015
- 1003-20 Structural Welding Code-Reinforcing Steel AWS D1.4/D1.4M—2011
- 1003-21 Low and Intermediate Tensile Strength Carbon Steel Plates ASTM A283/A283M—2012A
- 1003-22 Index of Specifications for Ductile-Iron Pressure Pipe ASTM A377—2018
- 1003-23 Selecting Proportions for Normal, Heavyweight and Mass Concrete ACI 211.1—1991 (Reapproved 2009)

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1003-24	Selecting Proportions for Structural Lightweight Concrete	ACI 211.2—1998 (Reapproved 2004)	The following Standards appearing in other Sections also shall apply to Section 1004:	
1003-25	Evaluation of Strength Test Results of Concrete	ACI 214R—2011	EPCOT Standard Number	Author Designation and Year of Publication
1003-26	Making and Curing Concrete Test Specimens in the Laboratory	ASTM C192/ C192M—2018	1003-16	ASTM A82—2002
1003-27	Sampling Freshly Mixed Concrete	ASTM C172—2010	1003-17	ASTM A185/ A185M—2006 (2011)
1003-28	Compressive Strength of Cylindrical Concrete Specimens	ASTM C39—2018	1003-20	AWS/D1.4M—2011
1003-29	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete	ASTM C42/ C42M—2018a	1007-9	ASTM C28/ C28M—2010
1003-30	Splitting Tensile Strength of Cylindrical Concrete Specimens	ASTM C496/ C496M—2017	1009-20	ASTM A242/ A242M—2013
1003-31	Ready-Mixed Concrete	ASTM C94/ C94M—2013	Section 1005—Glass and Glazing	
1003-32	Design and Control of Concrete Mixtures	PCA 15th Edition	1005-1	Architectural Glazing Material CPSC16-CFR, Part 1201—2002
			1005-2	Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test ANSI Z97.1—2014
			1005-3	Building Code Requirements for Masonry Structures ACI 530—2013 ASCE 5—2013 TMS 402—2016

The following Standards appearing in other Sections also shall apply to Section 1003:

EPCOT Standard Number	Title of Standard	Author Designation and Year of Publication		
1009-12	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless Specification for Cast-Iron Soil Pipe and Fittings	ASTM A53—2018	Section 1006—Masonry	
Section 1004—Gypsum Concrete and Precast Gypsum			1006-1	Building Code Requirements for Masonry Structures ACI 530—2013 ASCE 5—2013 TMS 402—2016
1004-1	Reinforced Gypsum Concrete	EPCOT Compilation	1006-2	Masonry Structures ACI 530.1—2013 ASCE 6—2013 TMS 602—2016
1004-2	Physical Testing of Gypsum, Gypsum Plaster and Gypsum Concrete	ASTM C472—1999 (2009)	1006-3	Building Brick (Solid Masonry Units Made from Clay or Shale) ASTM C62—2013
1004-3	Physical Testing of Gypsum Panel Products	ASTM C473—2012	1006-4	Calcium Silicate Brick (Sand-Lime Brick) ASTM C73—2010
1004-4	Gypsum Concrete	ASTM C317/ C317M—2000 (2010)	1006-5	Facing Brick (Solid Masonry Units Made from Clay or Shale) ASTM C216—2013
1004-5	Chemical Analysis of Gypsum and Gypsum Products	ASTM C471M—2001	1006-6	Concrete Building Brick ASTM C55—2011
			1006-7	Load-Bearing Concrete Masonry Units ASTM C90—2014
			1006-8	Reserved
			1006-9	Nonloadbearing Concrete Masonry Units ASTM C129—2017

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1006-10	Structural Clay Loadbearing Wall Tile	ASTM C34—2017	1003-13	ASTM A616—1979
1006-11	Structural Clay Nonload-bearing Tile	ASTM C56—2017	1003-14	ASTM A617—1979
1006-13	Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units	ASTM C126—2018	1003-15	ASTM A184/A184M—2017
1006-14	Structural Clay Facing Tile	ASTM C212—2017	1003-16	ASTM A82—2007
1006-16	Masonry Cement	ASTM C91/C91M—2012	1003-17	ASTM A185—2007
1006-17	Quicklime for Structural Purposes	ASTM C5—2010	Section 1007—Plastering, Lathing and Installation of Wallboard	
1006-18	Hydrated Lime for Masonry Purposes	ASTM C207—2018	1007-1	(a) Application of Portland Cement-Based Plaster ASTM C926—2015b
1006-19	Finishing Hydrated Lime	ASTM C206—2013	1007-2	(b) Interior Lathing and Furring ASTM C841—2003 (2008)e1
1006-20	Blended Hydraulic Cements	ASTM C595/C595M—2013	1007-2	Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster ASTM C1063—2015a
1006-21	Aggregates for Masonry Mortar	ASTM C144—2018	1007-3	Gypsum Wallboard (Withdrawn) ASTM C36/C36M—2003
1006-22	Aggregates for Masonry Grout	ASTM C404—2018	1007-4	Application and Finishing of Gypsum Panel Products GA 216—2013
1006-23	Mortar for Unit Masonry	ASTM C270—2012a	1007-5	Gypsum Backing Board, Gypsum Coreboard and Gypsum Shaftliner Board (Withdrawn) ASTM C442/C442M—2004
1006-24	Sampling and Testing Brick and Structural Clay Tile	ASTM C67—2013	1007-6	Treated Core and Non-Treated Core Gypsum Sheathing Board ASTM C79—2004a
1006-25	Sampling and Testing Concrete Masonry Units and Related Units	ASTM C140/C140M—2013	1007-7	Gypsum Lath ASTM C37/C37M—2001
1006-26	Packaged, Dry Combined Materials for Surface Bonding Mortar	ASTM C887—2005(2010)	1007-8	Inorganic Aggregates for Use in Gypsum Plaster ASTM C35—1995(2009)
1006-27	Building Brick (Solid Masonry Units Made from Clay or Shale)	ASTM C62—2013	1007-9	Gypsum Plasters ASTM C28/C28M—2010
1006-28	Lightweight Aggregates for Concrete Masonry Units	ASTM C331—2010	1007-10	Gypsum Casting Plaster and Molding Plaster ASTM C59/C59M—2011
1006-29	Grout for Masonry	ASTM C476—2002	1007-11	Finishing Hydrated Lime ASTM C206—2013
1006-30	Sampling and Testing Grout	ASTM C1019—2018	1007-12	Gypsum Keene’s Cement ASTM C61/C61M—2000 (2011)

The following Standards appearing in other Sections also shall apply to Section 1006:

EPCOT Standard Number	Author Designation and Year of Publication			
1003-3	ASTM C150/C150M—2012	1007-13	Adhesives for Fastening Gypsum Wallboard to Wood Framing ASTM C557—2003(2009)e01	
1003-12	ASTM A615/A615M—2012	1007-14	Joint Compound and Joint Tape for Finishing Gypsum Wallboard ASTM C475/C475M—2012	

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The following Standards appearing in other Sections also shall apply to Section 1007:

EPCOT Standard Number		Author Designation and Year of Publication		
1003-3		ASTM C150/ C150M—2012	1009-5	(a) Structural Welding Code— Steel (b) Structural Welding Code— Sheet Steel
1003-5		ASTM C595/ C595M—2013		AWS D1.1— 2010 AWS D1.3— 2008
1003-15		ASTM A184/ A184M—2006 (2017)	1009-6	Structural Joints Using High Strength Bolts
1006-16		ASTM C91/ C91M—2012	1009-7	Carbon Structural Steel
	Section 1008—Plastics		1009-8	Steel Casting, Carbon, for General Application
1008-1	Ignition Temperature of Plastics	ASTM D1929— 2012	1009-9	Gray-Iron Castings
1008-2	Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position	ASTM D635— 2010	1009-10	(a) Carbon Steel Electrodes and Rods for Gas-Shielded Arc Welding (b) Carbon Steel Electrodes for Flux-Cored Arc Welding
1008-3	Density of Smoke from the Burning or Decomposition of Plastics	ASTM D2843— 2010	1009-11	Reserved
	Section 1009—Steel		1009-12	Pipe, Steel, Black and Hot- Dipped, Zinc-Coated Welded and Seamless Specification for Cast-Iron Soil Pipe and Fittings
1009-1	Structural Steel Buildings (Supersedes AISC 335-1989s1)	ANSI/AIS C360—2010	1009-13	Structural Steel (SS), Sheet, Carbon, Coil-Rolled (Withdrawn)
1009-2	(a) North American Specification for the Design of Cold-Formed Steel Structural Members (b) Design of Cold-Formed Stainless Steel Structural Members	AISI S100— 2012 ASCE 8—2014	1009-14	Steel, Sheet and Strip, Carbon, Hot-Rolled (Withdrawn)
1009-3	(a) Open-Web Steel Joists, K-Series (b) Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series (c) Load Tables and Weight Tables for Steel Joists and Joist Girders K-Series, LH-Series, DHL-Series Joist Girders (d) Code of Standard Practice for Steel Joists and Joist Girders	SJK—2010 SJI LH/ DLH—2010 SJI 44 th Edition—2015 SJI COSP— 2010	1009-15	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
1009-4	Structural Applications of Steel Cables for Buildings	ASCE 19— 2009	1009-16	Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength
			1009-17	Quenched- and Tempered- Alloy Steel Bolts, Studs, and other Externally Threaded Fasteners
			1009-18	Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
			1009-19	Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium and/or Vanadium Hot-Rolled and Cold-Rolled (Withdrawn 2000)
			1009-20	High-Strength, Low-Alloy Structural Steel

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1009-21	High-Strength, Low-Alloy Columbium-Vanadium Structural Steel	ASTM A572/ A572M—2012A	1009-37	High-Strength Carbon-Manganese Steel of Structural Quality	ASTM A529/ A529M—2014
1009-22	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality (Withdrawn 1994)	ASTM A446/ A446M—1993	1009-38	Steel Joists Shop Primer/Metal Building Primer	SSPC- Paint 15
1009-23	Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use	ASTM A449— 2014	1009-39	Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks	SDI # 31—2007
1009-24	Heat-Treated Steel Structural Bolts, Alloy Steel, Heat Treated 150 ksi Minimum Tensile Strength	ASTM A490— 2008b	1009-40	Structural Steel Buildings	AISC 360—2010
1009-25	Rivets, Steel, Structural	ASTM A502— 2003(2015)	The following Standards appearing in other Sections apply to the use of steel pipe piles, welding and reinforcing steel:		
1009-26	High-Strength, Low-Alloy Columbium-Vanadium Structural Steel	ASTM A572/ A572M—2012A	EPCOT Standard Number	Author Designation and Year of Publication	
1009-27	Seamless Carbon Steel Pipe for High-Temperature Service	ASTM A106/ A106M—2018	9-6	ASTM A252— 2010	
1009-28	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes	ASTM A500/ A500M—2018	1003-12	ASTM A615/ A615M—2012	
1009-29	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing	ASTM A501— 2014	1003-13	ASTM A616— 1979 (Withdrawn)	
1009-30	Steel Castings, High-Strength for Structural Purposes	ASTM A148/ A148M—2015	1003-14	ASTM A617— 1979 (Withdrawn)	
1009-31	Steel Forgings, Carbon and Alloy, for General Industrial Use	ASTM A668/ A668M—2013el	1003-15	ASTM A184/ A184M—2006 (2017)	
1009-32	High-Strength, Low-Alloy Structural Steel with 50 psi Minimum Yield Point with Atmospheric Corrosion Resistance	ASTM A588/ A588M—2010	1003-16	ASTM A82— 2002	
1009-33	Steel Bars, Carbon, Merchant Quality, Mechanical Properties	ASTM A663/ A633M—2017	1003-17	ASTM A185— 2002	
1009-34	Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties	ASTM A675/ A675M—2014	1003-18	ASTM A416/ A416M—2012A	
1009-35	Mechanical Testing of Steel Products	ASTM A370— 2018	1003-19	ASTM A421/ A421M—2015	
1009-36	High-Yield-Strength, Quenched- and Tempered-Alloy Steel Plate, Suitable for Welding	ASTM A514/ A514M—2018	1003-20	AWS D1.4/ D1.4M—2011	
			1003-21	ASTM A283/ A283M—2003 (2012a)	
			1003-22	ASTM A377— 2003 (2018)	
			Section 1010—Wood		
			1010-1	(a) National Design Specification (NDS) for Wood Construction	ANSI/AWC NDS—2018
				(b) Special Design Provisions for Wind and Seismic	ANSI/AWC SDPWS—2015
			1010-2	(a) Span Tables for Joists and Rafters	AF&PA—2012

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	(b) Design Values for Joists and Rafters	AF&PA—2005	(c) Piles—Preservative Treatment by Pressure Processes (Withdrawn)	AWPA C3—2003
➔	1010-3 Wood Construction Data Plank and Beam Framing for Residential Buildings	AWC WCD-4—2003	(d) Poles—Preservative Treatment by Pressure Processes (Withdrawn)	AWPA C4—2003
➔	1010-4 Structural Glued-Laminated Timber of Softwood Species— Design Requirements— Standard Specifications for Structural Glued-Laminated Timber of Softwood Species— Manufacturing Requirements	AITC 117— 2010	(e) Sawn Timber Piles Used to Support Residential and Commercial Structures (Withdrawn)	AWPA C24— 2003
	1010-5 Reserved		(f) Posts—Pressure Treatment (Withdrawn)	AWPA C5— 2003
	1010-6 Reserved		(g) Plywood—Preservative Treatment by Pressure Processes (Withdrawn)	AWPA C9— 2003
	1010-7 Reserved		(h) Wood Block for Floors and Platforms Pressure Treatment (Withdrawn)	AWPA C11— 2001
	1010-8 Plywood Design Specification (Revised 1998)	APA PDS- Y510J—2004	(i) Wood for Commercial- Residential Construction— Preservative Treatment by Pressure Processes (Withdrawn)	AWPA C15— 2003
	1010-9 Wood		(j) Round Poles and Posts Used in Building Construction— Preservative Treatment by Pressure Processes (Withdrawn)	AWPA C23— 2003
➔	1010-10 Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber	ASTM D245— 2006(2011)	(k) Structural Glued-Laminated Members and Laminations Before Gluing (Withdrawn)	AWPA C28— 2003
➔	1010-11 Grades of Southern and Tidewater Red Cypress	SCMA-June 1, 1986	1010-21 (a) Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing	ASTM D2898— 2010
	1010-12 Southern Pine Inspection Bureau Grading Rules	SPIB—2014	(b) Hygroscopic Properties of Fire-Retardant-Treated Wood and Wood-Base Products	ASTM D3201/ D3201M—2013
	1010-13 Standard Grading Rules for West Coast Lumber	WCLIB 17— 2004	(c) Structural Lumber, Fire-Retardant Pressure Treatment (Withdrawn)	AWPA C20— 2002
➔	1010-14 Grades of California Redwood Lumber	California Redwood Association— 2000 Edition	(d) Plywood—Fire-Retardant Treated by Pressure Processes (Withdrawn)	AWPA C27— 2002
	1010-15 Western Lumber Grading Rules	WWPA— 2011	1010-22 Piles and Poles, Wood (Canceled)	ANSI 05.1— 2002
	1010-16 Official Grading Rules for Northern Hardwood and Pine	NHPMA	1010-23 Federal Specification for Insulation Board, Thermal (Cellulosic Fiber) (Canceled)	LLL-1-535B— 1977
	1010-17 Standard Grading Rules for Northeastern Lumber	NeLMA—2013		
➔	1010-18 Structural Glued-Laminated Timber	ANSI A-190.1— 2012		
	1010-19 Structural Plywood	NIST—2009		
	1010-20 (a) All Timber Products— Preservative Treatment by Pressure Processes (Withdrawn)	AWPA C1— 2003		
	(b) Lumber, Timber, Bridge Ties and Mine Ties— Preservative Treatment by Pressure Processes (Withdrawn)	AWPAC2—2002		

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1010-24	Fiberboard Nail-Base Sheathing (Withdrawn 1992)	ASTM D2277— 1987	The following Standard referenced in other Sections shall also apply to Section 1010:	
			EPCOT Standard Number	Author Designation and Year of Publication
1010-25	Federal Specifications for Nails, Brads, Staples and Spikes: Wire, Cut and Wrought	FF-N-105B— March 17, 1971	6-3	ASTM E84— 2013A
1010-26	Cellulostic Fiber Insulating Board	ASTM C208— 2012	7-8	EPCOT Compilation
		ASTM C209— 1998	9-4	ASTM D2899— 2017
1010-27	(a) Basic Hardboard	AHA A 135.4— 2012	9-5	ASTM D25— 2012
	(b) Prefinished Hardboard Paneling	AHA A 135.5— 2012	1007-1	ASTM C926— 2015b
	(c) Hardboard Siding	AHA A 135.6— 2012		
1010-28	Particleboard	ANSI A208.1— 2009	Section 1011—Thermal Insulating Material	
1010-29	Evaluating Properties for Wood-Base Fiber and Particle Panel Materials	ASTM D1037— 2012	1011-1	<i>EPCOT Energy Efficiency Code for Building Construction</i> 2018
1010-30	APA Engineered Wood Construction Guide, Form E30	APA EWCG	1011-2	Energy Standard for Buildings, Except Low-Rise Residential Buildings, I-P Edition ANSI/ ASHRAE/ IESNA 90.1— 2016
1010-31	National Design Standard for Metal-Plate-Connected Wood Truss Construction	TPI 1—2014	1011-3	Advanced Energy Design Guide for Small Office Buildings (Guide) ANSI/ ASHRAE— 2004
1010-32	Performance Standards and Policies for Structural-Use Panels	APA PRP-108	Appendix D—Regulation of Signs and Outdoor Advertising Structures	
1010-33	Adhesives for Field-Glueing Plywood to Wood Framing	APA AFG-01— March 1991	D-1	Standard for Electric Signs UL 48—2011
1010-34	Wood Construction Data No. 6, Design of Wood Frame Structures for Permanence	AF&PA WCD6—2006	D-2	Enclosures for Electrical Equipment, Non-Environmental Considerations UL 50—2015
1010-35	Test Method for Evaluating the Flexural Properties of Fire-Retardant-Treated Softwood Plywood Exposed to the Elevated Temperatures	ASTM D5516— 2009	Appendix N—Regulations for Membrane Structures and Tents	
1010-36	Technical Report No. 7, The Permanent Wood Foundation System (Replaced)	AF&PA TR 7— March 1987	N-1	Standard Practice for Design, Manufacture, Operation, and Maintenance of Inflatable Amusement Devices ASTM F2374— 2017
1010-37	Zinc Coating (Hot-Dip) on Iron and Steel Hardware	ASTM A153/ A153M—2009	Appendix R—Swimming Pools and Bathing Places	
1010-38	Coatings of Zinc Mechanically Strip Deposited on Iron and Steel for Building Construction	ASTM B695— 2004(2009)	R-1	Equipment for Pools, Spas, Hot Tubs and Other Recreational Water Facilities NSF/ANSI 50— 2011
			R-2	Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs ASTM F1346— 1991(2010)
			R-3	Public Swimming Pools ANSI/NSPI-1— 2003 ←
			R-4	Public Spas ANSI/NSPI-2— 1999 ←

→ █	R-5	Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs and Catch Basins	ANSI/APSP-7—2013
	R-6	Drinking Water Treatment Chemicals – Health Effects	NSF/ANSI 60—2005
	R-7	Dimensional Standards	National Collegiate Athletic Association—1998
	R-8	Federation Internationale de Natation Amateur Handbook	FINA 1998—2000
	R-9	Official Rules of Diving & Code Regulation of United States Diving, Inc.	1998—1999
	R-10	United States Swimming Rules and Regulations	1998
	R-11	National Federation of State High School Associations	1997-1998
	R-12	Federation Internationale de Natation Amateur Handbook	FINA 2005-2009
█	R-13	National Electrical Code	NFPA 70—2014
█	R-14	Suction Fitting for use in Pools, Wading Pools, Spas, Hot Tubs and Whirlpool Bathtub Appliances	ASME/ANSI A112.19.8—2007
	R-15	USEPA Ultraviolet Disinfectant Guidance Manual	EPA 815-R-06-007-Nov. 2006

EPCOT Standard 5-1

█	5-1-1	Safety Code for Elevators and Escalators—with A17.1a/CSA B44	ASME A17.1—2013
	5-1-2	Guide for Inspection of Elevators, Escalators, and Moving Walks	ASME A17.2—2012
█	5-1-3	Safety Standard for Belt Manlifts	ASME A90.1—2009
	5-1-4	Safety Standard for Conveyors, and Related Equipment	ASME B20.1—2009
	5-1-5	Safety Code for Existing Elevators and Escalators	ASME A17.3—1996
	5-1-6	Safety Standard for Platform Lifts and Stairway Chairlifts	ASME A18.1—2008
	5-1-7	Elevator and Escalator Electrical Equipment	ASME A17.5

APPENDIX B

FIRE LIMITS

SECTION B-101 GENERAL

B-101.1 Scope. For the purpose of this Code, there shall be no area within the District designated as a Fire District or included within any territory set forth as fire limits.

APPENDIX C

CALCULATED FIRE RESISTANCE

SECTION C-101 CALCULATED FIRE RESISTANCE

C-101.1 General.

C-101.1.1 Scope. These provisions contain procedures by which the fire resistance of specific materials or combinations of materials can be established by calculations. These procedures apply only to the information contained in this Section and shall not be otherwise used.

C-101.1.2 Definitions. For definitions, see Chapter 2.

C-101.2 Concrete assemblies.

C-101.2.1 Concrete walls.

C-101.2.1.1 Cast-in-place or precast walls.

C-101.2.1.1.1 The minimum equivalent thicknesses of cast-in-place or precast concrete walls for fire-resistance ratings of 1 hour to 4 hours are shown in Table C-101.2.1.1. For solid walls with flat vertical surfaces, the equivalent thickness is the same as the thickness. The values in Table C-101.2.1.1 apply to plain, reinforced or prestressed concrete walls.

C-101.2.1.1.2 For hollow-core precast concrete wall panels in which the cores are of constant cross section throughout the length, the equivalent thickness may be calculated by dividing the net cross-sectional area (the gross cross section minus the area of the cores) of the panel by its width.

C-101.2.1.1.3 Where all of the core spaces of hollow-core wall panels are filled with loose-fill material, such as expanded shale, clay or slag, or vermiculite or perlite, the fire-resistance rating of the wall is the same as that of a solid wall of the same concrete type and of the same overall thickness.

C-101.2.1.1.4 The thickness of panels with tapered cross sections shall be that determined at a distance $2t$ or 6 inches, whichever is less, from the point of minimum thickness, where t is the minimum thickness.

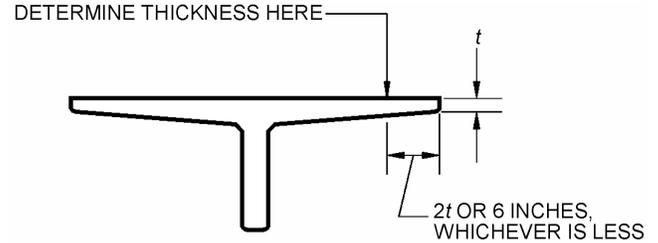


FIGURE C-101.2.1.1.4
THICKNESS OF PANELS WITH TAPERED CROSS SECTIONS

C-101.2.1.1.5 The equivalent thickness of panels with ribbed or undulating surfaces shall be determined by one of the following expressions:

For $s \geq 4t$, the thickness to be used shall be t ;

For $s \leq 2t$, the thickness to be used shall be t_e ;

For $4t > s > 2t$, the thickness to be used shall be

Equation C-101.2.1.1.5 Thickness of Concrete Wall Panels with Ribs

$$t + \left(\frac{4t}{s} - 1\right) (t_e - t)$$

Where:

s = Spacing of ribs or undulations.

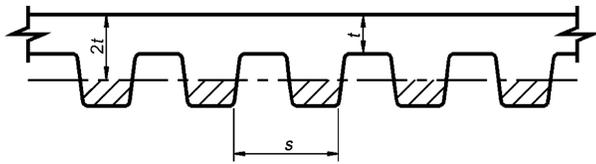
t = Minimum thickness.

t_e = Equivalent thickness of the panel calculated as the net cross-sectional area of the panel divided by the width, in which the maximum thickness used in the calculation shall not exceed $2t$.

TABLE C-101.2.1.1
**MINIMUM EQUIVALENT THICKNESS (inches) OF CAST-IN-PLACE
OR PRECAST CONCRETE WALLS, LOAD BEARING OR NONLOAD BEARING**

CONCRETE TYPE	1 hour	MINIMUM SLAB THICKNESS (inches) FOR FIRE RESISTANCE RATING OF			
		1½ hours	2 hours	3 hours	4 hours
Siliceous	3.5	4.3	5.0	6.2	7.0
Carbonate	3.2	4.0	4.6	5.7	6.6
Sand-Lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

APPENDIX C—CALCULATED FIRE RESISTANCE



NEGLECT SHADED AREA IN CALCULATION OF EQUIVALENT THICKNESS

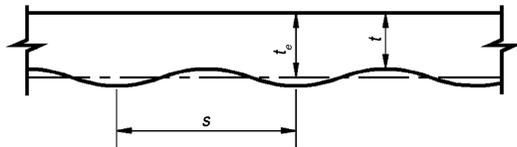


FIGURE C-101.2.1.1.5
THICKNESS OF PANELS WITH RIBBED
OR UNDULATING SURFACES

C-101.2.1.2 Multiwythe walls.

C-101.2.1.2.1. For walls that consist of two wythes of different types of concrete, the fire-resistance ratings may be determined from Figure C-101.2.1.2.

C-101.2.1.2.2. The fire-resistance rating for wall panels consisting of two or more wythes may be determined by the formula:

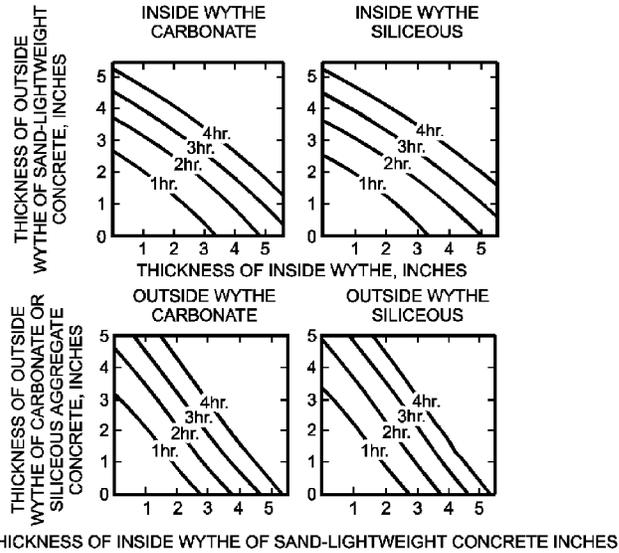


FIGURE C-101.2.1.2
FIRE-RESISTANCE RATINGS
OF TWO-WYTHE CONCRETE WALLS

Equation C-101.2.1.2.2 Fire-Resistance Rating for Multiwythe Walls

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7}$$

Where:

R = The fire endurance of the assembly, minutes.

R₁, R₂ and R_n = The fire endurances of the individual wythes, minutes.

Values of R_n^{0.59} for use in Equation C-101.2.1.2 are given in Table C-101.2.1.2.

TABLE C-101.2.1.2
VALUES OF R_n^{0.59} FOR USE IN EQUATION C-101.2.1.2

TYPE OF MATERIAL	THICKNESS OF MATERIAL (inches)											
	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7
Siliceous aggregate concrete	5.3	6.5	8.1	9.5	11.3	13.0	14.9	16.9	18.8	20.7	22.8	25.1
Carbonate aggregate concrete	5.5	7.1	8.9	10.4	12.0	14.0	16.2	18.1	20.3	21.9	24.7	27.2 ^c
Sand-lightweight concrete	6.5	8.2	10.5	12.8	15.5	18.1	20.7	23.3	26.0 ^c	Note c	Note c	Note c
Lightweight concrete	6.6	8.8	11.2	13.7	16.5	19.1	21.9	24.7	27.8 ^c	Note c	Note c	Note c
Insulating concrete ^a	9.3	13.3	16.6	18.3	23.1	26.5 ^c	Note c	Note c	Note c	Note c	Note c	Note c
Air space ^b	—	—	—	—	—	—	—	—	—	—	—	—

a. Dry unit weight of 35 pounds per cubic foot or less and consisting of cellular, perlite or vermiculite concrete.

b. The R_n^{0.59} value for one ½ inch to 3½ inches airspace is 3.3. The R_n^{0.59} value for two ½ inch to 3½ inches airspaces is 6.7.

c. The fire-resistance rating for this thickness exceeds 4 hours.

R, MINUTES	R ^{0.59}
60	11.20
120	16.85
180	21.41
240	25.37

C-101.2.1.2.3. The fire-resistance ratings of precast concrete wall panels consisting of a layer of foam plastic insulation sandwiched between two wythes of concrete may be determined by use of Equation C-101.2.1.2. Foam plastic insulation with a total thickness of less than 1 inch shall be disregarded. The R_n value for thickness of foam plastic insulation of 1 inch or greater, for use in the calculation, is 5 minutes; therefore, $R_n^{0.59}$ equals 2.5.

C-101.2.1.3 Joints between precast wall panels.

C-101.2.1.3.1 Joints between precast concrete wall panels, which are not insulated as required by this Section, shall be considered as openings in walls. Uninsulated joints shall be included in determining the percentage of openings permitted by Table 6.2. Where openings are not permitted or are required by this Code to be protected, the provisions of this Section shall be used to determine the amount of joint insulation required. Insulated joints shall not be considered openings for purposes of determining compliance with allowable percentage of openings in Table 6.2.

C-101.2.1.3.2 Figure C-101.2.1.3 shows thicknesses of ceramic fiber blankets to be used to insulate joints between precast concrete wall panels for various panel thicknesses and for joint widths of $3/8$ inch and 1 inch for fire-resistance rating of 1 hour to 4 hours. For joint widths between $3/8$ inch and 1 inch the thickness of ceramic fiber blanket may be determined by direct interpolation. Other tested and labeled materials may be used in place of ceramic fiber blankets.

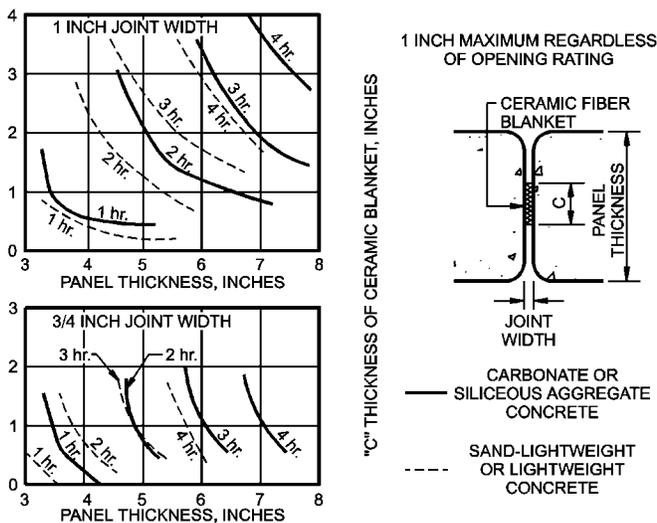


FIGURE C-101.2.1.3 CERAMIC FIBER JOINT PROTECTION

C-101.2.1.4 Walls with gypsum wallboard or plaster finishes.

C-101.2.1.4.1 The fire-resistance rating of cast-in-place or precast concrete walls with finishes of gypsum wallboard or plaster applied to one or both sides may be calculated in accordance with the provisions of this Section.

C-101.2.1.4.2 Where the finish of gypsum wallboard or plaster is applied to the side of the wall not exposed to fire, the contribution of the finish to the total fire resistance rating shall be determined as follows: The thickness of the finish shall first be corrected by multiplying the actual thickness of the finish by the applicable factor determined from Table C-101.2.1.4A based on the type of aggregate in the concrete. The corrected thickness of finish shall then be added to the actual thickness or equivalent thickness of concrete and fire-resistance rating of the concrete and finish determined from Table C-101.2.1.1, Figure C-101.2.1.2 or Table C-101.2.1.2.

C-101.2.1.4.3 Where gypsum wallboard or plaster is applied to the fire-exposed side of the wall, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The time assigned to the finish as established by Table C-101.2.1.4B shall be added to the fire-resistance rating determined from Table C-101.2.1.1, Figure C-101.2.1.2 or Table C-101.2.1.2 for the concrete alone, or to the rating determined in Subsection C-101.2.1.4.2 for the concrete and finish on the nonfire-exposed side.

TABLE C-101.2.1.4A MULTIPLYING FACTOR FOR FINISHES ON NONFIRE-EXPOSED SIDE OF WALL

TYPE OF FINISH APPLIED TO WALL	TYPE OF AGGREGATE USED IN CONCRETE OR CONCRETE MASONRY			
	Concrete			
	Siliceous or Carbonate	Sand—Lightweight	Lightweight	
	Concrete Masonry			
	Siliceous or Calcareous Gravel Slag	Limestone, Cinders or Unexpanded Slag	Expanded Shale, Clay or Slate	Pumice or Expanded Slag
Portland Cement—Sand Plaster	1.00	0.75 ^a	0.75 ^a	0.50 ^a
Gypsum—Sand Plaster or Gypsum Wallboard	1.25	1.00	1.00	1.00
Gypsum—Vermiculite or Perlite Plaster	1.75	1.50	1.25	1.25

a. For Portland cement-sand plaster $3/8$ inch or less in thickness and applied directly to the concrete masonry on the nonfire-exposed side of the wall, the multiplying factor shall be 1.00.

TABLE C-101.2.1.4B
TIME ASSIGNED TO FINISH MATERIALS ON FIRE-EXPOSED SIDE OF WALL

FINISH DESCRIPTION	TIME (minutes)
Gypsum Wallboard	
3/8 inch	10
1/2 inch	15
5/8 inch	20
2 layers of 3/8 inch	25
1 layer 3/8 inch, 1 layer 1/2 inch	35
2 layers 1/2 inch	40
Type X Gypsum Wallboard	
1/2 inch	25
5/8 inch	40
Portland Cement-Sand Plaster Applied Directly to Concrete Masonry	See Note a
Portland Cement-Sand Plaster on Metal Lath	
3/4 inch	20
7/8 inch	25
1 inch	30
Gypsum Sand Plaster on 3/8-inch Gypsum Lath	
1/2 inch	35
5/8 inch	40
3/8 inch	50
Gypsum Sand Plaster on Metal Lath	
3/4 inch	50
7/8 inch	60
1 inch	80

a. The actual thickness of Portland cement-sand plaster, provided it is 5/8 inch or less in thickness, may be included in determining the equivalent thickness of the masonry for use in Table C-101.3.1.

C-101.2.1.4.4 For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of Subsections C-101.2.1.4.2 and C-101.2.1.4.3 shall be performed twice, i.e., assume that either side of the wall may be the fire-exposed side. The fire-resistance rating of the wall shall not exceed the lower of the two values.

Exception: For exterior wall with more than 5 feet of horizontal separation, the fire shall be assumed to occur on the interior side only.

C-101.2.1.4.5 When the finish applied to a concrete wall contributes to the fire-resistance rating, the concrete alone shall provide not less than one-half the total required fire-resistance rating.

C-101.2.1.4.6 Finishes on concrete walls, which are assumed to contribute to the total fire-resistance rating of the wall, shall comply with the installation requirements of Subsection C-101.3.1.6.

C-101.2.2 Concrete floor and roof slabs.

C-101.2.2.1 Reinforced and prestressed floors and roofs.

C-101.2.2.1.1 The minimum thicknesses of reinforced and prestressed concrete floor or roof slabs for fire-resistance ratings of 1 hour to 4 hours are shown in Table C-101.2.2.1.

TABLE C-101.2.2.1
MINIMUM SLAB THICKNESS (inches)

CONCRETE TYPE	FIRE-RESISTANCE RATING				
	1 hour	1 1/2 hours	2 hours	3 hours	4 hours
Siliceous	3.5	4.3	5.0	6.2	7.0
Carbonate	3.2	4.0	4.6	5.7	6.6
Sand-Lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

C-101.2.2.1.2 For hollow-core prestressed concrete slabs in which the cores are of constant cross section throughout the length, the equivalent thickness may be obtained by dividing the net cross-sectional area of the slab, including grout in the joints, by its width.

C-101.2.2.1.3 The thickness of slabs with sloping soffits shall be determined at a distance $2t$ or 6 inches, whichever is less, from the point of minimum thickness, where t is the minimum thickness.

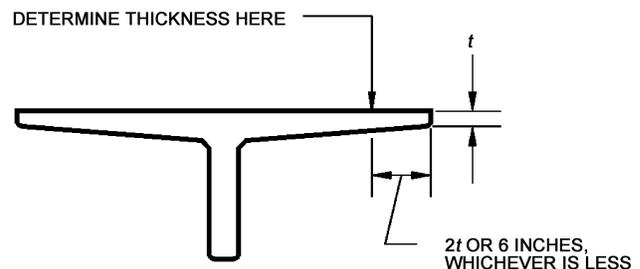


FIGURE C-101.2.2.1.3
THICKNESS OF SLABS WITH SLOPING SOFFITS

C-101.2.2.1.4 The thickness of slabs with ribbed or undulating soffits shall be determined by one of the following expressions, whichever is applicable.

For $s > 4t$, the thickness to be used shall be t ;

For $s \leq 2t$, the thickness to be used shall be t_e ;

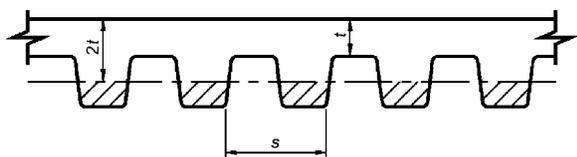
For $4t > s > 2t$, the thickness to be used shall be

Equation C-101.2.2.1.4 Thickness of Concrete Slabs with Ribbed Soffits

$$t + \left(\frac{4t}{s} - 1\right)(t_e - t)$$

Where:

- s = Spacing of ribs or undulations.
- t = Minimum thickness.
- t_e = Equivalent thickness of the slab calculated as the net area of the slab divided by the width, in which the maximum thickness used in the calculation shall not exceed $2t$.



NEGLECT SHADED AREA IN CALCULATION OF EQUIVALENT THICKNESS

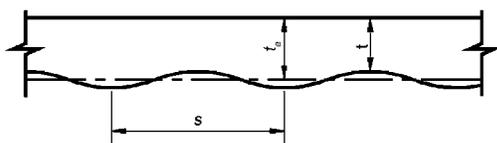


FIGURE C-101.2.2.1.4
THICKNESS OF SLABS WITH RIBBED OR UNDULATING SOFFITS

C-101.2.2.2 Multicourse floors and roofs.

C-101.2.2.2.1 Figure C-101.2.2A gives information on the fire-resistance ratings of floors that consist of a base slab of concrete with a topping (overlay) of a different type of concrete.

C-101.2.2.2.2 Figure C-101.2.2B.ABC and Figure C-101.2.2B.DE give information on the fire-resistance ratings of roofs that consist of a base slab of concrete with a topping (overlay) of an insulating concrete or with an insulating board and built-up roofing.

- (a) For the transfer of heat, three-ply built-up roofing contributes 10 minutes to the fire-resistance rating; thus, 10 minutes can be added to concrete assemblies such as those shown in Figure C-101.2.2B.ABC, but not to those shown in Figure C-101.2.2B.DE.

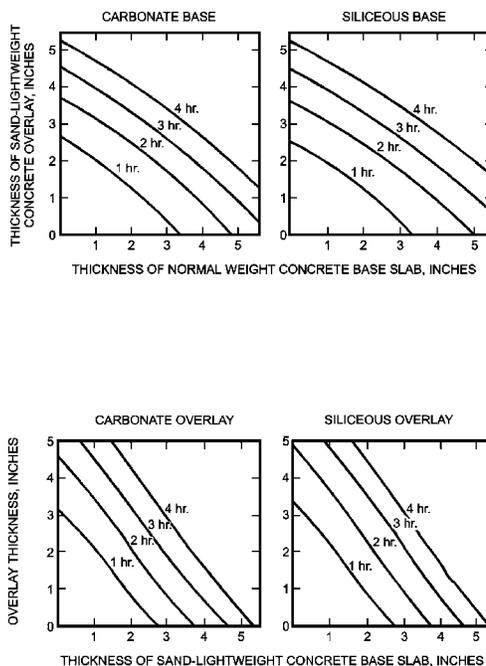
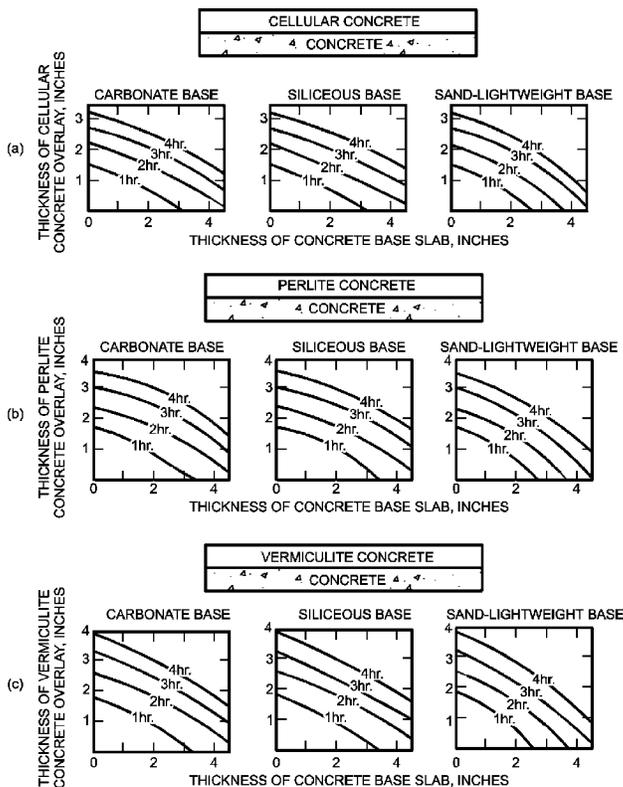


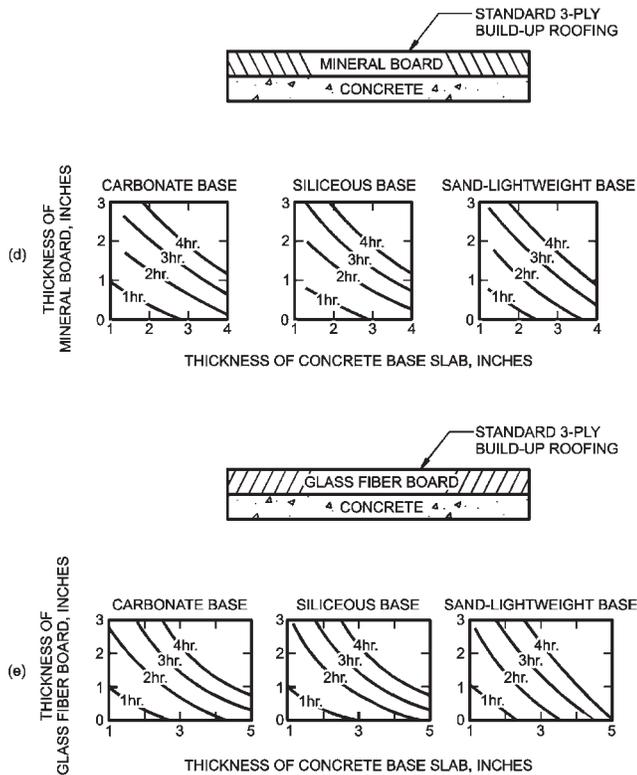
FIGURE C-101.2.2A
FIRE RESISTANCE FOR TWO-COURSE CONCRETE FLOORS



- (a) Thickness of Cellular Concrete Overlay, Inches.
- (b) Thickness of Perlite Concrete Overlay, Inches.
- (c) Thickness of Vermiculite Concrete Overlay, Inches.

FIGURE C-101.2.2B (a, b and c)
FIRE-RESISTANCE RATINGS—
CONCRETE FLOOR ASSEMBLIES

APPENDIX C—CALCULATED FIRE RESISTANCE



(d) Thickness of Mineral Board, Inches.
 (e) Thickness of Glass Fiber Board, Inches.

**FIGURE C-101.2.2B (d, e)
 FIRE-RESISTANCE RATINGS—
 CONCRETE FLOOR ASSEMBLIES**

C-101.2.2.3 Joints in precast slabs. Joints between adjacent precast concrete slabs may be ignored in calculating the slab thickness provided that a concrete topping at least 1 inch thick is used. Where no concrete topping is used, joints must be grouted to a depth of at least one-third the slab thickness at the joint, but not less than 1 inch, or the joints must be made fire resistant by other approved methods.

C-101.2.3 Concrete cover over reinforcement.

C-101.2.3.1 Slab cover. The minimum thickness of concrete cover to the positive moment reinforcement is given in Table C-101.2.3A for reinforced concrete and Table C-101.2.3B for prestressed concrete. These tables are applicable for solid or hollow-core, one-way or two-way slabs with flat undersurfaces. Slabs may be cast-in-place or precast. For precast, prestressed concrete not covered elsewhere, the procedures contained in *PCI Design for Fire Resistance of Precast Prestressed Concrete* shall be acceptable.

C-101.2.3.2 Reinforced beam cover. The minimum thickness of concrete cover to the positive moment reinforcement (bottom steel) for reinforced concrete beams is shown in Table C-101.2.3C for fire-resistance ratings of 1 hour to 4 hours.

C-101.2.3.3 Prestressed beam cover. The minimum thickness of concrete cover in the positive moment prestressing tendons (bottom steel) for prestressed concrete beams is shown in Table C-101.2.3D for fire-resistance ratings of 1 hour to 4 hours.

**TABLE C-101.2.3A
 COVER THICKNESS FOR REINFORCED CONCRETE FLOOR OR ROOF SLABS
 (inches)**

CONCRETE AGGREGATE TYPE	FIRE-RESISTANCE RATING									
	RESTRAINED ^a					UNRESTRAINED ^a				
	1 hour	1½ hours	2 hours	3 hours	4 hours	1 hour	1½ hours	2 hours	3 hours	4 hours
Siliceous	¾	¾	¾	¾	¾	¾	¾	1	1¼	1⅝
Carbonate	¾	¾	¾	¾	¾	¾	¾	¾	1¼	1¼
Sand—Lightweight or Lightweight	¾	¾	¾	¾	¾	¾	¾	¾	1¼	1¼

a. See Subsection C-101.5.2.5.2 for definition of restrained and unrestrained assemblies.

TABLE C-101.2.3B
COVER THICKNESS FOR PRESTRESSED CONCRETE FLOOR OR ROOF SLABS
(inches)

CONCRETE AGGREGATE TYPE	FIRE-RESISTANCE RATING									
	RESTRAINED ^a					UNRESTRAINED ^a				
	1 hour	1½ hours	2 hours	3 hours	4 hours	1 hour	1½ hours	2 hours	3 hours	4 hours
Siliceous	¾	¾	¾	¾	¾	1⅛	1½	1¾	2⅜	2¾
Carbonate	¾	¾	¾	¾	¾	1	1⅜	1⅝	2⅛	2¼
Sand—Lightweight or Lightweight	¾	¾	¾	¾	¾	1	1⅜	1½	2	2¼

a. See Subsection C-101.5.2.5.2 for definitions of restrained and unrestrained assemblies.

TABLE C-101.2.3C
MINIMUM COVER FOR MAIN REINFORCING BARS OF REINFORCED CONCRETE BEAMS^c
(Applicable to All Types of Structural Concrete)

RESTRAINED OR UNRESTRAINED ^a	BEAM WIDTH ^b (inches)	FIRE-RESISTANCE RATING				
		1 hour	1½ hours	2 hours	3 hours	4 hours
Restrained	5	¾	¾	¾	1 ^a	1¼ ^a
	7	¾	¾	¾	¾	¾
	≥ 10	¾	¾	¾	¾	¾
Unrestrained	5	¾	1	1¼	—	—
	7	¾	¾	¾	1¾	3
	≥ 10	¾	¾	¾	1	1¾

a. See Subsection C-101.5.2.5.2 for definitions of restrained and unrestrained assemblies. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on centers. For restrained beams spaced 4 feet or less on centers, minimum cover of ¾ inch is adequate for ratings of 4 hours or less.

b. For beam widths between the tabulated values, the minimum cover thickness can be determined by direct interpolation.

c. The cover for an individual reinforcing bar is the minimum thickness of concrete between the surface of the bar and the fire-exposed surface of the beam. For beams in which several bars are used, the cover for corner bars used in the calculation shall be reduced to one-half of the actual value. The cover for an individual bar must be not less than one-half of the value given in Table C-101.2.3C, nor less than ¾ inch.

TABLE C-101.2.3D
MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS^{d, f, g}

RESTRAINED OR UNRESTRAINED ^a	CONCRETE AGGREGATE TYPE ^b	BEAM WIDTH ^c (inches)	FIRE-RESISTANCE RATING				
			1 hour	1½ hours	2 hours	3 hours	4 hours
Restrained	Carb or Sil	8	1½	1½	1½	1¾ ^a	2½ ^a
	Carb or Sil	≥ 12	1½	1½	1½	1½	1¾ ^a
	Sand LW	8	1½	1½	1½	1½	2 ^a
	Sand LW	≥ 12	1½	1½	1½	1½	1¾ ^a
Unrestrained	Carb or Sil	8	1½	¾	2½	5 ^e	—
	Carb or Sil	≥ 12	1½	1½	1¾	2½	3
	Sand LW	8	1½	1½	2	¾	—
	Sand LW	≥ 12	1½	1½	1¾	2	2½

- a. See Subsection C-101.5.2.5.2 for definitions of restrained and unrestrained assemblies. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on centers. For restrained beams spaced 4 feet or less on centers, minimum cover of ¾ inch is adequate for 4-hour ratings or less.
- b. Carb = carbonate aggregate concrete; Sil = siliceous aggregate concrete; Sand LW = sand-lightweight concrete.
- c. For beam widths between 8 inches and 12 inches, minimum cover thickness can be determined by direct interpolation.
- d. The cover for an individual tendon is the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the beam, except that for ungrouted ducts the assumed cover thickness is the minimum thickness of concrete between the surface of the duct and the surface of the beam. For beams in which several tendons are used, the cover is assumed to be the average of the minimum cover of individual tendons, where the minimum cover for corner tendons used in the calculation shall be reduced to one-half of the actual value. The cover for an individual tendon must be not less than one-half of the value given in Table C-101.2.3D, nor less than 1 inch.
- e. Not practical for 8-inch-wide beam but shown for purposes of interpolation.
- f. For precast, prestressed concrete not covered elsewhere, the procedures contained in PCI *Design for Fire Resistance of Precast Prestressed Concrete* shall be acceptable.
- g. The minimum cover for nonprestressed reinforcing in prestressed concrete beams shall be determined in accordance with the provisions of Table C-101.2.3C.

C-101.2.4 Concrete columns.

C-101.2.4.1 Minimum size. Table C-101.2.4 shows the minimum overall dimensions of reinforced concrete columns for fire-resistance ratings of 1 hour to 4 hours.

C-101.2.4.2 Minimum cover for r/c columns. The minimum cover to the main longitudinal reinforcement in columns for fire-resistance ratings of 1 hour, 1½ hours, 2 hours and 3 hours shall be 1½ inches; for 4 hours, the minimum cover to the main longitudinal reinforcement shall be 2 inches for siliceous aggregate concrete and 1½ inches for carbonate aggregate concrete or sand-lightweight concrete.

C-101.2.4.3 Columns built into walls. The minimum dimensions of Table C-101.2.4 do not apply to a reinforced concrete column that is built into a concrete or masonry wall provided all of the following are met:

- (a) The fire-resistance rating for the wall is equal to or greater than the required rating of the column;
- (b) Openings in the wall are protected in accordance with Table 7.2; and
- (c) The main longitudinal reinforcing in the column has cover not less than that required by Subsection C-101.2.4.2.

C-101.2.4.4 Precast cover units for steel columns. See Subsection C-101.5.1.4.

C-101.3 Concrete masonry.

C-101.3.1 Concrete masonry walls.

C-101.3.1.1 The fire-resistance rating of walls and partitions constructed of concrete masonry units shall be determined from Table C-101.3.1. The rating shall be based on the equivalent thickness of the masonry and type of aggregate used.

C-101.3.1.2 Where plaster or gypsum wallboard is applied to the side of the wall not exposed to fire, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The thickness of gypsum wallboard or plaster shall be corrected by multiplying the actual thickness of the finish by applicable factor deter-

TABLE C-101.2.4
MINIMUM DIMENSION OF CONCRETE COLUMNS
(inches)

TYPES OF CONCRETE	FIRE-RESISTANCE RATING				
	1 hour	1½ hours	2 hours ^a	3 hours ^a	4 hours ^b
Siliceous	8	9	10	12	14
Carbonate	8	9	10	11	12
Sand-Lightweight	8	8½	9	10½	12

- a. The minimum dimension is permitted to be reduced to 8 inches for rectangular columns with two parallel sides at least 36 inches in length.
- b. The minimum dimension is permitted to be reduced to 10 inches for rectangular columns with two parallel sides at least 36 inches in length.

mined from Table C-101.2.1.4A. This corrected thickness of finish shall be added to the equivalent thickness of masonry and the fire-resistance rating of the masonry and finish determined from Table C-101.3.1.

C-101.3.1.3 Where plaster or gypsum wallboard is applied to the fire-exposed side of the wall, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The time assigned to the finish as established by Table C-101.2.1.4B shall be added to the fire-resistance rating determined in Subsection C-101.3.1.1 for the masonry alone, or in Subsection C-101.3.1.2 for the masonry and finish on the nonfire-exposed side.

C-101.3.1.4 For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this Section shall be performed twice, i.e., assume that either side may be the fire-exposed side of the wall. The fire-resistance rating of the wall shall not exceed the lower of the two values calculated.

Exception: For exterior walls with more than 5 feet of horizontal separation, the fire shall be assumed to occur on the interior side only.

C-101.3.1.5 When the finish applied to a concrete masonry wall contributes to the fire-resistance rating, the masonry alone shall provide not less than one-half the total required fire-resistance rating.

C-101.3.1.6 Installation of finishes shall be as follows:

- (a) Gypsum wallboard and gypsum lath applied to concrete masonry or concrete walls shall be secured to wood or steel furring members spaced not more than 16 inches o.c.
- (b) Gypsum wallboard shall be installed with the long dimension parallel to the furring members and shall have all joints finished.
- (c) Other aspects of the installation of finishes shall comply with the applicable provisions of Chapters 7 and 10.

TABLE C-101.3.1
MINIMUM EQUIVALENT THICKNESS^a (inches) OF BEARING
OR NONBEARING CONCRETE MASONRY WALLS^{b, c, d}

FIRE-RESISTANCE RATING (hours)	TYPE OF AGGREGATE			
	Pumice or Expanded Slag	Expanded Shale, Clay or Slate	Limestone, Cinders or Unexpanded Slag	Calcareous or Siliceous Gravel
0.50	1.5	1.8	1.9	2.0
0.75	1.9	2.2	2.3	2.4
1	2.1	2.6	2.7	2.8
1.25	2.5	2.9	3.1	3.2
1.50	2.7	3.3	3.4	3.6
1.75	3.0	3.4	3.7	3.9
2	3.2	3.6	4.0	4.2
2.25	3.4	3.8	4.3	4.5
2.50	3.6	4.0	4.5	4.8
2.75	3.8	4.2	4.8	5.0
3	4.0	4.4	5.0	5.3
3.25	4.2	4.6	5.2	5.5
3.50	4.4	4.8	5.5	5.8
3.75	4.5	4.9	5.7	6.0
4	4.7	5.1	5.9	6.2

- a. Equivalent thickness is the average thickness of the solid material in the unit. Determine the equivalent thickness in accordance with ASTM C140.
- b. Values between those shown in the table can be determined by direct interpolation.
- c. Where combustible members are framed into the wall, 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, shall not be less than 93 percent of the thickness shown in the table.
- d. Requirements of ASTM C55, ASTM C73 or ASTM C90 shall apply.

C-101.3.2 Filled core spaces. The equivalent thickness of filled hollow concrete masonry is the actual thickness of the unit when loose-fill materials are: sand, pea gravel, crushed stone or slag that meet ASTM C33 requirements; pumice, scoria, expanded shale, expanded clay, expanded slate, expanded slag, expanded fly ash or cinders in compliance with ASTM C331; perlite or vermiculite that complies with ASTM C332 requirements.

C-101.3.3 Multiwythe masonry walls. The fire-resistance rating of wall assemblies constructed of multiple wythes of masonry materials may be based upon the fire-resistance rating period of each wythe and the continuous airspace between each wythe in accordance with the following formula:

Equation C-101.3.3 Fire Resistance of Multiwythe Masonry Wall Assemblies

$$R_d = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + A_1 + A_2 + \dots + A_n)^{1.7}$$

Where:

R_d = Fire-endurance rating of the assembly, hours.

R_1, R_2, \dots, R_n = Fire-endurance rating of wythes for 1, 2, n (hours), respectively.

A_1, A_2, \dots, A_n = 0.30, factor for each continuous airspace for 1, 2, \dots, n , respectively, having a depth of 1/2 inch or more between wythes.

C-101.3.4 Concrete masonry lintels. Fire-resistance ratings for concrete masonry lintels shall be determined based upon the nominal thickness of the lintel and the minimum thickness of concrete masonry or concrete, or any combination thereof, covering the main reinforcing bars, as determined according to Table C-101.3.4, or by approved alternative methods.

TABLE C-101.3.4
MINIMUM COVER OF LONGITUDINAL
REINFORCEMENT IN FIRE-RESISTANCE RATED
REINFORCED CONCRETE MASONRY LINTELS
(inches)

NOMINAL WIDTH OF LINTEL (inches)	FIRE-RESISTANCE RATING			
	1 hour	2 hours	3 hours	4 hours
6	1½	2	—	—
8	1½	1½	1¾	3
10 or greater	1½	1½	1½	1¾

C-101.3.5 Concrete masonry columns. Concrete masonry columns shall be designed (and reinforced) in accordance with applicable requirements of this Code. The fire-resistance rating shall be determined based upon the least plan dimension of the column in accordance with Table C-101.3.5 or by approved alternative methods.

TABLE C-101.3.5
MINIMUM DIMENSION (inches)
OF CONCRETE MASONRY COLUMNS

FIRE-RESISTANCE RATING			
1 hour	2 hours	3 hours	4 hours
8	10	12	14

C-101.4 Brick and tile masonry.

C-101.4.1 Clay masonry walls.

C-101.4.1.1 The fire-resistance ratings of walls or partitions constructed of clay masonry units shall be determined from Table C-101.4.1A, C-101.4.1B or C-101.4.1C.

**TABLE C-101.4.1A
FIRE-RESISTANCE PERIODS OF BEARING AND NONBEARING
CLAY BRICK MASONRY WALLS OR PARTITIONS^a**

WALL OR PARTITION ASSEMBLY (MINIMUM NOMINAL THICKNESS)	MEMBERS FRAMED INTO WALL OR PARTITION	
	Combustible (minutes)	Noncombustible (minutes)
Clay or Shale, Solid		
4-inch brick	—	75
6-inch brick	—	153
8-inch brick	120	240
12-inch brick	240	—
Clay or Shale, Hollow		
8-inch brick, 71 percent solid	120	180
60 percent solid, cells filled with loose-fill insulation	—	240
12-inch brick 64 percent solid	—	240
Clay or Shale, Rolok		
8-inch Hollow Rolok	60	150
12-inch Hollow Rolok	180	240
8-inch Hollow Rolok Bak	—	240
Cavity Walls, Clay or Shale		
8-inch wall two 3-inch (actual) brick wythes separated by 2-inch airspace; masonry joint reinforcement spaced 16 inches o.c. vertically	—	180
9-inch wall two nominal 4-inch wythes separated by 2-inch airspace; 1/4-inch metal ties for each 3 square feet of wall area	60 ^b	240
Clay or Shale Brick, Metal Furring Channels		
5-inch wall 4-inch nominal brick (75 percent solid) backed with a hat-shaped metal furring channel 3/4-inch thick formed from 0.021-inch sheet metal attached to brick wall on 24-inch centers with approved fasteners; and 1/2-inch Type X gypsum board attached to the metal furring strips with 1-inch- long Type S screws spaced 8 inches on centers	—	120
Hollow Clay Tile, Brick Facing		
8-inch wall 4-inch units (40 percent solid) ^c plus 4-inch solid brick	60	210
12-inch wall 8-inch units (40 percent solid) ^c plus 4-inch solid brick	120	240

a. Units shall comply with the requirements of ASTM C62, ASTM C126, ASTM C216 or ASTM C652.

b. A 9-inch wall has a 120-minute rating if the hollow spaces near combustible members are filled with fire-resistant materials for the full thickness of the wall and for at least 4 inches above, below and between the combustible members.

c. Units shall comply with the requirements of ASTM C34.

APPENDIX C—CALCULATED FIRE RESISTANCE

TABLE C-101.4.1B
FIRE-RESISTANCE PERIODS OF BEARING AND NONBEARING
CLAY TILE MASONRY WALLS OR PARTITIONS^a

WALL OR PARTITION ASSEMBLY (MINIMUM NOMINAL THICKNESS)	MEMBERS FRAMED INTO WALL OR PARTITION	
	Combustible (minutes)	Noncombustible (minutes)
Hollow Clay Tile		
8-inch unit		
2 cells in wall thickness, 40 percent solid	45	75
2 cells in wall thickness, 43 percent solid	45	90
2 cells in wall thickness, 46 percent solid	60	105
2 cells in wall thickness, 49 percent solid	75	120
3 or 4 cells in wall thickness, 40 percent solid	45	105
3 or 4 cells in wall thickness, 43 percent solid	45	120
3 or 4 cells in wall thickness, 53 percent solid	75	180
3 or 4 cells in wall thickness, 48 percent solid	60	150
12-inch unit		
3 cells in wall thickness, 40 percent solid	120	150
3 cells in wall thickness, 45 percent solid	150	180
3 cells in wall thickness, 49 percent solid	180	210
12-inch wall		
2 units with 3 or 4 cells in wall thickness, 40 percent solid	120	210
2 units with 3 or 4 cells in wall thickness, 45 percent solid	150	240
2 units with 3 or 4 cells in wall thickness, 53 percent solid	180	240
16-inch wall		
2 or 3 units with 4 or 5 cells in wall thickness, 40 percent solid	240	240
Structural Clay Tile		
4-inch unit		
1 cell in wall thickness, 40 percent solid ^{b, c}	—	75
1 cell in wall thickness, 40 percent solid ^{c, d}	—	75
6-inch unit		
1 cell in wall thickness, 30 percent solid ^{b, c}	—	120
1 cell in wall thickness, 30 percent solid ^{c, d}	—	120
2 cells in wall thickness, 45 percent solid ^d	—	60
Hollow Structural Clay Tile		
8-inch unit		
2 cells in wall thickness, 40 percent solid	45	75
2 cells in wall thickness, 49 percent solid	75	120
2 cells in wall thickness, 46 percent solid	60	105
3 or 4 cells in wall thickness, 53 percent solid	75	180
12-inch unit		
3 cells in wall thickness, 40 percent solid	120	150
3 cells in wall thickness, 45 percent solid	150	180
3 cells in wall thickness, 49 percent solid	180	210
12-inch wall		
2 units, with 3 cells in wall thickness, 40 percent solid	120	210
2 units with 3 or 4 cells in wall thickness, 45 percent solid	150	240
16-inch wall		
2 units with 4 cells in wall thickness, 43 percent solid	240	240
2 or 3 units with 4 or 5 cells in wall thickness, 40 percent solid	240	240

a. Units shall comply with the requirements of ASTM C34, ASTM C56, ASTM C212 or ASTM C530.

b. Ratings are for dense hard-burned clay or shale.

c. Cells filled with tile, stone, slag, cinders or sand mixed with mortar.

d. Ratings are for medium-burned clay tile.

**TABLE C-101.4.1C
FIRE-RESISTANCE RATINGS FOR BEARING STEEL FRAMED
BRICK VENEER WALLS OR PARTITIONS**

WALL OR PARTITION ASSEMBLY	PLASTER SIDE EXPOSED (hours)	BRICK-FACED SIDE EXPOSED (hours)
<p>Outside facing of steel studs: $\frac{1}{2}$-inch wood fiberboard sheathing next to studs, $\frac{3}{4}$-inch airspace formed with $\frac{3}{4}$- × $1\frac{5}{8}$-inch wood strips placed over the fiberboard and secured to the studs; metal or wire lath nailed to such strips, $3\frac{3}{4}$-inch brick veneer held in place by filling $\frac{3}{4}$-inch airspace between the brick and lath with mortar.</p> <p>Inside facing of studs: $\frac{3}{4}$-inch unsanded gypsum plaster on metal or wire lath attached to $\frac{5}{16}$-inch wood strips secured to edges of the studs.</p>	1½	4
<p>Outside facing of steel studs: 1-inch insulation board sheathing attached to studs, 1-inch airspace, and $3\frac{3}{4}$-inch brick veneer attached to steel frame with metal ties every fifth course.</p> <p>Inside facing of studs: $\frac{7}{8}$-inch sanded gypsum plaster (1:2 mix) applied on metal or wire lath attached directly to the studs.</p>	1½	4
<p>Same as above except use $\frac{7}{8}$-inch vermiculite - gypsum plaster or 1-inch sanded gypsum plaster (1:2 mix) applied to metal or wire.</p>	2	4
<p>Outside facing of steel studs: $\frac{1}{2}$-inch gypsum sheathing board, attached to studs, and $3\frac{3}{4}$-inch brick veneer attached to steel frame with metal ties every fifth course.</p> <p>Inside facing of studs: $\frac{1}{2}$-inch sanded gypsum plaster (1:2 mix) applied to $\frac{1}{2}$-inch perforated gypsum lath securely attached to studs and having strips of metal lath 3 inches wide applied to all horizontal joints of gypsum lath.</p>	2	4

C-101.4.1.2 Where plaster is applied to the wall, the total fire-resistive rating shall be determined by the formula:

Equation C-101.4.1.2 Fire Resistance of Clay Masonry Walls with Plaster

$$R = (R_n^{0.59} + pl)^{1.7}$$

Where:

R = The fire endurance of the assembly, hours.

R_n = The fire endurance of the individual wall, hours.

pl = Coefficient for thickness of plaster.

Values for $R_n^{0.59}$ for use in Equation C-101.4.1.2 are given in Table C-101.4.1D. Coefficients for thickness of plaster shall be selected from Table C-101.4.1E based on the actual thickness of plaster applied to the wall or partition and whether one or two sides of the wall are plastered.

TABLE C-101.4.1D
VALUES OF $R_n^{0.59}$
(For Use in Equation C-101.4.1.2,
C-101.4.1.3 or C-101.4.3)

R (hours)	$R_n^{0.59}$
1	1.0
2	1.50
3	1.91
4	2.27

TABLE C-101.4.1E
COEFFICIENTS FOR PLASTER^a

THICKNESS OF PLASTER (inch)	ONE SIDE	TWO SIDE
1/2	0.3	0.6
5/8	0.37	0.75
3/4	0.45	0.90

a. Values listed in table are for 1:3 sanded gypsum plaster.

C-101.4.1.3 Where a continuous airspace separates multiple wythes of the wall or partition, the total fire-resistance rating shall be determined by the formula:

Equation C-101.4.1.3 Fire Resistance When Airspace Separates Wythes

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + as)^{1.7}$$

Where:

R = The fire endurance of the assembly, hours.

R_1, R_2 and R_n = The fire endurance of the individual wythes, hours.

as = Coefficient for continuous airspace.

Values for $R_n^{0.59}$ for use in Equation C-101.4.1.3 are given in Table C-101.4.1D. The coefficient for each continuous airspace of 1/2 inch to 3 1/2 inches separating two individual wythes shall be 0.3.

C-101.4.1.4 For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this Section shall be performed twice, i.e., assume that either side may be the fire-exposed side of the wall. The fire resistance of the wall shall not exceed the lower of the two values determined.

Exception: For exterior walls with more than 5 feet of horizontal separation, the fire shall be assumed to occur on the interior side only.

C-101.4.2 Hollow clay masonry walls. The fire-resistance rating for hollow clay masonry walls and partitions may be determined from Table C-101.4.2 based on the equivalent thickness of the hollow clay masonry units. The fire-resistance rating determined from Table C-101.4.2 may be used in the calculated fire-resistance rating procedures in Subsection C-101.4.1 or C-101.4.3.

C-101.4.3 Multiwythe walls.

C-101.4.3.1 The fire-resistance rating for walls or partitions consisting of two or more dissimilar wythes may be determined by the formula:

Equation C-101.4.3.1 Fire Resistance for Hollow Clay Multiwythe Walls

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7}$$

Where:

R = The fire endurance of the assembly, hours.

R_1, R_2 and R_n = The fire endurance of the individual wythes, hours.

Values for $R_n^{0.59}$ for use in Equation C-101.4.3 are given in Table C-101.4.1D.

C-101.4.3.2 For walls that consist of two or more wythes of different materials (concrete or concrete masonry units) in combination with clay masonry units, the fire resistance rating of the different materials may be determined from Table C-101.2.1.1 for concrete; Table C-101.3.1 for concrete masonry units; or Table C-101.4.1A, C-101.4.1B or C-101.4.1C for clay and tile masonry units.

TABLE C-101.4.2
MINIMUM EQUIVALENT THICKNESS^a (inches) OF BEARING OR NONBEARING CLAY MASONRY WALLS^{b, c}

TYPE OF MATERIAL	FIRE-RESISTANCE RATING			
	1 hour	2 hours	3 hours	4 hours
Hollow brick ^d of clay or shale, not filled	2.3	3.4	4.3	5.0
Hollow brick ^d of clay or shale, grouted or filled with perlite, vermiculite, or expanded shale aggregate	3.0	4.4	5.5	6.6

a. Equivalent thickness is the average thickness of the solid material in the wall. It may be found by taking the total volume of a wall unit, subtracting the volume of core spaces and dividing this by the area of the exposed face of the unit.

(continued)

TABLE C-101.4.2—continued
MINIMUM EQUIVALENT THICKNESS^a (inches) OF BEARING OR NONBEARING CLAY MASONRY WALLS^{b, c}

- b. Values between those shown in the table can be determined by direct interpolation.
- c. Where combustible members are framed in the wall, 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, shall be not less than 93 percent of the thickness shown in the table.
- d. Requirements of ASTM C652 shall apply.

C-101.5 Steel assemblies.

C-101.5.1 Structural steel columns.

C-101.5.1.1 General.

C-101.5.1.1.1 These procedures establish a basis for determining the fire resistance of column assemblies as a function of the thickness of fire-resistant material and, the weight, *W*, and heated perimeter, *D*, of steel columns. As used in these sections, *W* is the average weight of a structural steel column, in pounds per linear foot. The heated perimeter, *D*, is the inside perimeter of the fire-resistant material, in inches, as illustrated in Figure C-101.5.1A.

C-101.5.1.1.2 The application of these procedures shall be limited to column assemblies in which the fire-resistant material is not designed to carry any of the load acting on the column.

C-101.5.1.1.3 In the absence of substantiating fire-endurance test results, ducts, conduit, piping, and similar mechanical, electrical and plumbing installations shall not be embedded in any required fire-resistant materials.

C-101.5.1.1.4 Table C-101.5.1A contains weight-to-heated-perimeter ratios (*W/D*) for both contour and box fire-resistant profiles, for the wide flange shapes most often used as columns. For different fire-resistant protection profiles or column cross sections, the weight-to-heated-perimeter ratios (*W/D*) shall be determined in accordance with the definitions given in this Section.

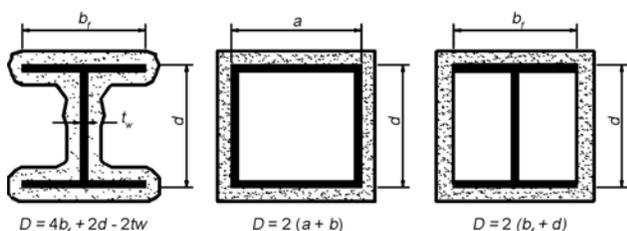


FIGURE C-101.5.1A
DETERMINATION OF THE HEATED PERIMETER OF STRUCTURAL STEEL COLUMNS

APPENDIX C—CALCULATED FIRE RESISTANCE

TABLE C-101.5.1A
W/D RATIOS FOR STEEL COLUMNS

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE	STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W14 × 233	2.49	3.65	W10 × 112	1.78	2.57
× 211	2.28	3.35	× 100	1.61	2.33
× 193	2.10	3.09	× 88	1.43	2.08
× 176	1.93	2.85	× 77	1.26	1.85
× 159	1.75	2.60	× 68	1.13	1.66
× 145	1.61	2.39	× 60	1.00	1.48
× 132	1.52	2.25	× 54	0.91	1.34
× 120	1.39	2.06	× 49	0.83	1.23
× 109	1.27	1.88	× 45	0.87	1.24
× 99	1.16	1.72	× 39	0.76	1.09
× 90	1.06	1.58	× 33	0.65	0.93
× 82	1.20	1.68			
× 74	1.09	1.53	W8 × 67	1.34	1.94
× 68	1.01	1.41	× 58	1.18	1.71
× 61	0.91	1.28	× 48	0.99	1.44
× 53	0.89	1.21	× 40	0.83	1.23
× 48	0.81	1.10	× 35	0.73	1.08
× 43	0.73	0.99	× 31	0.65	0.97
			× 28	0.67	0.96
W12 × 190	2.46	3.51	× 24	0.58	0.83
× 170	2.22	3.20	× 21	0.57	0.77
× 152	2.01	2.90	× 18	0.49	0.67
× 136	1.82	2.63			
× 120	1.62	2.36	W6 × 25	0.69	1.00
× 106	1.44	2.11	× 20	0.56	0.82
× 96	1.32	1.93	× 16	0.57	0.78
× 87	1.20	1.76	× 15	0.42	0.63
× 79	1.10	1.61	× 12	0.43	0.60
× 72	1.00	1.48	× 9	0.33	0.46
× 65	0.91	1.35			
× 58	0.91	1.31	W5 × 19	0.64	0.93
× 53	0.84	1.20	× 16	0.54	0.80
× 50	0.89	1.23			
× 45	0.81	1.12	W4 × 13	0.54	0.79
× 40	0.72	1.00			

C-101.5.1.2 Gypsum wallboard protection.

C-101.5.1.2.1 The fire resistance of structural steel columns with weight-to-heated-perimeter ratios (W/D) less than or equal to 3.65 and which are protected with Type X gypsum wallboard may be determined from the following expression:

Equation C-101.5.1.2.1 Gypsum Wallboard Protection

$$R = 130 \left[\frac{h(W'/D)}{2} \right]^{0.75}$$

Where:

- R = Fire resistance, minutes.
- h = Total thickness of gypsum wallboard, inches.
- D = Heated perimeter of the structural steel column, inches.
- W' = Total weight of the structural steel column and gypsum wallboard protection, pounds per linear foot; or
- $W' = W + 50hD/144.$

C-101.5.1.2.2 The gypsum wallboard shall be supported as illustrated in either Figure C-101.5.1B for fire-resistance ratings of 4 hours or less, or Figure C-101.5.1C for fire-resistance ratings of 3 hours or less.

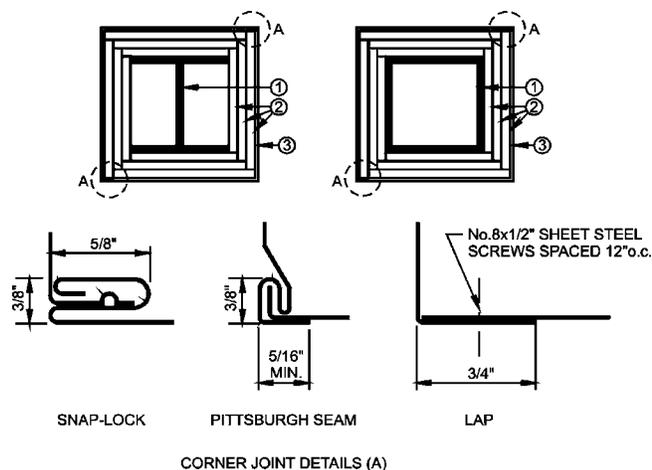


FIGURE C-101.5.1B
GYPSON WALLBOARD PROTECTED
STRUCTURAL STEEL COLUMNS

Notes:

1. Structural steel column, either wide flange or tubular shapes.
2. Type X gypsum wallboard in accordance with ASTM C36. For single-layer applications, the wallboard shall be applied vertically with no horizontal joints. For multiple-layer applications, horizontal joints are permitted at a minimum spacing of 8 feet provided that the joints in successive layers are staggered at least 12 inches. The total required thickness of wallboard shall be determined on the basis of the specified fire-resistance rating and the weight-to-heated-perimeter ratio (W/D) of the column. For fire-resistance

ratings of 2 hours or less, one of the required layers of gypsum wallboard may be applied to the exterior of the sheet steel column covers with 1-inch-long, Type S screws spaced 1 inch from the wallboard edge and 8 inches on center. For such installations, 0.0149 inch minimum thickness galvanized steel corner beads with 1 1/2-inch legs shall be attached to the wallboard with Type S screws spaced 12 inches on center.

3. For the resistance ratings of 3 hours or less, the column covers shall be fabricated from 0.0239 inch minimum thickness galvanized or stainless steel. For 4 hour fire-resistance ratings, the column covers shall be fabricated from 0.0239 inch minimum thickness stainless steel. The column covers shall be erected with the Snap Lock or Pittsburgh joint details.

For fire-resistance ratings of 2 hours or less, column covers fabricated from 0.0269 inch minimum thickness galvanized or stainless steel may be erected with lap joints. The lap joints may be located anywhere around the perimeter of the column cover. The lap joints shall be secured with 1/2-inch-long, No. 8 sheet metal screws spaced 12 inches on center.

The column covers shall be provided with a minimum expansion clearance of 1/8 inch per linear foot between the ends of the cover and any restraining construction.

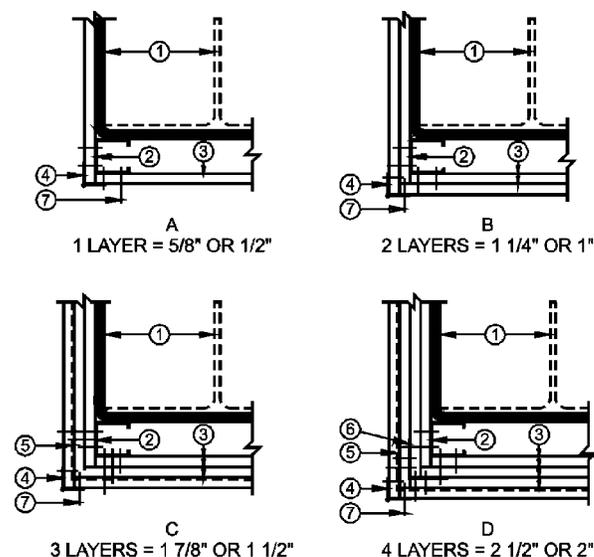


FIGURE C-101.5.1C
GYPSON WALLBOARD PROTECTED STRUCTURAL STEEL
COLUMNS WITH STEEL STUD/SCREW ATTACHMENT SYSTEM

Notes:

1. Structural steel column, either wide flange or tubular shapes.
2. 1 5/8-inch-deep studs fabricated from 0.0179 inch minimum thickness galvanized steel with 1 5/16- or 1 7/16-inch legs. The length of the steel studs shall be 1/2 inch less than the height of the assembly.
3. Type X gypsum wallboard in accordance with ASTM C36. For single-layer applications, the wallboard shall be applied vertically with no horizontal joints. For multiple-layer applications, horizontal joints are permitted at a minimum spacing of 8 feet provided that the joints in successive layers are staggered at least 12 inches. The total required thickness of wallboard shall be determined on the basis of the specified fire-resistance rating and the weight-to-heated-perimeter ratio (W/D) of the column.
4. Galvanized 0.0149 inch minimum thickness steel corner beads with 1 1/2-inch legs attached to the wallboard with 1-inch-long, Type S screws spaced 12 inches on center.

(continued)

FIGURE C-101.5.1C—continued
GYPSUM WALLBOARD PROTECTED STRUCTURAL STEEL
COLUMNS WITH STEEL STUD/SCREW ATTACHMENT SYSTEM

5. No. 18 SWG steel tie wires spaced 24 inches on center.
6. Sheet metal angles with 2-inch legs fabricated from 0.0209 inch minimum thickness galvanized steel.
7. Type S screws 1 inch long shall be used for attaching the first layer of wallboard to the steel studs and the third layer to the sheet metal angles at 24 inches on center. Type S screws 1 3/4 inches long shall be used for attaching the second layer of wallboard to the steel studs and the fourth layer to the sheet metal angles at 12 inches on center. Type S screws 2 1/4 inches long shall be used for attaching the third layer of wallboard to the steel studs at 12 inches on center.

C-101.5.1.2.3 The fire resistance of structural steel columns can be determined from Figure C-101.5.1D for various thicknesses of gypsum wallboard as a function of the weight-to-heated-perimeter ratio (W/D) of the column. For structural steel columns with weight-to-heated-perimeter ratios (W/D) greater than 3.65, the thickness of gypsum wallboard required for specified fire-resistance ratings shall be the same as the thickness determined for a W14 × 233 wide flange shape.

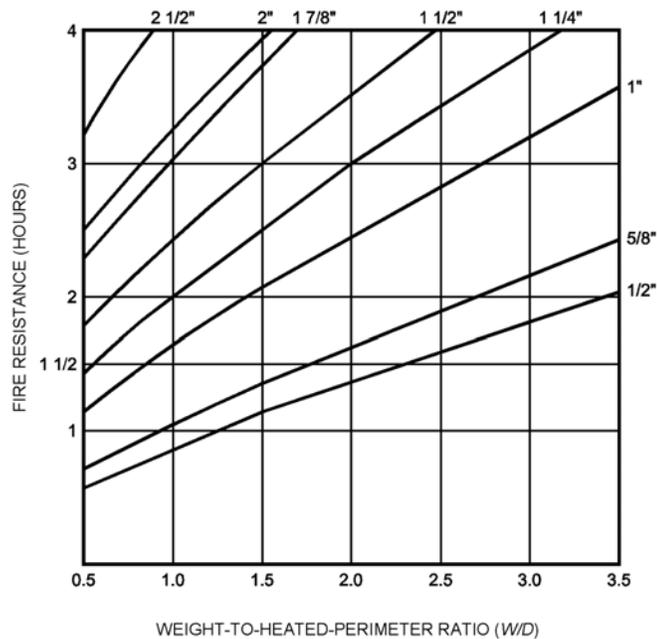


FIGURE C-101.5.1D
FIRE RESISTANCE OF STRUCTURAL STEEL COLUMNS^a
PROTECTED WITH VARIOUS THICKNESSES OF TYPE X
GYPSUM WALLBOARD

a. The W/D ratios for typical wide flange columns are listed in Table C-101.5.1A. For other column shapes, the W/D ratios shall be determined in accordance with Subsection C-101.5.1.1.

C-101.5.1.3 Spray-applied fire-resistant materials.

C-101.5.1.3.1 The fire resistance of wide flange structural steel columns protected with spray-applied fire-resistant materials, as illustrated in Figure C-101.5.1E, may be determined from the following expression:

Equation C-101.5.1.3.1 Spray-Applied Fire-Resistant Materials

$$R = [C_1(W/D) + C_2] h$$

Where:

- R = Fire resistance, minutes.
- h = Thickness of spray-applied fire-resistant material, inches.
- D = Heated perimeter of the structural steel column, inches.
- C_1 and C_2 = Material-dependent constants.
- W = Weight of structural steel column, pounds per linear foot.

C-101.5.1.3.2 The material-dependent constants, C_1 and C_2 , shall be determined for specific fire-resistant materials on the basis of standard fire-endurance tests in accordance with Chapter 7. Unless evidence is submitted to the building official substantiating a broader application, this expression shall be limited to determining the fire resistance of structural steel columns with weight-to-heated-perimeter ratios (W/D) between the largest and smallest columns for which standard fire-endurance test results are available.

C-101.5.1.3.3 Spray-applied fire-resistant materials shall be identified by density and thickness required for a given fire-resistance rating.

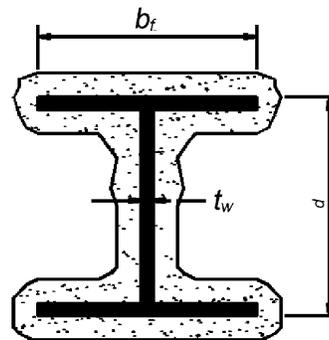


FIGURE C-101.5.1E
WIDE FLANGE STRUCTURAL STEEL COLUMNS WITH SPRAY-
APPLIED FIRE RESISTANT MATERIALS

C-101.5.1.4 Concrete-protected columns.

C-101.5.1.4.1 The fire resistance of structural steel columns protected with concrete, as illustrated in Figures C-101.5.1F(a) and C-101.5.1F(b), may be determined from the following expression:

Equation C-101.5.1.4.1 Fire Endurance at Zero Moisture Content

$$R = R_o (1 + 0.03m)$$

Where:

$$R_o = 10(W/D)^{0.7} + 17(h^{1.6} / k_c^{0.2}) \times [1 + 26(H/p_c c h (L + h)^{0.8})]$$

As used in these expressions:

R = Fire endurance at equilibrium moisture conditions, minutes.

R_o = Fire endurance at zero moisture content, minutes.

m = Equilibrium moisture content of the concrete by volume, percent.

W = Average weight of the steel column, pounds per linear foot.

D = Heated perimeter of the steel column, inches.

h = Thickness of the concrete cover, inches.

k_c = Ambient temperature thermal conductivity of the concrete, Btu/hr · ft · °F.

H = Ambient temperature thermal capacity of the steel column = 0.11 W , Btu/ft · °F.

p_c = Concrete density, pounds per cubic foot.

c_c = Ambient temperature specific heat of concrete, Btu/lb · °F.

L = Interior dimension of one side of a square concrete box protection, inches.

C-101.5.1.4.2 For wide flange steel columns completely encased in concrete with all re-entrant spaces filled [see Figure C-101.5.1F(c)], the thermal capacity of the concrete within the re-entrant spaces may be added to the thermal capacity of the steel column, as follows:

Equation C-101.5.1.4.2 Added Thermal Capacities of Concrete/Steel Columns

$$H = 0.11W + (p_c c_c / 144)(b_f d - A_s)$$

Where:

b_f = Flange width of the steel column, inches.

d = Depth of the steel column, inches.

A_s = Cross-sectional area of the steel column, square inches.

C-101.5.1.4.3 If specific data on the properties of concrete is not available, the values given in Table C-101.5.1B may be used.

TABLE C-101.5.1B
PROPERTIES OF CONCRETE

PROPERTY	NORMAL WEIGHT CONCRETE	STRUCTURAL LIGHTWEIGHT CONCRETE
Thermal conductivity (k_c)	0.95 Btu/hr · ft · °F	0.35 Btu/hr · ft · °F
Specific heat (c_c)	0.20 Btu/lb · °F	0.20 Btu/lb · °F
Density (P_c)	145 lb/ft ³	110 lb/ft ³
Equilibrium (free) moisture content (m) by volume	4%	5%

C-101.5.1.4.4 For structural steel columns encased in concrete with all re-entrant spaces filled [see Figure C-101.5.1F(c)], Tables C-101.5.1C and C-101.5.1D give the thickness of concrete cover required for various fire-resistance ratings for typical wide flange sections. The thicknesses of concrete given in these tables also apply to structural steel columns larger than those listed.

C-101.5.1.4.5 For structural steel columns protected with precast concrete column covers as shown in Figure C-101.5.1F(a), Table C-101.5.1E gives the thickness of the column covers required for various fire-resistance ratings for typical wide flange shapes. The thicknesses of concrete given in these tables also apply to structural steel columns larger than those listed.

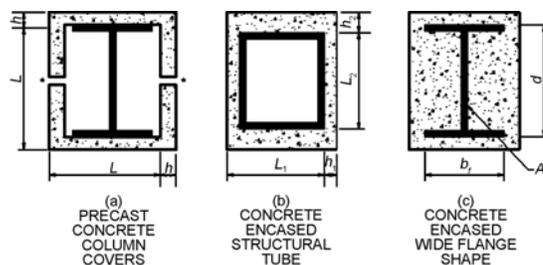


FIGURE C-101.5.1F
CONCRETE PROTECTED STRUCTURAL STEEL COLUMNS^{a, b}

- a. When the inside perimeter of the concrete protection is not square, L shall be taken as the average of L_1 and L_2 . When the thickness of concrete cover is not constant, h shall be taken as the average of h_1 and h_2 .
- b. Joints shall be protected with a minimum 1 inch thickness of ceramic fiber blanket but in no case less than one-half the thickness of the column cover (see Subsection C-101.2.1.3).

APPENDIX C—CALCULATED FIRE RESISTANCE

TABLE C-101.5.1C
MINIMUM COVER (inch) FOR STEEL COLUMNS
ENCASED IN NORMAL WEIGHT CONCRETE^a
[Figure C-101.5.1F(c)]

SHAPE	FIRE-RESISTANCE RATING STRUCTURAL (hours)				
	1	1½	2	3	4
W14 × 233	1	1	1	1½	2
× 176				2½	
× 132			1½		
× 90				2	
× 61		3			
× 48					
× 43		1½	2½	3	
W12 × 152		1	1	1	2
× 96	1½		1½	2½	3
× 65					
× 50					
× 40					
W10 × 88	1	1½	1½	2	
× 49	1			2	3
× 45					2½
× 39			2	3½	
× 33			2		
W8 × 67	1		1	1½	2½
× 58		1½	2	3	3½
× 48					
× 31			4		
× 21					
× 18					
W6 × 25	1	1½	2	3	3½
× 20		2	2½		3½
× 16					
× 15				4	
× 9		1½	3½		

a. The tabulated thicknesses are based upon the assumed properties of normal weight concrete given in Table 709.5.1B.

TABLE C-101.5.1D
MINIMUM COVER (inch) FOR STEEL COLUMNS
ENCASED IN STRUCTURAL LIGHTWEIGHT CONCRETE^a
[Figure C-101.5.1F(c)]

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2	3	4
W14 × 233	1	1	1	1	1½
× 193				2	
× 74					2½
× 61					
× 43			1½	2	
W12 × 65			1	1	1
× 53	2	2½			
× 40					1½
W10 × 112	1	1	1	1½	2
× 88				2	2½
× 60			1½		
× 33					
W8 × 35	1	1	1½	2	2½
× 28				2	3
× 24					
× 18		1½			

a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table 709.5.1B.

TABLE C-101.5.1E
MINIMUM COVER (inch) FOR STEEL COLUMNS
IN NORMAL WEIGHT PRECAST COVERS^a
[Figure C-101.5.1F(a)]

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)					
	1	1½	2	3	4	
W14 × 233	1½	1½	1½	2½	3	
× 211			2		3	3½
× 176				2		
× 145		3	4½			
× 109					3½	
× 99		4				
× 61			4½			
× 43						
W12 × 190		1½	1½	1½	2½	3½
× 152	2			3		4
× 120					2	
× 96	3		4½			
× 87				4		
× 58	4½					
× 40						
W10 × 112	1½		1½	2	3	3½
× 88				2		3½
× 77		2	2½		4	
× 54				3		4
× 33						
W 8 × 67	1½	1½	2	3	4	
× 58			2			2½
× 48		2		3	4	
× 28			3			4½
× 21						
× 18						
W 6 × 25		1½	2	2½	3½	4½
× 20	3					
× 16			4			
× 12				5		
× 9						

a. The tabulated thicknesses are based upon the assumed properties of normal weight concrete given in Table 709.5.1B.

TABLE C-101.5.1F
MINIMUM COVER (inch) FOR STEEL COLUMNS
IN STRUCTURAL LIGHTWEIGHT PRECAST COVERS^a
[Figure C-101.5.1F(a)]

Structural Shape	Fire-Resistance Rating (hours)						
	1	1½	2	3	4		
W14 × 233	1½	1½	1½	2	2½		
× 176					2½	3	
× 145				2			3½
× 132			3		4		
× 109						3½	
× 99			4				
× 68				4½			
× 43							
W12 × 190			1½	1½	1½	2	2½
× 152	2	3					
× 136						2	2½
× 106	3	4					
× 96					3½		
× 87	4						
× 65		4½					
× 40							
W10 × 112	1½	1½			1½	2	3
× 100			2	3			
× 88					2	2½	3
× 77			3	4			
× 60							
× 39	4½						
× 33							
W8 × 67	1½	1½	1½	2	3		
× 48					2	3	
× 35			2	2½			3
× 28					3	4	
× 18							
W 6 × 25	1½	2	2	3	3½		
× 15					3	4	
× 9							

a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table 709.5.1B.

C-101.5.1.4.6 The fire resistance of structural steel columns protected with concrete masonry units as illustrated in Figure C-101.5.1G, may be determined from the following expression:

Equation C-101.5.1.4.6 Fire Resistance of Structural Steel Columns

$$R = 0.17(W/D)^{0.7} + [0.285(T_e^{1.6}/K^{0.2})]$$

$$[1.0 + 42.7\{(A_s/d_m T_e)/(0.25p + T_e)\}^{0.8}]$$

Where:

R = Fire-resistance rating of column assembly, hours.

W = Average weight of steel column, pounds per foot.

D = Heated perimeter of steel column, inches (see Figure C-101.5.1G).

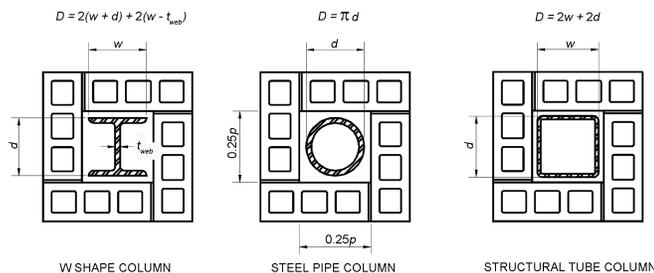
T_e = Equivalent thickness of concrete masonry unit, inches (see Table C-101.3.1, Note a).

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- K = Thermal conductivity of concrete masonry unit, Btu/hr · ft · °F (see Table C-101.5.1G).
- A_s = Cross-sectional area of steel column, square inches.
- d_m = Density of the concrete masonry unit, pounds per cubic foot.
- p = Inner perimeter of concrete masonry protection, inches (see Figure C-101.5.1G).

**TABLE C-101.5.1G
THERMAL CONDUCTIVITY OF CONCRETE MASONRY UNITS**

DENSITY (d_m) OF UNITS (lb/ft ³)	THERMAL CONDUCTIVITY (K) OF UNITS (Btu/hr · ft · °F)
80	0.207
85	0.228
90	0.252
95	0.278
100	0.308
105	0.340
110	0.376
115	0.416
120	0.459
125	0.508
130	0.561
135	0.620
140	0.685
145	0.758
150	0.837



**FIGURE C-101.5.1G
CONCRETE MASONRY PROTECTED
STRUCTURAL STEEL COLUMNS**

Notes:

- d = Depth of a wide flange column, outside diameter of pipe column, or outside dimension of structural tubing column, inches.
- t_{web} = Thickness of web of wide flange column, inches.
- w = Width of flange of wide flange column, inches.

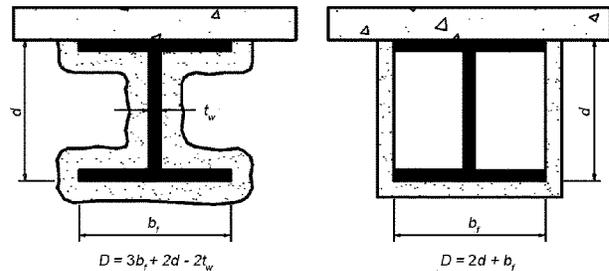
C-101.5.2 Structural steel beams and girders.

C-101.5.2.1 Determination of fire resistance.

C-101.5.2.1.1 These procedures establish a basis for determining the fire resistance of structural steel beams and girders, which differ in size from that specified in approved fire-resistant assemblies as a

function of the thickness of fire-resistant material and the weight (W) and heated perimeter (D) of the beam or girder.

As used in these sections, W is the average weight of a structural steel member, in pounds per linear foot. The heated perimeter, D , is the inside perimeter of the fire-resistant material, in inches, as illustrated in Figure C-101.5.2.



**FIGURE C-101.5.2
DETERMINATION OF THE HEATED PERIMETER
OF STRUCTURAL STEEL BEAMS AND GIRDERS**

C-101.5.2.1.2 The weight-to-heated-perimeter ratios (W/D), for both contour and box fire-resistant protection profiles, for the wide flange shapes most often used as beams or girders are given in Table C-101.5.2. For different shapes, the weight-to-heated-perimeter ratios (W/D) shall be determined in accordance with the definitions given in this Section.

C-101.5.2.1.3 Except as provided for in Subsection C-101.5.2.2, structural steel beams in approved fire-resistant assemblies shall be considered the minimum permissible size. Other beam or girder shapes may be substituted provided that the weight-to-heated-perimeter ratio (W/D) of the substitute beam is equal to or greater than that of the beam specified in the approved assembly.

C-101.5.2.2 Spray-applied fire-resistant materials.

C-101.5.2.2.1 The provisions in this Section apply to unrestrained structural steel beams and girders protected with spray-applied cementitious or mineral fiber materials. Larger or smaller unrestrained beam and girder shapes may be substituted for beams specified in approved unrestrained or restrained fire-resistant assemblies provided that the thickness of the fire-resistant material is adjusted in accordance with the following expression:

Equation C-101.5.2.2.1 Spray-Applied Fire Protection

$$(h_2 = h_1) \left[\frac{W_1/D_1 + 0.60}{W_2/D_2 + 0.60} \right]$$

Where:

- h = Thickness of spray-applied fire-resistant material, inches.

W = Weight of the structural steel beam or girder, pounds per linear foot.

D = Heated perimeter of the structural steel beam or girder, inches.

Subscript 1 refers to the beam and fire-resistant material thickness in the approved assembly.

Subscript 2 refers to the substitute beam or girder and the required thickness of fire-resistant material.

C-101.5.2.2.2 The equation in Subsection C-101.5.2.2.1 is limited to beams with a weight-to-heated-perimeter ratio (W/D) of 0.37 or greater. The minimum thickness of fire-resistant material shall not be less than $3/8$ inch.

TABLE C-101.5.2
WEIGHT TO HEATED PERIMETER RATIOS (W/D)
FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W36 × 300	2.47	3.33
× 280	2.31	3.12
× 260	2.16	2.92
× 245	2.04	2.76
× 230	1.92	2.61
× 210	1.94	2.45
× 194	1.80	2.28
× 182	1.69	2.15
× 170	1.59	2.01
× 160	1.50	1.90
× 150	1.41	1.79
× 135	1.28	1.63
W33 × 241	2.11	2.86
× 221	1.94	2.64
× 201	1.78	2.42
× 152	1.51	1.94
× 141	1.41	1.80
× 130	1.31	1.67
× 118	1.19	1.53
W30 × 211	2.00	2.74
× 191	1.82	2.50
× 173	1.66	2.28
× 132	1.45	1.85
× 124	1.37	1.75
× 116	1.28	1.65
× 108	1.20	1.54
× 99	1.10	1.42
W27 × 178	1.85	2.55
× 161	1.68	2.33
× 146	1.53	2.12
× 114	1.36	1.76
× 102	1.23	1.59
× 94	1.13	1.47
× 84	1.02	1.33
W24 × 162	1.85	2.57
× 146	1.68	2.34
× 131	1.52	2.12
× 117	1.36	1.91
× 104	1.22	1.71
× 94	1.26	1.63
× 84	1.13	1.47
× 76	1.03	1.34
× 68	0.92	1.21
× 62	0.92	1.14
× 55	0.82	1.02

(continued)

TABLE C-101.5.2—continued
WEIGHT TO HEATED PERIMETER RATIOS (W/D)
FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W14 × 132	1.83	3.00
× 120	1.67	2.75
× 109	1.53	2.52
× 99	1.39	2.31
× 90	1.27	2.11
× 82	1.41	2.12
× 74	1.28	1.93
× 68	1.19	1.78
× 61	1.07	1.61
× 53	1.03	1.48
× 48	0.94	1.35
× 43	0.85	1.22
× 38	0.79	1.09
× 34	0.71	0.98
× 30	0.63	0.87
× 26	0.61	0.79
× 22	0.52	0.68
W12 × 87	1.44	2.34
× 79	1.32	2.14
× 72	1.20	1.97
× 65	1.09	1.79
× 58	1.08	1.69
× 53	0.99	1.55
× 50	1.04	1.54
× 45	0.95	1.40
× 40	0.85	1.25
× 35	0.79	1.11
× 30	0.69	0.96
× 26	0.60	0.84
× 22	0.61	0.77
× 19	0.53	0.67
× 16	0.45	0.57
× 14	0.40	0.50
W10 × 112	2.14	3.38
× 100	1.93	3.07
× 88	1.70	2.75
× 77	1.52	2.45
× 68	1.35	2.20
× 60	1.20	1.97
× 54	1.09	1.79
× 49	0.99	1.64
× 45	1.03	1.59
× 39	0.94	1.40
× 33	0.77	1.20
× 30	0.79	1.12
× 26	0.69	0.98
× 22	0.59	0.84

(continued)

TABLE C-101.5.2—continued
WEIGHT TO HEATED PERIMETER RATIOS (*W/D*)
FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W21 × 147	1.83	2.60
× 132	1.66	2.35
× 122	1.54	2.19
× 111	1.41	2.01
× 101	1.29	1.84
× 93	1.38	1.80
× 83	1.24	1.62
× 73	1.10	1.44
× 68	1.03	1.35
× 62	0.94	1.23
× 57	0.93	1.17
× 50	0.83	1.04
× 44	0.73	0.92
W18 × 119	1.69	2.42
× 106	1.52	2.18
× 97	1.39	2.01
× 86	1.24	1.80
× 76	1.11	1.60
× 71	1.21	1.59
× 65	1.11	1.47
× 60	1.03	1.36
× 55	0.95	1.26
× 50	0.87	1.15
× 46	0.86	1.09
× 40	0.75	0.96
× 35	0.66	0.85
W16 × 100	1.56	2.25
× 89	1.40	2.03
× 77	1.22	1.78
× 67	1.07	1.56
× 57	1.07	1.43
× 50	0.94	1.26
× 45	0.85	1.15
× 40	0.76	1.03
× 36	0.69	0.93
× 31	0.65	0.83
× 26	0.55	0.70
× 19	0.59	0.78
× 17	0.54	0.70
× 15	0.48	0.63
× 12	0.38	0.51
W8 × 67	1.61	2.55
× 58	1.41	2.26
× 48	1.18	1.91
× 40	1.00	1.63
× 35	0.88	1.44
× 31	0.79	1.29
× 28	0.80	1.24
× 24	0.69	1.07
× 21	0.66	0.96
× 18	0.57	0.84
× 15	0.54	0.74
× 13	0.47	0.65
× 10	0.37	0.51
W6 × 25	0.82	1.33
× 20	0.67	1.09
× 16	0.66	0.96
× 15	0.51	0.83
× 12	0.51	0.75
× 9	0.39	0.57

(continued)

TABLE C-101.5.2—continued
WEIGHT TO HEATED PERIMETER RATIOS (*W/D*)
FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W5 × 19	0.76	1.24
× 16	0.65	1.07
W4 × 13	0.65	1.05

C-101.5.2.3 Structural steel trusses. The fire resistance of structural steel trusses protected with cementitious or mineral fiber materials spray-applied to each of the individual truss elements may be determined in accordance with this Section. The thickness of the fire-resistant material shall be determined in accordance with Subsection C-101.5.1.3. The weight-to-heated-perimeter ratio (*W/D*) of truss elements, which can be simultaneously exposed to fire on all sides, shall be determined on the same basis as columns, as specified in Subsection C-101.5.1.1. The weight-to-heated-perimeter ratio (*W/D*) of truss elements, which directly support floor or roof construction, shall be determined on the same basis as beams and girders, as specified in Subsection C-101.5.2.1.

C-101.5.2.4 Determining conditions of restraint. See Table C-101.5.2.5 for guidance on restrained and unrestrained assemblies.

C-101.5.2.5 Determining conditions of restraint.

C-101.5.2.5.1 For the purpose of determining the required fire-resistance rating of floor and roof assemblies, including individual beams, used in steel and concrete construction, such structural elements shall be classified as restrained or unrestrained in accordance with Subsection C-101.5.2.5.

C-101.5.2.5.2 Floor and roof assemblies, and individual beams in buildings, shall be considered restrained when their surrounding or supporting structure is capable of resisting substantial thermal expansion throughout the range of anticipated elevated temperatures. Construction not complying with this definition is assumed to be free to rotate and expand and shall, therefore, be considered as unrestrained. See Table C-101.5.2.5 for determining restrained and unrestrained assemblies.

C-101.6 Wood assemblies.

C-101.6.1 General.

C-101.6.1.1 This Section contains procedures for calculating the fire-resistance ratings of walls, floor/ceiling and roof/ceiling assemblies based, in part, on the standard method of testing referenced in EPCOT Standard 6-1.

C-101.6.1.2 Fire-resistance ratings calculated using the procedures in this Section shall be used only for 1-hour-rated assemblies.

C-101.6.1.3 When dissimilar membranes are used on a wall assembly, the calculation shall be made from the least fire-resistant (weaker) side.

**TABLE C-101.5.2.5
CONDITIONS OF RESTRAINT**

	CONSTRUCTION	CLASSIFICATION
I.	Wall Bearing:	
	Single-Span and Simply Supported End Spans of Multiple Bays: ^a (1) Open-web steel joists or beams supporting concrete slabs, precast units or metal decking Unrestrained (2) Concrete slabs, precast units or metal decking Unrestrained	
II.	Interior Spans of Multiple Bays: (1) Open-web steel joists or steel beams supporting precast units or metal decking Unrestrained (2) Open-web steel joists, steel beams or metal decking supporting continuous concrete slab Restrained (3) Cast-in-place concrete slab systems Restrained (4) Precast concrete where the potential thermal expansion is resisted by adjacent construction ^b Restrained	
	Steel Framing: (1) Steel beams welded, riveted or bolted to the framing members Restrained (2) All types of cast-in-place floor and roof systems (such as beam-and-slabs, flat slabs, pan joists and waffle slabs) where the floor or roof system is secured to the framing members Restrained (3) All types of prefabricated floor or roof systems where the structural members are secured to the framing members and the potential thermal expansion of the floor or roof system is resisted by the framing system or the adjoining floor or roof construction ^b Restrained	
	Concrete Framing: (1) Beams securely fastened to the framing members Restrained (2) All types of cast-in-place floor or roof systems (such as beam-and-slabs, flat slabs, pan joists and waffle slabs) where the floor or roof system is cast with the framing members Restrained (3) Interior and exterior spans of precast systems with cast-in-place joints resulting in restraint equivalent to that which would exist in Condition III(1) Restrained (4) All types of prefabricated floor or roof systems where the structural members are secured to such systems and the potential thermal expansion of the floor or roof systems is resisted by the framing system or the adjoining floor or roof construction ^b Restrained	

- a. Floor and roof systems shall be considered restrained when they are tied into walls with or without tie beams, the walls being designed and detailed to resist thermal thrust from the floor or roof system.
- b. Resistance to potential thermal expansion is considered to be achieved when:
 - (1) Continuous structural concrete topping is used,
 - (2) The space between the ends of precast units or between the ends of units and the vertical face of supports is filled with concrete or mortar, or
 - (3) The space between the ends of precast units and the vertical faces of supports, or between the ends of solid or hollow core slab units does not exceed 0.25 percent of the length for normal-weight concrete members or 0.1 percent of the length for structural lightweight concrete members.

C-101.6.2 Walls, floors and roofs.

C-101.6.2.1 These procedures apply to both load-bearing and nonload-bearing assemblies.

C-101.6.2.2 The fire-resistance rating of a wood-framed assembly is equal to the sum of the time assigned to the membrane on the fire-exposed side, the time assigned to the framing members and the time assigned for additional contribution by other protective measures, such as insulation. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly.

C-101.6.2.3 Table C-101.6.2A gives the time-assigned to membranes on the fire-exposed side.

**TABLE C-101.6.2A
TIME ASSIGNED TO WALLBOARD MEMBRANES^{a, b, c, d}**

DESCRIPTION OF FINISH	TIME (minutes)
3/8-inch wood structural panel bonded with exterior glue	5
15/32-inch wood structural panel bonded with exterior glue	10
19/32-inch wood structural panel bonded with exterior glue	15
3/8-inch gypsum wallboard	10
1/2-inch gypsum wallboard	15
5/8-inch gypsum wallboard	30
1/2-inch Type X gypsum wallboard	25
5/8-inch Type X gypsum wallboard	40
Double 3/8-inch gypsum wallboard	25
1/2- + 3/8-inch gypsum wallboard	35
Double 1/2-inch gypsum wallboard	40

- a. These values apply only when membranes are installed on framing members which are spaced 16 inches o.c.
- b. Gypsum wallboard installed over framing or furring shall be installed so that all edges are supported, except 3/8-inch Type X gypsum wallboard may be installed horizontally with the horizontal joints staggered 24 inches each side and unsupported but finished.
- c. On wood-framed floor/ceiling or roof/ceiling assemblies, gypsum board shall be installed with the long dimension perpendicular to framing members and shall have all joints finished.
- d. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly. When dissimilar membranes are used on a wall assembly, the calculation shall be made from the least fire-resistant (weaker) side.

C-101.6.2.4 For an exterior wall having more than 5 feet of horizontal separation, the wall is assigned a rating dependent on the interior membrane and the framing as described in Tables C-101.6.2A and C-101.6.2B. The membrane on the outside or nonfire-exposed side of exterior walls having more than 5 feet of horizontal separation may consist of sheathing, sheathing paper, and siding as described in Table C-101.6.2C.

C-101.6.2.5 In the case of a floor or roof, the standard test provides only for testing for fire exposure from below. Except as noted in Subsection C-101.5.3, floor or roof assemblies of wood framing shall have an upper membrane consisting of a subfloor and finish floor conforming to Table C-101.6.2D or any other membrane that has a contribution to fire resistance of at least 15 minutes in Table C-101.6.2A.

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C-101.6.2.6 Table C-101.6.2E gives the time increments that can be added to the fire resistance when glass fiber, rockwool or slag mineral wool insulation is incorporated in the assembly.

C-101.6.2.7 Fastening of wood framed assemblies and the fastening of membranes to the wood framing members shall be done in accordance with EPCOT Standard 1010-9.

**TABLE C-101.6.2B
TIME ASSIGNED FOR CONTRIBUTION
OF WOOD FRAME^{a, b, c}**

DESCRIPTION	TIME ASSIGNED TO FRAME (minutes)
Wood studs 16 inches o.c.	20
Wood floor and roof joists 16 inches o.c.	10

- a. This table does not apply to studs or joists spaced more than 16 inches o.c.
- b. All studs shall be nominal 2 × 4 and all joists shall have a nominal thickness of at least 2 inches.
- c. Allowable spans for joists shall be determined in accordance with Chapter 9.

**TABLE C-101.6.2C
MEMBRANE^a ON EXTERIOR FACE OF WOOD STUD WALLS**

SHEATHING	PAPER	EXTERIOR FINISH
5/8-inch T & G lumber		Lumber siding
5/16-inch exterior glue plywood	Sheathing paper	Wood shingles and shakes
1/2-inch gypsum wallboard		1/4-inch wood structural panels— exterior type
5/8-inch gypsum wallboard		1/4-inch hardboard
1/2-inch fiberboard		Metal siding Stucco on metal lath Masonry veneer
None		3/8-inch exterior grade wood structural panels

- a. Any combination of sheathing, paper and exterior finish listed may be used.

**TABLE C-101.6.2D
FLOORING OR ROOFING OVER WOOD FRAMING^a**

ASSEMBLY	STRUCTURAL MEMBERS	SUBFLOOR OR ROOF DECK	FINISH FLOORING OR ROOFING
			Hardwood or softwood flooring on building paper.
Floor	Wood	15/32-inch wood structural panels or 11/16-inch T & G softwood	Resilient flooring, parquet floor felted-synthetic-fiber floor coverings, carpeting, or ceramic tile on 3/8-inch-thick panel-type underlay Ceramic tile on 1 1/4-inch mortar bed
Roof	Wood	15/32-inch wood structural panels or 11/16-inch T & G softwood	Finish roofing material with or without insulation

- a. This table applies only to wood joist construction. It is not applicable to wood truss construction

**TABLE C-101.6.2E
TIME ASSIGNED FOR ADDITIONAL PROTECTION**

DESCRIPTION OF ADDITIONAL PROTECTION	RESISTANCE (minutes)
Add to the fire-resistance rating of wood stud walls if the spaces between the studs are completely filled with glass fiber mineral wool batts weighing not less than 2 pounds per cubic foot (0.6 pound per square foot of wall surface), or rockwool or slag mineral wool batts weighing not less than 3.3 pounds per cubic foot (1 pound per square foot of wall surface).	15

C-101.6.3 Design of fire-resistant exposed wood members.

C-101.6.3.1 The fire-resistance rating, in minutes, of timber beams and columns with a minimum nominal dimension of 6 inches is equal to:

- Beams: (1) $2.54Zb [4 - 2(b/d)]$ for beams that may be exposed to fire on four sides.
- (2) $2.54Zb [4 - (b/d)]$ for beams that may be exposed to fire on three sides.
- Columns: (3) $2.54Zd [3 - (d/b)]$ for columns that may be exposed to fire on four sides.
- (4) $2.54Zd [3 - (d/2b)]$ for columns that may be exposed to fire on three sides.

Where:

- b = The breadth (width) of a beam or larger side of a column before exposure to fire, inches.
- d = The depth of a beam or smaller side of a column before exposure to fire, inches.

Z = Load factor, based on Figure C-101.6.3A.

C-101.6.3.2 Formula (4) applies only where the unexposed face represents the smaller side of the column. If a column is recessed into a wall, its full dimension shall be used for the purpose of these calculations.

C-101.6.3.3 Allowable loads on beams and columns are determined using design values given in *Design Values for Wood Construction*, a supplement to the ANSI/AF&PA *National Design Specification for Wood Construction*.

C-101.6.3.4 Where minimum 1-hour fire resistance is required, connectors and fasteners shall be protected from fire exposure by 1 1/2 inches of wood, or other approved covering or coating for a 1-hour rating. Typical details for commonly used fasteners and connectors are shown in AITC Technical Note No. 7.

C-101.6.3.5 Wood members are limited to dimensions of 6 inches nominal or greater. Glued-laminated timber beams utilize standard laminating combinations except that a core lamination is removed. The tension zone is moved inward and the equivalent of an extra nominal 2-inch-thick outer tension lamination is added.

C-101.7.1 The following publications may be accepted as if herein listed:

- FM *Specification Tested Products Guide*
- GA *Fire-Resistance Design Manual*
- SBCCI, ICBO, BOCA and ICC PST & ESI Evaluation Reports
- UL *Fire Directory*

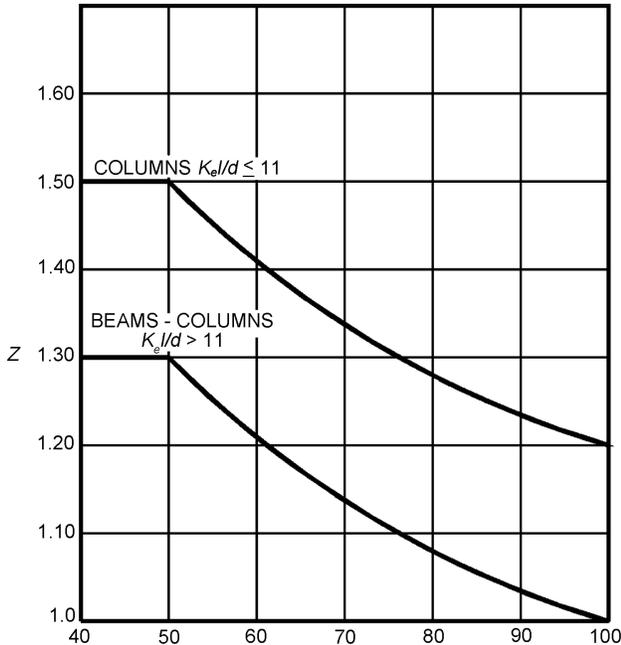


FIGURE C-101.6.3A
LOAD FACTOR

Notes:

K_e = The effective length factor as noted in Figure C-101.6.3B.

l = The unsupported length of columns, inches.

BLOCKING MODES						
THEORETICAL K_e VALUE	0.5	0.7	1.0	1.0	2.0	2.0
RECOMMENDED DESIGN K_e WHEN IDEAL CONDITIONS APPROXIMATED	0.65	0.80	1.2	1.0	2.10	2.4
END CONDITION CODE						
	ROTATION FIXED, TRANSLATION FIXED ROTATION FIXED, TRANSLATION FIXED ROTATION FIXED, TRANSLATION FREE ROTATION FREE, TRANSLATION FREE					

FIGURE C-101.6.3B
EFFECTIVE LENGTH FACTORS

C-101.7 Other referenced documents. Refer to Subsection C-101.7.1, and NBS BMS 71, NBS *Fire Tests of Building Columns* and NBS TRBM-44 for fire-resistance ratings of materials and assemblies.

APPENDIX D

REGULATION OF SIGNS AND OUTDOOR ADVERTISING STRUCTURES

SECTION D-101 ADMINISTRATIVE REQUIREMENTS

D-101.1 Scope. The requirements of this Appendix shall apply to outdoor signs and display structures as classified in Subsection D-101.2, hereafter constructed, erected, installed, altered, repaired or maintained.

D-101.2 Classification. Classification of signs and outdoor display structures shall be as follows:

- (a) **Electric sign.** A sign containing electrical wiring, but not including signs illuminated by an exterior light source.
- (b) **Ground sign.** Sign supported directly on the ground by braces, uprights or poles with live and dead loads transmitted to the ground.
- (c) **Life safety sign.** Signs required for egress during an emergency in a building and other identification signs necessary for the safety of occupants.
- (d) **Marquee sign.** Sign attached to or hung from a marquee projecting from a building over public property.
- (e) **Projecting sign.** Sign affixed to building wall or structure projecting 12 inches or more beyond the building or structure, building line or property.
- (f) **Roof sign.** Sign constructed, erected or maintained on or above a roof or parapet wall of a building or structure.
- (g) **Sign structure.** Any structure which supports or is capable of supporting a sign as defined in this Code. A sign structure is permitted to be a single pole, multiple poles, archway or independent structure and is not required to be an integral part of the building.
- (h) **Temporary sign.** Sign constructed of nonpermanent materials for which a permit has been issued for a period of not more than 90 days.
- (i) **Wall sign.** Sign attached to, or erected against, the wall of a building or structure with exposed face of the sign in a plane parallel to the plane of said wall and projecting less than 12 inches from the building or structure, building line or property line.

D-101.3 Reserved.

D-101.4 Criteria.

- (a) Electrical signs shall be installed, operated and maintained in accordance with the requirements of the *EPCOT Electrical Code*, *UL 48 Standard for Electric Signs*, *UL 2161 Standard for Neon Transformers and Power Supplies* and this Appendix.
- (b) Signs shall not be erected, constructed or maintained so as to obstruct any fire escape or any window or door or opening used as a means of egress or so as to pre-

vent free passage from one part of a roof to any other part thereof. A sign shall not be attached in any form, shape or manner to a fire escape, nor be placed in such manner as to interfere with any opening required for ventilation.

- (c) A sign shall not be erected in a manner that would confuse or obstruct the view of, or interfere with, exit signs required by Chapter 8 or with official traffic signs, signals or devices. Signs and sign support structures, together with their supports, braces, guys and anchors, shall be kept in repair and in a proper state of preservation.

D-101.5 Permits.

- (a) Life safety signs require permitting.
- (b) Other signs and display structures hereafter constructed, erected, installed, altered, repaired or maintained shall require a permit.

Exception: The following signs are exempt from the requirements to obtain a permit when not subject to wind loads. In no case shall the installation of a sign violate other provisions of this Code.

1. Painted nonilluminated wall signs less than 40 square feet and not exceeding 35 pounds.
 2. Projecting signs not exceeding 2.5 square feet.
 3. Signs erected by transportation authorities.
 4. Pole mounted signs that do not exceed 4 square feet and are located in nonaccessible areas, protected by railing or landscape and that do not project into an occupied area.
- (c) Application for a permit shall be filed in accordance with the requirements of Chapter 3 and accompanied by drawings, computations, stress diagrams and other information regarding location, construction, weight, materials and electrical equipment as required by the Building Official. If filed by other than the owner of the property, the application shall bear the owner's signature. Drawings and computations shall bear the signature of a Professional Engineer registered in the State of Florida.
 - (d) Except for signs projecting over public property and roof signs, the Building Official may waive the requirement for drawings and computations when, in his opinion, public safety is not involved, and when the sign is less than 24 inches in either dimension.

D-101.6 Inspections.

- (a) Outdoor signs and advertising display structures requiring a permit shall be inspected by the Building Official, and the inspection shall be in accordance with the requirements of Chapter 3.

- (b) The permit holder shall request structural and electrical inspections of outdoor signs and advertising display structures before enclosing the wiring and shall request final inspection not more than 48 hours after the sign is completed.
- (c) Outdoor signs and advertising display structures shall be inspected at regular intervals as required by the Building Official. Removal of temporary signs shall be verified by the Building Official at the end of the time period specified in the permit.

D-101.7 Noncomplying signs. The owner, person, firm or corporation responsible for constructing, erecting or maintaining an outdoor sign or display structure that is unsafe or in any other way is in violation of this Code and Appendix shall be ordered by written notice from the Building Official to bring the sign into compliance with the requirements of this Code and Appendix. If within 10 days the order is not complied with, the Building Official shall cause the sign to be removed at the expense of the owner or lessee.

SECTION D-201 DESIGN AND CONSTRUCTION REQUIREMENTS

D-201.1 Design.

- (a) Wind pressure on signs shall be computed in accordance with the requirements of Chapter 9 and the design shall be based on panels remaining in place during winds of high velocity. Working stresses for materials shall conform to the requirements of Chapters 9 and 10. Bracing systems shall be designed and constructed to transmit stresses to the foundation. Dead and lateral loads of signs on or attached to buildings shall be transmitted through the structural frame of the building to the foundation without overstressing structural elements.
- (b) Members supporting unbraced signs shall be designed so the bearing loads imposed on the soil in either horizontal or vertical direction shall not exceed the values specified in Chapter 9. Brace ground signs shall be anchored to resist wind forces acting in any direction. Anchors and supports shall be designed for safe bearing loads on soil and for resistance to pull out 25 percent higher than the required resistance to over-turning.
- (c) The overturning moment produced from lateral forces shall not exceed two-thirds of the dead-resisting moment. Uplift caused by overturning shall be resisted by anchorage to the ground or to the structural frame of the building.
- (d) Vertical design loads shall be assumed to be acting simultaneously with wind loads.
- (e) Working stresses of guys, cables, rods and their fastenings shall not exceed 25 percent of the ultimate strength of the guy ropes and fastenings.

D-201.2 Construction.

- (a) Materials of construction for outdoor signs and advertising displays and their fastenings shall be of the quality and grade specified in Chapter 10 and in the requirements for special types of signs, Section D-301.

- (b) Display surfaces of all types of signs may be of metal, glass or approved plastic when used in accordance with the requirements of this Code. Maximum areas of glass panels shall be as specified in Section 1005. Plastic used shall conform to the requirements of Section 1008 and individual panels of approved plastic shall not be more than 120 square feet in area. The dimensional limitation of 120 square feet shall not apply to sign facing sections made from flame-resistant-coated fabric (ordinarily known as “flexible sign face plastic”) that weighs less than 20 ounces per square yard and that, when tested in accordance with NFPA 701, meets the fire propagation performance requirements of both Test 1 and Test 2 or that when tested in accordance with an approved test method, exhibits an average burn time of 2 seconds or less and a burning extent of 5.9 inches or less for 10 specimens.
- (c) Walkways and nonstructural trim on signs, including molding, battens, caps, nailing strips, lattices, cutouts or letters may be of wood, metal, approved plastics or a combination thereof.
- (d) Roof signs, wall signs, projecting signs and marquee signs shall be constructed of noncombustible material, except as provided in Paragraph (b) and Subsection D-301.1(a).
- (e) Anchors and supports when of wood embedded in the soil or within 6 inches of the soil shall be pressure impregnated as required in Section 1010.
- (f) Signs shall be secured to supports and supporting structures by rot-resistant fastenings. Wood or plastic plugs or pins shall not be used.
- (g) Outdoor signs and advertising displays shall be constructed with rainwater drains.
- (h) Electrolysis shall be considered in the design and prevented. The methods shall be shown on the drawings.

D-201.3 Clearances and location.

- (a) Signs projecting from a building or extending over public property shall maintain a clear height of 9 feet above the sidewalk and shall not extend to within 18 inches of the curb line.
- (b) Outdoor signs and advertising displays shall not obstruct an exit or a window used as a means of egress, or an opening required for ventilation, nor interfere with use of standpipes by the Fire Department, nor with passage from one roof to another by fire fighters.
- (c) Outdoor signs and advertising displays shall not be located within 6 feet horizontally or 12 feet vertically of overhead conductors carrying more than 750 volts.
- (d) Outdoor signs and advertising displays located within 5 feet of exterior walls required to be fire resistive by this Code shall be noncombustible throughout.
- (e) Outdoor signs and advertising displays shall not project into an alley below a height of 16 feet above grade, but may project 36 inches when located more than 16 feet above grade.

SECTION D-301 REQUIREMENTS FOR SPECIAL TYPES OF SIGNS

D-301.1 Electric signs.

- (a) Electric signs structure shall be of noncombustible material. Wood or approved plastic may be used for surface decoration if located at least 2 inches from the nearest current-carrying part of the sign.
- (b) Electric signs shall not display flashing red lights, nor use the words “Stop,” “Go” or “Danger,” nor shall an electric sign be an imitation of an official traffic signal or road sign.
- (c) The sign body and/or fabricated enclosure of an electric sign, intended for installation in a damp or wet location, shall be provided with drain openings in accordance with UL 48.
- (d) Signs intended for installation in damp or wet locations need not comply with the drain opening requirements of (c) provided that they comply with either:
 1. The requirements for a Type 3R or better enclosure as defined in the UL 50 *Standard for Enclosures for Electrical Equipment, Non-Environmental Considerations*, or
 2. The Rain Test, described in UL 879 *Standard for Electric Sign Components*, where there is no indication of water entering the units.
- (e) Electric signs are required to be listed/marked to include the manufacturer’s name, trade name, trademark or identifier and include electrical ratings and wiring methods.
- (f) Each sign and outline lighting system, feeder circuit or branch circuit supplying a sign, outline lighting system, or skeleton tubing shall be controlled by an externally operable switch or circuit breaker that opens all ungrounded conductors and controls no other load.

D-301.2 Ground signs.

- (a) **Height restrictions.** The structural frame of ground signs shall not be erected of combustible materials to a height greater than 35 feet above the ground. Ground signs constructed entirely of noncombustible material shall not be erected to a height of greater than 100 feet above the ground. Greater heights are permitted where approved and located so as not to create a hazard or danger to the public.
- (b) Ground signs shall be constructed of materials, resistant to deterioration from rot, termites and borers. Wood used below the ground shall be pressure impregnated as required in Section 1010. Steel used below grade shall be encased in concrete or all elements below grade shall be stainless steel. Aluminum used below grade or fastened to a concrete foundation shall have a barrier coating of epoxy or an approved equal to prevent aluminum-concrete chemical reaction.
- (c) Ground signs shall be erected so that the face of the sign paralleled to or at an angle not more than 30 degrees with the lot line shall be not less than 3 feet from the line. The ends of a sign at an angle of 30

degrees or more with adjacent lot lines may be extended to the lot line.

- (d) Lighting reflectors may project beyond the face of the sign.
- (e) Ground signs shall not project over public property.

D-301.3 Marquee signs. Marquee signs shall be noncombustible throughout and shall be at least 8 feet above the sidewalk or ground level. Marquee signs may be attached to the sides or front of a marquee for its entire length and width, but shall not extend outside the line of the marquee, nor more than 6 feet above or 1 foot below the marquee.

D-301.4 Projecting signs.

- (a) Signs projecting more than 12 inches from the building shall be constructed of noncombustible materials and shall be attached to the building or structure by metal bolts, anchors, supports, chains, guys or rods. Staples and nails shall not be used.
- (b) Dead and wind loads shall be supported by chains, guys or rods not less than $\frac{3}{8}$ inch in diameter at an angle of 45 degrees with the horizontal to resist the dead load, and at an angle of 45 degrees or more with the face of the sign to resist the wind pressure. When the area of the face of the sign exceeds 30 square feet, two supports shall be provided on each side not more than 8 feet apart to resist the wind pressure.

Exception: Signs that have been engineered to consider resisting wind and dead loads.

- (c) Supports of projecting signs shall be secured to a bolt or expansion screw that will develop the strength of the supporting chains, guys or steel rods with a minimum $\frac{5}{8}$ -inch bolt or lag screw. Turnbuckles shall be placed in chains, guys or steel rods that support projecting signs.
- (d) Chains, cables, guys or rods used to support live and dead loads of projecting signs may be fastened to solid masonry walls with expansion bolts or with machine screws in iron supports, but supports shall not be attached to a parapet wall. Where supports are fastened to walls of wood, anchor bolts shall pierce the wall and shall be secured on the inside.
- (e) Projecting signs shall not project above the roof or cornice wall above the roof level, except that signs installed at right angle to the wall and not over 18 inches in horizontal width may project 2 feet above the roof. A sign projecting from the corner of a building parallel to the vertical line or the corner shall be considered to be at a right angle to the building.

D-301.5 Roof signs.

- (a) Roof signs shall be designed in accordance with the requirements of Chapter 9. Loads shall be distributed to the structural frames and to the foundation without overstressing the structural members.
- (b) Roof sign structures shall be constructed of noncombustible materials throughout, except as specified in Subsection D-201.2(b).

- (c) Roof signs shall be constructed to leave a clear space of not less than 1 foot clearance between the roof level and the lowest part of the sign.

Exception: The bottom of the sign can be set at 2 inches above the roof line for removable signs that do not exceed 40 square feet and are mechanically fastened to the vertical supports that allow the sign body to be easily removed, leaving the vertical supports with not less than 12 inches clear above the roof line.

Signs larger than 40 square feet may have an escutcheon that is mechanically fastened to the sign structure, leaving not less than 2 inches between the bottom of the escutcheon and the roof line. The escutcheon is to be constructed to be easily removed for future roof repairs.

- (d) No part of a roof sign or structure shall project beyond the exterior walls of the building.
- (e) Roof signs more than 40 square feet in area shall be supported by steel, aluminum or concrete, fire protected when required for the type of construction.
- (f) Roof signs having a solid surface shall be not more than 24 feet above the roof level.
- (g) Open roof signs in which the open area is at least 40 percent of the total area of the sign may not exceed 75 feet above the surface of the roof or buildings of Types I and II construction and 40 feet above the surface of the roof for buildings of other types of construction. Anchorage to the roof of the building shall be by metal bolts, supports, chains, stranded cables, steel rods or braces.
- (h) Passage 3 feet wide shall be provided at parapet and roof level around all roof signs.

D-301.6 Wall signs.

- (a) Wall signs shall extend not more than 12 inches from the building to which they are attached.
- (b) Wall signs attached to exterior walls of solid masonry, concrete or stone shall be attached by metal anchors, bolts or expansion screws not less than 3/8-inch diameter embedded at least 5 inches.

Exception: Signs that have been engineered to consider resisting dead and wind loads.

- (c) Wall signs shall not be supported by anchorage to an unbraced wall.
- (d) Temporary wall signs of cloth in combustible frames shall be permitted for not more than 30 days and such temporary signs shall be not more than 100 square feet in area.
- (e) Wall signs which have an area exceeding 40 square feet shall be constructed of metal or other approved noncombustible material, except for nailing rails and as provided for in Subsection D-201.2(b).

APPENDIX E

REGULATION OF PRIVATE SWIMMING POOLS

SECTION E-101 ADMINISTRATIVE REQUIREMENTS

E-101.1 Scope. The requirements of this Appendix shall apply to private swimming pools as defined in the Rules and Regulations of the State of Florida pertaining to the Department of Health Rule 64E-9 F.A.C. and Chapter 514 F.S., except that wading pools shall be defined as having a maximum depth of 18 inches.

E-101.2 Criteria.

- (a) Design of swimming pools shall be in accordance with the requirements of Chapters 9 and 10, and this Appendix.
- (b) Materials used in the construction of swimming pools shall be concrete or other materials impervious to water, and such materials shall comply with the requirements of Chapter 10.
- (c) Construction and operation of swimming pools shall comply with the Rules and Regulations of the State of Florida referred to in 64E-9, F.A.C. and Chapter 514 F.S. Where there is conflict between the State of Florida regulations and those of this Code, the most restrictive requirement shall apply.
- (d) Installation of electrical equipment for swimming pools shall comply with the *EPCOT Electrical Code*.
- (e) Installation of heating and ventilating equipment shall comply with the requirements of the *EPCOT Mechanical Code* and the applicable requirements of the *EPCOT Fuel Gas Code*.
- (f) Installation of sanitary facilities and plumbing installations shall comply with the *EPCOT Plumbing Code* and the Rules and Regulations of the Florida State Board of Health.

E-101.3 Permits and inspections.

- (a) Application for permit to construct, alter or repair a swimming pool, or to install electrical and plumbing equipment therein, shall be filed in accordance with the requirements of Chapter 3. Separate permits shall be filed for building, plumbing and electrical installations. Permits for such construction shall be issued when the installation has been approved by the Building Official and the Florida State Board of Health.
- (b) Plans shall be drawn by a Professional Engineer registered by the State of Florida for the following:
 1. Pools requiring special design because of unstable soil or unusual ground water conditions.
- (c) Inspection of swimming pools shall be made in accordance with the requirements of Chapter 3. No swimming pool shall be placed in operation until it has been approved by the Florida State Board of Health.

SECTION E-201 CONSTRUCTION REQUIREMENTS

E-201.1 Design and materials. Materials of construction shall be as specified in the Rules and Regulations of the Florida State Board of Health and in the following requirements:

- (a) **Concrete.** Concrete used in construction of swimming pools shall be Portland cement reinforced concrete having a compressive strength of 2,500 pounds per square inch (psi) at 28 days. Reinforcing bars shall have not less than 3 inches of concrete protection when placed in contact with the soil.
- (b) **Masonry.** Unit masonry walls shall be two-cell blocks, laid with nominal 8-inch thickness in the wall. All voids shall be filled with concrete having a minimum strength of 2,500 psi at 28 days and shall contain aggregate no larger than will pass a No. 3 sieve. Filling of voids shall proceed in stages not to exceed 24 inches high or 12 times the least dimension of the void, whichever is greater. Concrete shall be thoroughly rodded into the voids. Walls more than 3 feet, 4 inches high shall have minimum vertical reinforcement of No. 3 bars placed 16 inches on center.
- (c) **Pneumatically placed concrete.** Pneumatically placed concrete shall be as specified in ACI 318, except that walls of swimming pools shall have a minimum thickness of 6 inches at the bottom and 4 inches at the top with the reinforcing centered.
- (d) **Other materials.** Other materials meeting the requirements of Chapter 9 for design strength may be used when tested in accordance with Section 311 and when approved as an alternative to the materials specified in Chapter 10.

E-201.2 Workmanship. Surrounding areas and walkways shall not drain into the pool. Completed pools shall pass a test for water tightness before being approved by the Building Official. A pressure relief valve or hydrostatic valve shall be provided to prevent uplift due to hydrostatic pressure when the pool is empty or is being drained.

APPENDIX F

REGULATION OF BUILDING CONSTRUCTION AND DEMOLITION OPERATIONS

SECTION F-101 ADMINISTRATIVE REQUIREMENTS

F-101.1 Purpose and scope.

- (a) The purpose of this Appendix is to provide regulations for attaining reasonable safety for life, limb and property during building construction and demolition, and the requirements herein are minimum for that purpose. The provisions of this Appendix are intended to supplement, but not to supersede, the requirements of this Code and the regulations of Florida Statute 442.
- (b) The provisions of this Appendix apply to all building and demolition operations and shall not be construed as replacing or conflicting with the provisions of Chapters 1 through 4.
- (c) In cases of practical difficulty or undue hardship in meeting the requirements of this Appendix, the Building Official may grant exceptions from the literal requirements or may permit the use of alternative methods or devices when reasonable safety is thereby assured.

F-101.2 Insurance and workmen's compensation. Before obtaining a permit for a building or demolition operation, the contractor shall provide proof of compliance with regulations of Florida Statute 440.

F-101.3 Sanitary facilities.

- (a) Temporary sanitary facilities shall be provided on sites of construction and demolition in accordance with the regulations of the Florida State Board of Health, Chapters 10D-6.08, 10D-6.09 and 10D-10.
- (b) Organic refuse, such as uneaten food from workers' lunches and food wrappings, shall not be permitted to accumulate on the site of a construction operation. Arrangements shall be made for regular collection of such refuse.

F-101.4 Protection of utilities. Substantial protective frame and boarding shall be built around and over every street lamp, utility box, fire or police alarm box, fire hydrant, catch basin and manhole that can be damaged by work being done and shall not obstruct the normal functioning of the device being protected.

F-101.5 Temporary light and power. All parts of a building under construction or being demolished, for which temporary lighting and power are required, shall be lighted in accordance with the requirements of the *EPCOT Electrical Code*.

F-101.6 Excavations. Safeguards shall be provided for excavations as required in Chapter 4 and the following provisions:

- (a) No more than one-half the width of the street or alley may be open or obstructed at one time.

- (b) Tunneling shall be permitted only in yards, courts and driveways of the building site. Approved underground installations shall not be damaged or removed.
- (c) When an excavation is made in a paved street requiring removal of paving, the permittee shall file a notice with the Department of Public Works that the excavation has been filled, tamped and made ready for repaving.
- (d) All parts of the street excavated shall be left in as good condition as before the excavation was made.
- (e) The trench or excavation shall be filled, rammed and puddled within 48 hours after making the connections or the repairs.
- (f) Barricades shall be provided and shall encircle the excavation or trench.
- (g) Signs shall be posted on the barricades stating the name of the permittee making the excavation.
- (h) Red flags shall be placed at intervals of 100 feet to warn the public of the existence of the excavation.
- (i) Red lights shall be placed at intervals of 100 feet during hours of darkness.

F-101.7 Temporary construction and use of equipment.

- (a) Except as set forth in this Code and Appendix, temporary construction and use of equipment on construction operations shall be in accordance with EPCOT Standard 5-1 and the pertinent requirements of the *EPCOT Electrical Code*.
- (b) All persons engaged in construction work or entering the site of a construction project shall be required to wear protective head gear.

F-101.8 Sandblasting, steam-cleaning, etc. In exterior operations, sandblasting, steam-cleaning, spray painting, water-proofing or other exterior operations shall be performed with sidewalk canopies in such a manner as not to create a nuisance and to adequately protect persons and property.

F-101.9 Exits. Where a building has been constructed to a height greater than one story, at least one lighted stairway shall be provided that meets the requirements of Section 806. The stairway shall follow the progression of the building construction.

Exception: When approved by the Building Official, a temporary, lighted stairway may be installed, until a permanent lighted stairway is available for use.

F-101.9.1 During demolition the stairway shall remain accessible, clear of obstructions, lighted and follow the building down during the demolition process. The stairway shall be protected from falling debris.

F-101.10 Construction fencing.

- (a) Construction fencing is required to have an approved building permit issued prior to installation.
Exception: Construction fences not greater than 4 feet high.
- (b) Construction fences located within or adjacent to fire lanes must be approved by the Fire Marshal.
- (c) Construction fences located more than 10 feet from guest or cast access routes may be designed to comply with Subsection 904.2(e).
- (d) Construction fences over 4 feet high and not greater than 8 feet high shall be installed to meet the minimum requirements of Figure F-1.
- (e) Construction fences greater than 8 feet high shall be required to be designed and installed to comply with the full wind load requirements of this Code.

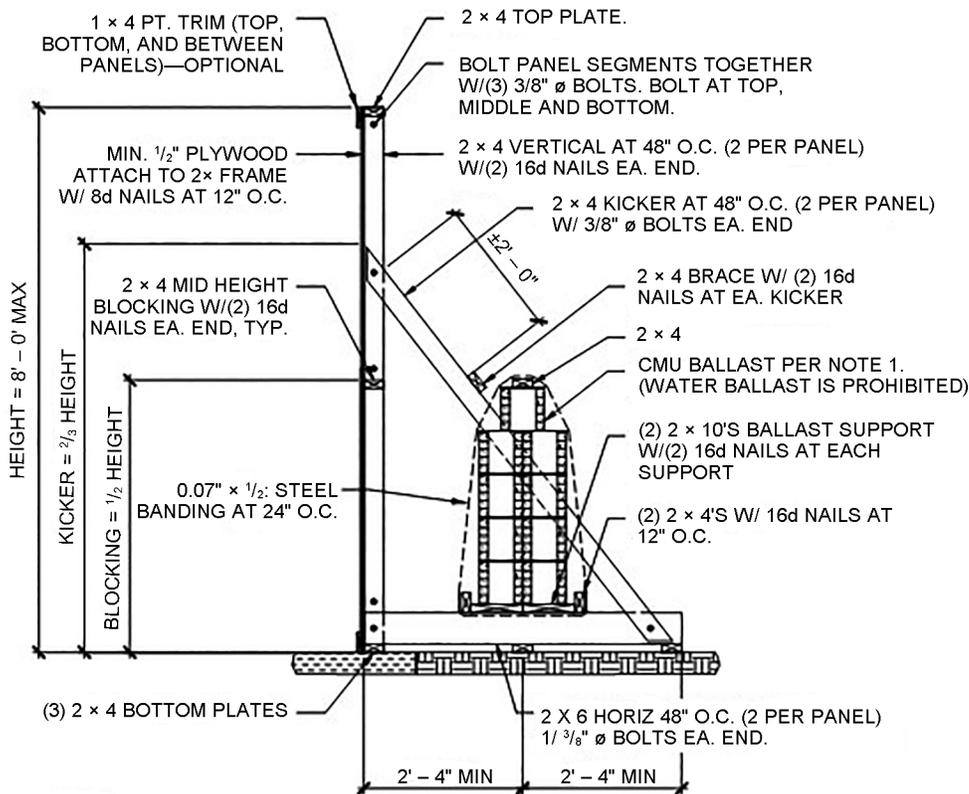
**SECTION F-201
ALLOWABLE USE OF PUBLIC
PROPERTY DURING CONSTRUCTION**

F-201.1 General. The amount of space and conditions under which use of public property is permitted for construction or demolition purposes shall be as set forth in Subsection F-201.2.

F-201.2 Limitations. Street or sidewalk space shall be permitted to be used if approved by the applicable governing authority and provided the following provisions are met:

- (a) A walkway shall be constructed in the outer portion of the permissible occupied street space, conforming to the requirements of Subsection F-201.4.
- (b) Building materials, fences, sheds or any obstruction of any kind shall not be placed so as to obstruct free approach to any fire hydrant, lamp post, manhole, fire alarm box or catch basin, or so as to interfere with the passage of water in the gutter. Protection against damage shall be provided to such utility fixtures during the

TYPICAL CONSTRUCTION BARRIER (4'-0" WIDE PANEL SEGMENTS)



- NOTES:
1. PROVIDE (27) CMU BLOCKS OR 945 LB FOR BARRIERS 6' - 1" TO 8' - 0" TALL
 PROVIDE (18) CMU BLOCKS OR 630 LB FOR BARRIERS 4' - 1" TO 4' - 0" TALL.
 2. ALL $\frac{3}{8}$ " \varnothing BOLTS SHALL BE SAE GRADE 5 FOR BETTER CARRIAGE BOLTS WITH STANDARD WASHERS AND HEX HEAD NUTS. WING NUTS SHALL NOT BE USED.
 3. DESIGN WIND SPEED = 103 MPH (ULTIMATE) / 80 MPH (SERVICE).

FIGURE F-1

progress of the work, but sight of them shall not be obstructed.

- (c) A 10-foot clear roadway shall be maintained through any alley located along the building site.
- (d) Proper precautions shall be made during construction to prevent concrete, mortar washings or any other material from entering a sewer.
- (e) The person or persons to whom a permit is issued for such purposes as stated herein, shall post with the applicable governing authority a bond of such type and amount as may be deemed advisable by the applicable governing authority as protection from any and all liability.

Exception: The provisions in this Subsection may be modified if approved by the applicable governing authority, provided alternative provisions are made to protect the public.

F-201.3 Where covered walkways are required.

F-201.3.1 Erection or demolition. During the erection or demolition of any building exceeding one story in height that is located at a distance less than 10 feet or less than one-quarter of the height of the building from any street or alley property line, or when required by the Building Official, a roof covering for the entire length of the project shall be provided over the temporary or permanent sidewalk, from the time the construction or demolition extends above the second-floor level until materials are no longer being used or handled on the front above such walk.

F-201.3.2 Exterior alterations or repair. Buildings having their exteriors altered or repaired in an extensive manner involving any hazard shall be provided with a covered walk as required for new structures during erection.

Exception: Where, in the opinion of the Building Official, a covered walk is not necessary, a permit may be issued to block off part of the sidewalk and have a temporary walk constructed as provided in Subsection F-201.4.

F-201.4 Construction of walkways, fences and protective coverings.

F-201.4.1 General. When required by the Building Official, before any construction work is commenced, the owner or his agent shall construct a temporary walkway in conformity to this Section.

F-201.4.2 Visual obstruction. All fences, barriers or temporary structures of any kind located on public highways shall be so constructed as not to obstruct vision at the intersection of streets.

F-201.4.3 Width. Walkways shall be not less than 4 feet wide in the clear except that in congested districts the Building Official may require a walkway as wide as, in his opinion, is necessary. Walks shall be built in a safe and substantial manner and be maintained in that condition at all times.

F-201.4.4 Handrail. A smooth handrail of substantial construction, not less than 3 feet high, shall be provided on the traffic or street side of the walkway, and also on the

building side when considered necessary by the Building Official.

F-201.4.5 Separation. Where the distance from building to street or alley property line is less than half the height of the building, a fence of substantially solid construction at least 8 feet high shall be provided on the building side of the walkway.

F-201.4.6 Roof. Roof coverings over walkways, as required by Subsection F-201.3, shall be considered of not less than one layer of 2-inch nominal dimension wood plank spanning not more than 3 feet between supports or equivalent decking. The framework supporting the walkway covering shall be well-braced and designed to support at least 150 pounds per square feet (psf), but the top deck shall be designed to carry not less than 250 psf. The roof covering shall be of width sufficient to cover the entire walkway or sidewalk, and shall be made water tight. Suitable provisions shall be made for adequate lighting of the walk under the covering, at all times. A minimum clearance of 8 feet, 6 inches shall be maintained above walkways.

F-201.5 Walkways over excavated areas. When the area occupied by the sidewalk or temporary walkways is to be excavated, such walk shall be made of boards not less than 2 inches nominal dimension designed to support a load of not less than 150 psf and meet the requirements of the *EPCOT Accessibility Code for Building Construction*. Such walkways shall be provided with a fence and handrails on each side.

F-201.6 Lights required. Every walkway shall be kept well-lighted continuously between sunset and sunrise, and the outer edge of the occupied space of the street or sidewalk shall have placed thereon lights, which shall burn continuously between sunset and sunrise.

**SECTION F-301
FIRE PREVENTION**

F-301.1 Welding. Fire protection measures taken during welding and torch operations shall conform to the requirements of EPCOT Standard 1009-5.

F-301.2 Open fires.

- (a) Disposal of waste materials from building and demolition shall be in accordance with regulations of the governing body. Open fires are prohibited.
- (b) Heaters with enclosed flames shall be used for heating roofing compounds or other material.
- (c) When heaters with enclosed flames are in use, a workman shall be in attendance whose duty is to control the use of such equipment at all times.

F-301.3 Standpipes. In buildings of six or more stories, not less than one standpipe shall be installed for use of the Fire Department during construction of the building. Standpipes shall be installed when the construction has progressed not more than 50 feet above grade. Standpipes shall have Fire Department inlet connections at accessible locations and adjacent to stairways that are usable during construction. Standpipe systems shall be extended as construction pro-

gresses to within one floor of the highest point where secured decking or flooring has been constructed.

F-301.4 Fire-extinguishing systems. In every building operation where a toolhouse, storeroom or shed is used, or where a room or space is used for storage, dressing room or workshop, at least one approved portable extinguisher of a type appropriate for the hazard shall be provided and maintained in an accessible location for every 10,000 square feet of the building area. A suitable fire extinguisher or other means of fire prevention shall be ready for instant use in locations where welding or cutting is done, or where flammable liquids are stored.

F-301.5 Access to fire hydrants. During building operations, unobstructed access from the street to fire hydrants and to outside connections for standpipes, sprinklers or other fire-extinguishing equipment, whether permanent or temporary, shall be provided and maintained at all times. No material or construction equipment shall be placed within 10 feet of such hydrant or connection, nor between it and the center line of the street.

SECTION F-401 STORAGE OF MATERIALS AND EQUIPMENT

F-401.1 Storage on public property.

- (a) Material and equipment used in construction and demolition shall be stored in accordance with the regulations of the Department of Public Works, the State of Florida and this Appendix.
- (b) Material and equipment necessary for work to be done under a permit shall not be placed or stored on public property so as to obstruct free and convenient approach to and use of a fire hydrant, fire or police alarm box, utility box, catch basin, manhole, or to interfere with the free flow of water in a street or alley gutter.
- (c) Mixing, handling and storing of mortar, concrete or other material on public property shall be done in a manner that will not deface public property or create a nuisance.

F-401.2 Storage of combustible materials.

- (a) Storage of combustible material shall not be permitted under or near welding operations. (See Subsection F-301.1.)
- (b) In buildings of concrete construction, forms of combustible material shall be stripped from the concrete and removed from the premises as soon as possible. No part of the building shall be used for storage of combustible material until the concrete forms have been removed.
- (c) Storage of material under or on stairs or in stairways or adjacent to stair openings shall not be permitted.

SECTION F-501 DEMOLITION OPERATIONS

F-501.1 Unobstructed passageways.

- (a) Walkways and passageways shall be provided for the use of workmen, who shall be instructed to use them,

and all such walkways and passageways shall be adequately lighted and free from debris and other materials.

- (b) Protruding nails and fastenings in lumber shall be withdrawn, hammered in or bent over as soon as the lumber is removed from the structure being demolished, or all lumber from demolition operations shall be placed in piles for cleaning or disposal.
- (c) Lumber sizes, as used in this Appendix, shall refer to nominal stock sizes.

F-501.2 Standards of operation.

- (a) All persons engaged in demolition work, or entering the site of a demolition project, shall be required to wear protective headgear meeting the requirements for Type I or II, Class A or B as set forth in *Safety Code for Head, Eye and Respiratory Protection*, ANSI Z2.1.
- (b) Workmen using jackhammers or engaged in work that may cause flying chips or particles likely to damage the eyes shall be furnished with safety goggles, with strength-tested lenses conforming to the requirements for chippers goggles, as set forth in ANSI Z2.1.
- (c) Persons required to work in dusty areas shall be furnished with dust-filter-type respirators as set forth in ANSI Z2.1.
- (d) Blasting operations shall be performed in accordance with the requirements of the *EPCOT Fire Prevention Code*. (See Subsection F-501.10.)

F-501.3 Warning signs and lights.

- (a) Danger signs shall be conspicuously posted around the property being demolished and barricades shall be provided at doorways and thorough-fares giving access to the property. Barricades shall be in place at all times, except during the actual passage of men and equipment.
- (b) During hours of darkness, red or amber lights, or flares, shall be placed on or around all barricades.
- (c) When demolition is not in progress, the contractor shall provide a watchman or watchmen who shall prevent the public from entering the danger zone and who shall maintain danger signs, lights and barricades.

F-501.4 Preparatory measures.

- (a) If a structure to be demolished has been partially wrecked by fire, flood, explosion, wind or other causes, the walls shall be braced or shored in accordance with the requirements of EPCOT Standards 6-4 and 9-7.
- (b) Electric power, gas, water, steam and other services shall be disconnected, capped or otherwise controlled at the building line or curb before demolition work is started. In each case, the utility or service company concerned shall be notified in advance and its cooperation obtained. Utility boxes, police or fire alarm boxes, and fire hydrants shall be protected as required in Subsection F-101.4.
- (c) If the demolition work is to proceed on part of a structure only, while the undemolished part remains in use,

all utility services shall be disconnected from the part to be demolished. Electric power circuits, gas lines or other utility lines shall be inspected to make certain that all services have, in fact, been disconnected. Existing electric circuits, gas lines or other services in a structure or part of a structure to be demolished shall not be used for any purpose during demolition; except that fire control standpipes and hydrants shall be retained in service, free from material or debris, and available for Fire Department use as long as required.

- (d) Glass doors and windows, and other glass, shall be removed before other demolition work is started.
- (e) Floor openings and shafts shall be boarded over or enclosed with substantial guardrails, constructed in accordance with Section 501 and Florida Statute 442.

F-501.5 Ground-level protection.

- (a) Before demolition is started, every sidewalk or public thoroughfare adjacent to the site shall be either closed or barricaded, or protected as specified herein. Thoroughfares open to the public shall be kept clear and unobstructed at all times.
- (b) If the structure to be demolished is more than two stories or 25 feet high, measured from sidewalk or street level, and the horizontal distance from the inside of the sidewalk to the structure is 15 feet or less, a sidewalk shed or canopy shall be constructed over the entire length of the sidewalk adjacent to the structure, wide enough to accommodate pedestrian traffic without causing congestion. Sidewalk sheds and canopies shall be lighted by either natural or artificial means sufficient to ensure safety at all times. Sidewalk sheds shall be constructed in accordance with the following requirements:
 1. A roof or deck shall be constructed consisting of planking not less than 2 inches thick, closely laid and made water tight, and shall be designed to sustain a load of not less than 150 psf. A minimum of 7 feet clearance shall be maintained between the underside of the roof structure and the sidewalk.
 2. If the roof or deck is to be used for the storage of material, the design shall provide for additional load capacity to accommodate safely the planned storage and shall be approved by the Building Official. When used for storage, the outside edge and ends of the deck or roof shall be provided with a substantial enclosure at least 42 inches above the deck of the shed. Such enclosures may be vertical or inclined outward at an angle of approximately 45 degrees and shall consist of boards laid close together, secured to braced uprights or toe boards and galvanized wire netting formed of not less than 16 U.S. gage wire and 1½-inch mesh.
 3. Unless the top deck of the sidewalk shed is built solidly against the face of the structure to be demolished, the vertical face of the supports of the shed next to the building shall be solidly fenced throughout. This shall not prohibit construction and use of solid sliding or swinging

gates as may be necessary for the movement of workmen and materials.

- 4. Except for necessary supports to carry the roof or deck load, the side of the sidewalk shed opposite to or away from the building to be demolished shall be open.
- (c) When the horizontal distance from the inside of the sidewalk to the structure is more than 15 feet and less than 25 feet, a sidewalk shed or canopy may be constructed along the inside edge of the sidewalk or, if permission has been granted to close the sidewalk, a substantial fence shall be constructed along the inside edge of the roadway. Fences for protection of pedestrians shall be constructed at least 8 feet high and shall meet the requirements of Subsection F-201.4. Fences shall be constructed of wood or other suitable material and shall be built solid for the entire height and length, except that openings necessary for movement, or workmen or materials may be provided with solid sliding or swinging gates.
- (d) When the horizontal distance from the inside of the sidewalk to the structure is more than 25 feet, a shed, canopy or fence as described in Paragraphs (b) and (c) may be built or, in place of such shed, canopy or fence, a substantial railing shall be constructed on the inside of the sidewalk or roadway along the entire length of the demolition site and shall be provided with movable bars for access of workmen and movement of materials for the work.
- (e) Where workmen’s entrances are required, they shall be protected by canopies extending from the face of the building to a point not less than 8 feet from it. Such overhead protection shall be at least 2 feet wider than the building entrance or opening, and the canopy shall be at least as strong as the sidewalk shed specified in Paragraph (b).
- (f) Sidewalk shed or fence openings provided for movement of workmen and materials shall be kept closed at all times, except during actual passage of workmen, materials and vehicles.

F-501.6 Removal of materials.

- (a) No material shall be dropped at any point lying outside the exterior walls of the building, except through fully enclosed chutes leading to an exterior container.
- (b) Chutes shall be provided for removal of material through floor openings, shafts or interior courts when the vertical drop exceeds 20 feet.
- (c) Material chutes that are at an angle of more than 45 degrees from the horizontal shall be enclosed on all sides, except for openings at or about floor level for receiving materials.
- (d) Material chutes at an angle of less than 45 degrees from the horizontal may be left open on the upper side.
- (e) No part of a chute shall be at an angle greater than 85 degrees from the horizontal for a length of more than 20 feet, unless substantial stops or baffles are installed

to prevent descending materials from attaining dangerous speeds.

- (f) Openings in enclosed chutes for receiving materials shall be not more than 48 inches high, measured along the wall of the chute. In all stories below the top, such openings shall be located and constructed in a manner to prevent material from being deflected out of the opening when passing from above. All openings below the top shall be provided with a substantial cover or door, which shall be kept closed when the opening is not in use.
- (g) Every enclosed chute shall be equipped with a substantial gate at or near the discharge end, and a workman shall be assigned to control the gate and the positioning and loading of trucks. The designated workman shall prevent anyone from passing under or near the discharge end of the chute.
- (h) Openings into chutes, or holes in floors through which debris is dumped, shall be protected by a substantial guardrail not less than 42 inches high.
- (i) Intermediate floor openings for passage of material shall be enclosed with barricades or a substantial guardrail shall be provided. The guardrail shall be not less than 42 inches high and shall be located not less than 6 feet from the opening. Barricades or guardrails shall not be removed until the story immediately above has been demolished down to the floor line and all debris cleared from that floor.
- (j) When cutting a hole in a floor for passage of material makes the floor unsafe, the floor shall be shored as required in EPCOT Standards 6-4 and 9-7.

F-501.7 Stairs and passageways.

- (a) Except for stairs, passageways and ladders for the use of workmen, access to the building being demolished shall be enclosed at all times.
- (b) Existing stairs and handrails shall be kept in place and in usable condition as long as practicable, and steps and landings shall be kept free of debris.

F-501.8 Hand-wrecking.

- (a) Hand-wrecking is defined for the purpose of this Appendix as a demolition procedure wherein workmen accomplish the demolition by the use of hand-held tools, such as hammers, pry bars, jackhammers, saws, welding and cutting equipment, wrenches and similar tools. In a hand-wrecking operation, heavy equipment, such as cranes, winches, tractors and trucks, shall be used solely to lower heavy components safely and to haul debris from the site.
- (b) Hand-wrecking procedures shall be used under the following conditions:
 - 1. When demolishing part of a building, the remainder of which is to continue in service, with or without modification.
 - 2. When a building to be demolished is in such close proximity to other structures, public thor-

oughfares or other occupied areas that other demolition procedures cannot be followed safely.

- 3. When the building to be demolished is of such height that other procedures would be impractical or unsafe.
- (c) Masonry wall sections or other masonry building components shall not be permitted to fall on the floors of the building in such masses as to exceed the safe carrying capacity of the floors.
- (d) No section of wall, the height of which is more than 22 times its thickness, shall be permitted to stand without lateral bracing, unless the wall is in good condition and was originally designed to stand to a greater height without lateral support.
- (e) Workmen shall not be permitted to work on top of a wall when weather conditions constitute a hazard.
- (f) Structural members or load-supporting members on any floor shall not be cut or removed until all stories above that floor have been demolished and removed.
- (g) Before demolishing interior or exterior walls within 10 feet of an opening in the floor immediately below, such opening shall be boarded over, unless all workmen are removed from the floors below the access to such floors is prevented.
- (h) In buildings of skeleton construction, the steel framing may be left in place during the demolition of masonry work. Where this is completed, steel beams, girders and other structural members shall be cleared of loose material as the masonry demolition work progresses downward.
- (i) At the completion of each day's work, walls of the building being demolished shall be left in stable condition and in no danger of being overturned.
- (j) During the demolition of exterior walls of a structure originally more than 50 feet high, the Building Official may require the construction of catch platforms along the exterior faces of such walls where necessary, to prevent injury to the public and men working below.
- (k) Such catch platforms shall be constructed and maintained not more than three stories below the story from which the exterior walls are being removed. When the demolition has progressed to within three stories of ground level, catch platforms will not be required. Design of catch platforms shall be as follows:
 - 1. Catch platforms shall consist of outriggers and planks not less than 5 feet wide, measured in a horizontal direction from the face of the structure. Planks shall be laid tight together without openings between them and the wall.
 - 2. Catch platforms may be constructed of material other than wood when the material does not lessen the security against falling material.
 - 3. Catch platforms shall be capable of sustaining a live load of not less than 125 psf.

4. Catch platforms shall be inclined so that the outer edge is at least 6 inches higher than the inner edge.
 5. Supports shall consist of outriggers of strength to support the planks and falling material, and shall be secured against turning and spaced not more than 10 feet apart.
 6. Each outrigger shall be supported against the building and in window openings, and shall be tied to the building. Planks supported by the outrigger shall be not less than 2 inches thick and the ends shall overlap each other for a distance of at least 1 foot over the supports. All planks shall be secured against displacement.
 7. The outer edge of each catch platform shall be provided with a substantial enclosure, constructed at an angle of approximately 45 degrees with the horizontal and having its outer edge not less than 48 inches from the platform, measured along the slope of the enclosure.
 8. The enclosure shall consist of galvanized wire mesh made of not less than 16 U.S. gage wire and 1½-inch mesh. The enclosure shall be secured to supports placed not more than 10 feet apart.
 9. There shall be no openings between the platform and the enclosure.
 10. Supports for the enclosure shall be not less than 2 inches by 6 inches in section, with the greater dimension at right angles to the enclosures.
- (l) Materials shall not be dumped on catch platforms, nor shall such platforms be used for the storage of materials.
 - (m) When workmen are engaged in removing floors consisting of masonry filling between floor beams or girders, planks not less than 2 inches by 10 inches wide shall be provided and used by workmen breaking down the masonry. The planks shall be placed and fastened to give the workmen firm support, should the masonry collapse unexpectedly.
 - (n) Demolition of a floor shall not be started until the floor surrounding the work area shall have been cleared of debris and unnecessary material for a distance of 20 feet.
 - (o) Workmen shall not be permitted to work in an area directly under a floor being demolished and such area shall be barricaded to prevent access.
 - (p) Walkways not less than 30 inches wide, formed of planks not less than 2 inches by 10 inches, shall be provided and shall be used by the workmen whenever necessary to enable the workmen to reach a work location without walking on exposed beams.
 - (q) Storage of waste material or debris on any floor or roof of the building or structure being demolished shall not be permitted to such an extent that the floor load specified in Section 902 is exceeded.
 - (r) Space for storage of waste material or debris may be created by removing flooring and floor beams to an elevation of 25 feet above ground level, when such removal does not endanger the stability of the structure.
 - (s) Dumping material from upper floors into the storage space shall be discontinued during periods when workmen are in the storage space.
 - (t) Walls shall not be subjected to lateral pressure from stored material or lateral impact from falling material.
 - (u) The storage space into which material is dumped shall be blocked off, except for openings necessary for removal of material and such openings shall be closed at all times when material is not being removed.
 - (v) Beams shall not be cut until precautions have been taken to prevent a loose beam from swinging freely and striking a workman, a piece of equipment or any part of the structure being demolished.
 - (w) All structural steel shall be lowered from the building by cable and shall not be permitted to drop.
- F-501.9 Cable and ball wrecking.** Where desired to demolish a building by cable and ball, whether applied to a single wall or to an entire building, the following conditions shall be met:
- (a) Cable and ball wrecking will be permitted in cases where the building is located a distance from a public thoroughfare and the adjoining property at least equal to 1½ times the height of the building.
 - (b) A public thoroughfare may be closed and barricaded to prevent entry of pedestrians or vehicles during demolition operations, provided that the separation from adjoining property specified in Paragraph (a) is maintained, and that a permit is secured to close the street.
 - (c) When a building to be demolished is too high to meet the requirements of Paragraphs (a) and (b), hand-wrecking procedures may be used to reduce the building height to meet these requirements. Such hand-wrecking operations shall be terminated and the partly demolished building shall be vacated before cable and ball wrecking operations are started.
- F-501.10 Use of explosives.** Explosives shall not be used in the demolition of a building without written approval of the Building Official, and when used, shall conform to the requirements of the *EPCOT Fire Prevention Code*.

APPENDIX G

REGULATIONS FOR CONSTRUCTION OF STAGES, ENCLOSED PLATFORMS, MOTION PICTURE PROJECTION ROOMS AND OPEN-AIR EVENT OR PERFORMANCE PLATFORMS

SECTION G-101 ADMINISTRATIVE

G-101.1 Scope.

- (a) Part 1 of this Appendix shall apply to the construction, alteration, repair and maintenance of stages and enclosed platforms in legitimate theaters hereafter erected.
- (b) Part 2 of this Appendix shall apply to the construction, alteration, repair and maintenance of motion picture projection rooms and open-air event or performance platforms hereafter erected or installed.

G-101.2 Criteria. The requirements of this Appendix shall supplement, but shall not supersede, the requirements of this Code. Where there is a conflict between the provisions of this Code and Appendix, the requirements of this Code shall apply.

G-101.3 Design. The design of theaters, theater stages, enclosed platforms and motion picture projection rooms shall comply with Chapter 9.

G-101.4 Construction and materials. The type of construction and materials of construction shall conform to the requirements of Chapters 6 and 10.

G-101.5 Exits. Theater exits, stage exits and exits from motion picture projection rooms shall be as specified in Chapter 8.

G-101.6 Fire protection. Fire protection of structural members shall be as specified in Chapter 6 and EPCOT Standard 6-1.

PART 1— REGULATIONS FOR CONSTRUCTION OF STAGES, ENCLOSED PLATFORMS AND PROSCENIUM CURTAINS

SECTION G-201 DESIGN, CONSTRUCTION AND FIRE PROTECTION OF STAGES

G-201.1 Stage floors. All parts of stage floors shall be of Type I construction, except the part of the stage extending from the proscenium opening to the back wall of the stage and 6 feet beyond the full width of the proscenium opening on each side, which may be constructed of steel or heavy timber covered with a wood floor of not less than 2-inch nominal thickness. No part of the combustible construction, except the floor finish, shall be carried through the proscenium opening. Openings through stage floors shall be equipped with tight-fitting doors of wood of not less than 2-inch nominal thickness.

G-201.2 Proscenium walls.

- (a) A stage (as defined in Chapter 2) shall be separated from the auditorium by a proscenium wall of not less than 2-hour fire-resistive construction. The proscenium wall shall extend not less than 5 feet above the roof over the proscenium opening. In addition to the main proscenium openings, proscenium walls may have one opening at the stage-floor level and one from the basement into the orchestra pit, either of which shall be not more than 25 square feet in area. All openings in the proscenium wall of a stage, other than the proscenium opening, shall be protected by an automatic-closing fire assembly having a 1½-hour fire-resistive rating. (See Subsection 715.4 for requirements for automatic fire-extinguishing systems.)
- (b) The proscenium opening, which shall be the main opening for viewing performances, shall be provided with an automatic-closing fire-resistive curtain as specified in Section G-301.

G-201.3 Gridirons, fly galleries and pinrail.

- (a) Gridirons and fly galleries shall be designed to support not less than 75 pounds per square foot (psf). Each loft block well shall be designed to support 250 pounds per lineal foot and the head block well shall be designed to support the aggregate weight of all the loft block wells served. The head block well shall be provided with an adequate strongback or lateral brace to offset torque. The main counterweight sheave beam shall be designed to support a horizontal and vertical uniformly distributed live load sufficient to accommodate the weight imposed by the total number of loft blocks in the gridiron. The sheave blocks shall be designed to accommodate the maximum load for the loft blocks or head blocks served, with a safety factor of five.
- (b) Gridirons, fly galleries and pinrails shall be constructed of noncombustible materials. Fire protection of steel and iron may be omitted. Gridirons and fly galleries shall be designed in accordance with Chapter 9 and shall be fire protected as required in EPCOT Standard 6-1.

G-201.4 Stage ventilators.

- (a) There shall be one or more ventilators constructed of metal or other noncombustible material near the center and above the highest part of a working stage. Such ventilation shall be installed in the stage roof and shall have a total ventilation area equal to at least 5 percent of the floor area within the working stage area. The entire equipment shall conform to the requirements specified in the *EPCOT Mechanical Code*.

**APPENDIX G—REGULATIONS FOR CONSTRUCTION OF STAGES, ENCLOSED PLATFORMS,
MOTION PICTURE PROJECTION ROOMS AND OPEN-AIR EVENT OR PERFORMANCE PLATFORMS**

- (b) Ventilators shall open by force of gravity or by spring action sufficient to overcome the effects of neglect, rust, dirt, frost, snow, or expansion by heat or warping of the framework.
- (c) Stage ventilators shall not be connected with ventilating or air-conditioning systems serving other parts of the building.
- (d) Glass used in ventilators shall be protected against falling on the stage. A wire screen used under the glass shall be so placed that, if clogged, it cannot reduce the required ventilating area or interfere with the operating mechanism or obstruct the distribution of water from the automatic fire-extinguishing system.
- (e) Ventilators, penthouses and supporting framework shall be designed in accordance with Chapter 9. Curbs on which the ventilator rests shall be constructed of noncombustible materials as required for the roof.
- (f) Each ventilator shall be arranged to open automatically after the outbreak of fire by the use of an approved automatic-closing device as defined in Chapter 7. The fusible link and operating cable shall hold each damper closed against a minimum 30-pound counterforce exerted on each damper through its entire arc of travel and for a minimum of 115°F. A manual control shall be provided.
- (g) Springs, when employed to activate ventilator dampers, shall be capable of maintaining full required tension indefinitely. Springs shall not be stressed more than 50 percent of their rated capacity and shall not be located directly in the airstream, nor exposed to the elements.
- (h) A fusible link shall be placed in the cable control system on the underside of the ventilator at or above the roof line, or as approved by the Building Official, and shall be located so as not to be affected by the operation of fire-extinguishing systems.
- (i) Remote, manual or electrical control shall provide for both opening and closing of the ventilator doors for periodic testing and shall be located at a point on the stage designated by the Building Official. When remote control of the stage ventilator is electrical, power failure shall not prevent operation of the ventilator when a fire starts.

G-201.5 Stage switchboard. A hood shall be provided over the full length of the stage switchboard to protect electrical equipment from water from the fire-extinguishing system.

G-201.6 Flame-retardant scenery and other materials. No combustible scenery, drops, props, decorations or other combustible materials shall be placed on any stage or enclosed platform unless they are treated with an effective fire-retardant solution and maintained in fire-retardant condition as approved by the Fire Department.

G-201.7 Gas service. Every gas service to the stage section of a building housing a Group A occupancy shall be operated from every other service to the building. Each building shall be provided with an approved, adequately marked gas shutoff

valve at a convenient and conspicuous location outside the building.

**SECTION G-301
PROSCENIUM CURTAINS**

G-301.1 General requirements. A proscenium fire safety curtain shall be constructed and installed as specified in this Section. Proscenium fire safety curtains, when required, shall be made of approved materials constructed and mounted so as to intercept hot gases, flames and smoke, and to prevent a glow from a severe fire on the stage from showing on the auditorium side within a period of 30 minutes. The closing of the curtain from the full open position shall be effected in less than 30 seconds, but the last 8 feet of travel shall require not less than 5 seconds.

G-301.2 Definitions.

- (a) **Braille proscenium fire safety curtain.** A curtain that folds up and stores in a very limited space above the proscenium opening.
- (b) **Frame proscenium fire safety curtain.** A curtain with a rigid frame that stores over the proscenium opening in one flat panel.
- (c) **Modified frame proscenium fire safety curtain.** A curtain made up of various components of the frame and straight-lift-style curtains that stores over the proscenium opening in one flat panel.
- (d) **Straight lift proscenium fire safety curtain.** A curtain that stores over the proscenium opening in one flat panel.

**SECTION G-302
CURTAIN MATERIALS**

G-302.1 Curtain materials. Curtain fabric shall be made of approved material or an approved water curtain complying with NFPA 13. Curtain material shall be listed or supporting data submitted to the Building Official for approval.

G-302.2 Activation. The curtain shall be activated by a rate-of-rise heat detection installed in accordance with NFPA 72, and by an auxiliary manual control.

G-302.3 Fire endurance test. A sample fabric curtain with a minimum of two vertical seams shall be subjected to the ASTM E119 procedure applicable to nonbearing walls and partitions for 30 minutes. The curtain shall overlap the furnace edges an appropriate amount to seal the top and sides, and have a bottom pocket weighted with a minimum of 4 pounds per linear foot. The unexposed surface of the curtain shall not glow, and flame or smoke shall not penetrate the curtain (only vapors escaping due to elevating temperatures meeting the requirements in Subsection G-303.5 are allowable). Unexposed surface temperature and hose stream test requirements are not applicable to this Section. Sample curtains of other materials shall be subjected to the same requirements as fabric curtains.

G-302.4 Smoke density test. When subjected to the ASTM E84 procedure, a curtain fabric or other material tested in the condition it is to be used (coated or noncoated, painted or unpainted), shall have a maximum smoke density of 25.

SECTION G-303 DESIGN AND CONSTRUCTION

The various style curtains detailed in this Section shall be acceptable for use in all installations, except those in new facilities where the proscenium opening exceeds 50 feet wide or 30 feet high. Only frame or modified frame-style curtains shall be used for these installations.

G-303.1 Basic construction. The curtain shall consist of continuous vertical fabric panels joined using minimum 1-inch wide overlap seams. These and all other functionally stitched areas on the curtain shall contain two rows of lock-stitch stitching, using thread conforming to the requirements of Section G-302.

G-303.2 Curtain size. The curtain shall overlap the opening a minimum of 18 inches on each side and 24 inches at the top.

G-303.3 Pipe battens/vertical side edge hems. All curtains except those without batten pockets and/or vertical side edge hems, shall have a minimum 6-inch-flat single-thick pockets and triple-thick side edge hems a minimum $\frac{1}{2}$ inch wider than guide brackets or metal hem reinforcement pieces, but not less than 4 inches wide. Should the fabric being used be an acceptable (nonwire-reinforced) fabric, or an acceptable wire-reinforced fabric weighing less than $2\frac{3}{8}$ pounds per square yard in accordance with Subsections G-303.2 through G-303.5; batten pockets shall be double thick. Pockets and vertical side edge hems shall be sewn as required by this Section. Minimum $1\frac{1}{2}$ -inch inside diameter metal battens shall be placed in the top and bottom curtain pockets where the proscenium opening's height is 18 feet or less and width is 34 feet or less; minimum 2-inch inside diameter metal battens shall be used for openings more than 34 feet and 50 feet or less wide, or more than 18 feet and 30 feet or less high. Metal battens shall be Schedule 40 or 80 steel pipe, or other metallic tubing meeting the physical specifications of Schedule 40 steel pipe. All batten joints shall be reinforced with minimum 18-inch sections of said pipes or tubing internally, and riveted.

G-303.4 A minimum 3-inch-thick yield pad made with an outer covering of the curtain fabric and filled with fiberglass or other noncombustible materials shall be sewn beneath the bottom batten pocket with two rows of stitching on each side of the pocket, to force the bottom batten to compress the yield pad against the stage floor when the curtain is in its deployed position.

G-303.5 Curtain styles.

(a) **Straight-lift style.** The straight-lift-style curtain shall comply with Paragraphs 1 through 4 and the requirements of this Section.

1. **Side edge hem metal reinforcements.** Side edge hems shall be reinforced for their full height with 0.064-inch-thick (16 ga) plated or painted sheet metal $5\frac{1}{2}$ inches wide on both sides of both

vertical hems, or with plated or painted minimum 2-inch by $1\frac{1}{2}$ -inch by $\frac{1}{8}$ -inch-thick steel angle with 2-inch by $\frac{1}{8}$ -inch flat steel clamped on both edges for their full height. Either system shall be fastened to the hems with pairs of minimum $\frac{3}{16}$ -inch-plated tubular or solid steel rivets, or bolts on 6-inch vertical centers.

2. **Roller guides.** Curtains for proscenium openings 50 feet or less wide and 30 feet or less high, not meeting the requirements of Paragraph 3, shall use a roller guide/metal track side edge guide system, using guides on maximum 18-inch vertical centers with roller or ball bearing steel wheels, and minimum 0.064-inch-thick (16 ga) plated steel tracks installed rigidly in place so that roller guides will operate smoothly with a lateral load of 2 psf over entire area of curtain. Each guide shall be attached to the curtains metal stiffened edges by way of three or more minimum $\frac{3}{16}$ -inch-plated tubular or solid steel rivets, or bolts or a single minimum $\frac{3}{8}$ -inch-plated machine screw assembly. An equivalent attachment system shall be permitted to be used.

3. **Spool guides.** Curtains for proscenium openings 50 feet or less wide and 22 feet or less high shall use bronze alloy, oil-impregnated wood or other spool-type wire guides on maximum 18-inch vertical centers on metal stiffened edges, in a guide wire side edge system where the guide wires are galvanized minimum $\frac{1}{4}$ -inch diameter 7-by-19 aircraft cable or flexible independent wire rope core wire rope installed securely using minimum $\frac{3}{8}$ -inch-locked turnbuckles, thimbles and three forged wire rope clips or one swaged fitting at each end of each guide wire; or the roller guide system in Paragraph 2.

Exception: Curtains for proscenium openings less than 50 feet wide and less than 18 feet high shall not require metal stiffened edges if a spool-type guide wire side edge system is used.

4. **Upper smoke seal.** An approximate 3-inch-diameter upper smoke seal made of the curtain fabric and filled with fiberglass or other noncombustible materials shall be installed to make as smoke tight a seal as practical when the curtain is in its deployed position.

(b) **Braille style.** The braille-style curtain shall comply with Paragraphs (a)1 through (a)4, except as follows:

1. Curtain shall have minimum 5 percent fullness in the height.
2. Side edge guide system shall be as specified in Paragraph (a)3 without either edge reinforcing/stiffening system.
3. Lift lines as specified in Subsection G-304.3 shall operate through plated steel D-rings on a path reinforced with a layer of the curtain's fabric

**APPENDIX G—REGULATIONS FOR CONSTRUCTION OF STAGES, ENCLOSED PLATFORMS,
MOTION PICTURE PROJECTION ROOMS AND OPEN-AIR EVENT OR PERFORMANCE PLATFORMS**

with raw edges turned under or equivalent webbing.

4. Galvanized minimum $\frac{1}{4}$ -inch-diameter 7-by-19 aircraft cable or flexible independent wire rope core wire rope, sized using a minimum 8-to-1 safety factor, shall be used for the drive line, which connects the winch to the cable clew.
 5. Instead of the smoke seal required in Paragraph (a)4, an attached fill piece smoke seal made of the curtain fabric shall span the gap between the curtain and the proscenium wall.
- (c) **Frame style.** The frame-style curtain shall consist of a rigid steel or metallic alloy frame, with a frame thickness not less than $\frac{1}{120}$ of the width, and $\frac{1}{96}$ of the height of the proscenium opening, but in no case less than 4 inches thick, complete with interior steel or metallic alloy members, and a single-thick fabric panel battened to the audience (downstage) side of the frame. The assembly shall operate properly when subjected to a lateral load of 2 psf over the entire area of the curtain. Cable, block sizes and all operating equipment shall be sized to accommodate the assembly's size and weight with a minimum 8-to-1 safety factor.

1. The side edge guide system shall consist of vertical steel flat edges parallel to the face of the curtain with bronze bushings on both surfaces, traveling in grooves in the vertical steel smoke pockets on both sides of the proscenium opening or a steel wheel roller or ball bearing roller guide system sufficiently strong to properly handle the requirements of the system.
2. A separate square or semicircular yield pad made of the curtain fabric and filled with fiberglass or other noncombustible materials, approximately as thick as the depth of the frame, shall be attached beneath the frame and create a seal when curtain is in its deployed position.
3. An appropriate diameter upper smoke seal, as described in Paragraph (a)4, shall be installed to create as smoke tight a seal as practical when the curtain is in its deployed position.
4. The modified-frame-style curtain shall be any variation or combination of the frame and straight-lift-style curtains yielding as assembly that will operate properly when subjected to a lateral load of 2 psf over the entire area of the curtain. Cable, blocks and operating equipment shall be sized to accommodate the assembly's size and weight with a minimum 8-to-1 safety factor.

**SECTION G-304
OPERATING EQUIPMENT**

G-304.1 Smoke pockets. The curtain's vertical edges and guide system shall be contained in smoke pockets fabricated of minimum $\frac{1}{4}$ -inch-thick painted structural steel shapes and plates, using minimum $\frac{3}{8}$ -inch-diameter Grade 5 bolts on maximum 4-foot centers to attach plates to the steel shapes for

the entire height of the pockets, or to attach plates at the bottom of both smoke pockets for a minimum of 6 feet for all nonrigid edge curtains, and a minimum of 4-feet more than the opening's height for frame and other rigid edge style curtains. These smoke pockets shall extend vertically a minimum of 1 foot above the top of the raised curtain and be securely fastened to the side of the proscenium walkway from the audience with minimum $\frac{1}{2}$ -inch-diameter Grade 5 anchors or bolts in concrete on maximum 4-foot centers or minimum $\frac{3}{8}$ -inch-diameter Grade 5 anchors or bolts in concrete on maximum 2-foot centers. An anchoring system equivalent in strength on concrete or other surfaces shall be permitted to be used. These smoke pockets may vary in depth and width, depending on the style of curtain and the distance the smoke pockets are set back from the vertical edges. Straight-lift curtains shall have minimum 6-inch-deep pockets, braille curtains shall have minimum 8-inch-deep pockets, and frame and modified-frame curtains shall have pockets a minimum of 4 inches deeper than the thickest batten or frame member. The pockets shall be a minimum of 11 inches wide, set back a minimum of 6 inches away from center stage at the proscenium arch and contain at least 3 inches of the curtain's vertical edges.

G-304.2 Side edge guide system. The curtain's side edge guide system shall comply with Section G-303.

G-304.3 Lift lines.

- (a) Straight-lift and braille curtains for proscenium openings 50 feet or less wide and 30 feet or less high, shall have galvanized minimum $\frac{1}{4}$ -inch-diameter 7-by-19 aircraft cable or flexible independent wire rope core wire rope lift lines on maximum 10-foot centers with a maximum 3 feet between the outside lift lines and the curtain's side edges; curtains for openings exceeding 50 feet wide or 30 feet high shall use the same type lift lines sized to provide at least an 8-to-1 safety factor.
- (b) Frame and modified-frame curtains may require larger diameter lift lines to meet the requirements in Subsection G-303.5(c). Galvanized 7-by-19 aircraft cable or flexible independent wire rope core wire rope shall be used.

G-304.4 Winch lifting devices. Straight-lift-style curtains for openings 42 feet or less wide and 22 feet or less high, and all braille-style curtains, shall be permitted to operate using properly sized manual or electric winches with adjustable hydraulic speed governing circuitry. Models with handles shall have removable handles, with appropriate signs in English and other languages prevalent in the area, stating: DANGER! REMOVE HANDLE AFTER USE!

G-304.5 Lift line hardware. Curtain lift lines, shall pass through block sheaves in or under the gridiron, steel trusses or beams to the counterweight guides or winch clew and fasten to the appropriate batten or frame member using appropriate plated or painted steel or equivalent material clamps, deburred, with corners rounded. Clamps shall be attached using appropriately sized minimum $\frac{3}{8}$ -inch-diameter Grade 5 bolts, with each lift line attached using a thimble and one swaged fitting or three forged wire rope clips. Equivalent attachment methods that do not use clove hitches or leave exposed fabric cut edges shall be acceptable. Connections to

counterweight guides and winch drive line clews, shall be made using a thimble and one swaged-type fitting or three forged wire rope clips at each cable. Turnbuckles, when used, may be $\frac{1}{8}$ inch larger in diameter than the cable being used.

G-304.6 Stay chains. Straight lift and braille curtains for proscenium openings 50 feet or less wide and 30 feet or less high shall have safety stay chains of straight welded link minimum $\frac{1}{4}$ -inch-proof coil chain fastened securely to the curtain's top batten. Other curtains shall have the same safety stay chains sized to be sufficiently strong to safely support the curtain. There shall be one more chain than the number of lift lines, except for the chains at the ends of the curtain, and they shall be centered between the lift lines. One end of each chain shall be securely attached to the curtain's highest steel batten or frame member with the other fastened securely to steel brackets or other steel above the curtain in a manner that will safely support the curtain assembly. Chains shall be adjusted to support the curtain in its deployed position, and shall be permitted to be the method of holding a braille curtain's top batten in its stationary position. Except for wire rope clamps, swaged fittings and thimbles, attachments shall meet the requirements in Subsection G-304.5.

G-304.7 Head and loft blocks. Precision ball or tapered roller bearing blocks with grooves machined to cradle and protect the cables shall be supported on the proscenium wall by appropriate steel brackets, structural steel beams, trusses or other steel that may be added. Loft blocks using $\frac{1}{4}$ -inch-diameter cable shall be minimum 8-inch diameter for proscenium openings 20 feet high or less and minimum 12-inch diameter for all others. Larger cable sizes shall require loft blocks with diameters a minimum of 38 times the cable diameter. Head blocks shall be at least 4 inches larger in diameter than the loft blocks. Blocks shall be installed so as to prevent cable fouling and have appropriate capacities.

G-304.8 Controls. The mechanism and devices for operating the curtain shall be of simple design and positive in operation. Nonautomatic operation of curtains installed on proscenium openings of 1,500 square feet or less, may be by manual means, as long as operation can be accomplished with relative ease by a single person. Nonautomatic-operation curtains shall be by electric devices.

G-304.9 Emergency release.

- (a) **Automatic.** Automatic emergency curtain deployment shall be by gravity. A minimum $\frac{3}{8}$ -inch-diameter manila rope, or minimum $\frac{3}{32}$ -inch-diameter 7-by-19 galvanized aircraft cable emergency control line shall extend up both sides and above the proscenium opening. It shall contain a minimum of four maximum 165°F, nonelectric fusible links, one on each side of the opening and two overhead. When any link in the series separates, the curtain shall automatically properly deploy. The fire curtain's automatic emergency release system shall not be connected with the building's fire alarm system; it shall also not be connected to the emergency ventilator release system, unless a time delay ensures the fire curtain will fully deploy before the vents open.

- (b) **Manual.** A pull pin or equivalent manual activation assembly shall be located on both sides of the proscenium opening. Manual emergency curtain deployment shall be accomplished by the activation of either assembly, both of which are incorporated into the emergency control line, and attached to the counterweight arbor or wench by a mechanical quick-release mechanism, unless the emergency control line rigging is accomplished in a manner that does not require this quick-release assembly. Knife, axe and other emergency-release line cutting systems, and ball/fly away knot quick-release systems, shall only be permitted in existing installations until a new fire curtain is installed. The emergency control line shall be constructed such that the curtain can be easily reset to its ready position within a few minutes in the case of an erroneous activation, manually or automatically.

G-304.10 Signs. Appropriate signs in English and other languages prevalent to the facility's area shall be prominently displayed at the locations of the emergency control line's emergency manual activation assemblies. For pull pin assemblies with rings attached, the signs shall read: IN CASE OF FIRE, PULL RING FOR EMERGENCY LOWERING OF FIRE CURTAIN! There shall also be a less prominent sign or instruction pamphlet in English located on the main control side of the opening, detailing the procedure required to properly and quickly reset the fire curtain to its ready position.

G-304.11 Electric operation. Electric operation shall be from a single station located on either side of the proscenium opening, and shall consist of two "Hold-To-Operate-Style" push buttons, one labeled "Up" and one labeled "Down." Alternately, three push buttons that function from a single push of a button shall be used; one button labeled "UP," and one labeled "DOWN," and one labeled "STOP." A sign stating: NONEMERGENCY FIRE CURTAIN OPERATION shall be adjacent to the push button station.

G-304.12 Manual operation. Curtains with endless operation handlines shall consist of $\frac{3}{4}$ -inch manila rope securely fastened to both the top and bottom of the counterweight arbor or spliced to itself in certain applications, and pass under a minimum 12-inch-diameter floor block, which is adjustable for tension.

G-304.13 Counterweights. The top and bottom counterweight sections of the arbor shall be of steel, sufficiently heavy to safely accommodate the loads. The top and bottom sections shall be connected with rods not less than $\frac{3}{4}$ inch in diameter, with one tie plate for every 4 feet of rod. Counterweights may be cast iron or flame cut steel, with edges deburred. There shall be smooth grooves on the ends of the weights, which engage the steel rods. The arbor top and bottom shall be provided with bronze or other nonflammable guides.

G-304.14 Counterweight guides. Counterweight guide tracks shall be structural tees or angles properly tied together and securely anchored to a wall. All joints where the counterweight travels shall be ground smooth. These guide tracks shall be caged their entire length.

G-304.15 Adjustable curtain closure speed system. Curtains shall have an approved adjustable checking device or system, whether it be a counterweight arrangement, a hydraulic speed governing system, a hydraulic dash pot shock absorbing unit, or another equivalent device or system, enabling the installation to meet the automatic-closing requirements in Subsection G-301.1.

SECTION G-305 NEW DESIGNS

G-305.1 Curtain materials. Curtain materials shall meet the requirements of Subsections G-302.1 through G-302.4. Curtains made of materials other than fabrics shall not be required to be listed by an approved agency.

G-305.2 Curtain styles. Curtain styles that are combinations of, or modifications of, other styles specified in this Appendix shall be acceptable if the design meets the criteria of the modified-frame-style curtain. Other designs shall be acceptable if approved by the Building Official.

G-305.3 Water deluge systems. Water curtains or deluge systems with or without automatic-closing flame-resistant curtains shall not be permitted.

SECTION G-401 ENCLOSED PLATFORMS

G-401.1 Fire resistance. Walls and ceilings of an enclosed platform in an assembly room shall be of not less than 1-hour fire-resistive construction when more than 400 square feet in area.

G-401.2 Occupancy separation. In buildings having an enclosed platform, the dressing room section, workshops and storerooms shall be separated from each other and from other parts of the building by not less than a 1-hour fire-resistive occupancy separation as defined in Section 502, except that a chair-storage area under the platform and having headroom of not more than 4 feet need not be so separated.

G-401.3 Ventilation. Enclosed platforms shall be provided with one or more ventilators conforming to the requirements of EPCOT Standard 7-9 and Subsection 503.7, except that the total area shall be equal to not less than 5 percent of the area of the platform. When more than one ventilator is provided, they shall be spaced so as to provide satisfactory exhaust ventilation. Ventilators shall not be required for enclosed platforms having a floor area of 500 square feet or less.

PART 2— MOTION PICTURE PROJECTION ROOMS

SECTION G-501 GENERAL REQUIREMENTS

G-501.1 Scope. The provisions of this Subsection shall apply where 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.

G-501.2 Projection room required. Each motion picture machine projecting film within the scope of this Subsection shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, may be within the projection room or in an adjacent room of equivalent construction. There shall be posted on the outside of every projection room door and in the projection room a conspicuous sign with 1-inch block letters stating: SAFETY FILM ONLY PERMITTED IN THIS ROOM.

SECTION G-601 CONSTRUCTION REQUIREMENTS

G-601.1 Construction. Every projection room shall be of permanent construction of the same type as the 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 for a single machine, and at least 40 square feet for each additional machine. Each motion picture projector, floorlight, spotlight or similar piece of equipment shall have a clear working space not less than 30 inches by 30 inches on each side and at the rear thereof, but only one such space shall be required between two adjacent projectors. The projection room and rooms appurtenant thereto shall have a ceiling height of not less than 7 feet, 6 inches.

G-601.2 Projection ports and openings. The aggregate area 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 closed with glass or other approved material.

G-601.3 Ventilation. Ventilation shall be provided in motion picture projection rooms in accordance with the following requirements:

- (a) **Supply air.** Every projection room shall be provided with two or more separate fresh air inlet ducts with screened openings terminating within 12 inches of the floor and located at opposite ends of the room. Such air inlets shall be not less than 144 square inches in area and of sufficient size to permit an air change every 3 minutes. Fresh air may be supplied from the building's air-conditioning system, but when this is done, the system outlet shall be arranged so that the projection room will continue to receive one change of air every 3 minutes.
- (b) **Exhaust air.** Every projection room shall be provided with one or more air outlets that may be manifolded into a single duct outside the room. Exhaust outlets shall be so located as to ensure a circulation throughout the room. Such an exhaust air system shall be independent of any other air system. Exhaust air ducts shall terminate at the exterior of the building in a location such that the exhaust air cannot be recirculated into the supply air system. The exhaust shall be mechanically operated and of a capacity to provide a minimum of one change of air every 3 minutes. The blower motor shall be outside the duct system. The projecting room ventilation system may also serve appurtenant rooms, such as the generator room and the rewind room.

- (c) **Projection room ventilation.** Each projection machine shall be provided with an exhaust duct that will draw air from each lamp and exhaust it directly to the outside of the building so that the exhaust air will not be picked up by supply inlets. Such duct shall be of rigid materials, except that a continuous flexible connector approved for the purpose may be used. The lamp exhaust system shall not be interconnected with any other system.
- (d) **Electric arc equipment.** The exhaust capacity of electric arc projection equipment shall be 200 cubic feet per minute (cfm) for each lamp connected to the lamp exhaust system or shall be as recommended by the manufacturer of the equipment. Auxiliary air may be introduced into the system through a screened opening to stabilize the arc. Such an auxiliary air duct opening shall be screened.
- (e) **Xenon equipment.** The lamp exhaust system of Xenon projection equipment shall exhaust not less than 300 cfm per lamp, nor less than the exhaust volume required or recommended by the equipment manufacturer, whichever is greater. The temperature of the lamp housing shall not exceed 130°F when operating.

G-601.4 Miscellaneous equipment.

- (a) Every projection room shall be provided with rewind and film storage facilities.
- (b) Sanitary facilities shall be provided as required in the *EPCOT Plumbing Code*.
- (c) A maximum of four nonbreakable containers for flammable liquids, not greater than a 16-ounce capacity, may be permitted in every projection room.

**SECTION G-701
OPEN-AIR EVENT
OR PERFORMANCE PLATFORMS**

G-701.1 Performance or event platforms. Any platform or stage must meet the requirements of this Code and the *EPCOT Accessibility Code for Building Construction*. All performance or event platforms, as well as any associated light trusses, scaffold towers and electrical power, require permitting.

Exception: Performance or event platforms less than 30 inches in height do not require a building permit, unless accessible to the public.

G-701.2 Plans and specification requirements. An accurate and complete site plan, two sets of performance or event platform construction plans with framing and structural details shall be submitted. Structural calculations may be required depending on the complexity of the platform. The platform plans shall also show accessibility to conform with the *EPCOT Accessibility Code for Building Construction*. An event stage or performance platform 30 inches in height or greater shall have guardrails or edge protection.

APPENDIX H

REGULATION OF COMMERCIAL STABLES

SECTION H-101 ADMINISTRATIVE REQUIREMENTS

H-101.1 Scope. The requirements of this Appendix shall apply to stables and barns, and their appurtenances, hereafter constructed, erected, maintained, repaired or altered. Such buildings and structures shall be classified as Group S, Division 2, in accordance with Table 5.1 and Subsection 516.1.

H-101.2 Criteria.

- (a) Design of buildings and structures housing Group S-2 occupancies shall comply with the requirements of Chapter 9 for design loads and with the applicable requirements of Section 516, and Chapters 7 and 8.
- (b) Material used in construction of buildings and structures housing Group S-2 occupancies may be any material complying with the requirements of this Code and Appendix.

H-101.3 Location on property.

- (a) Buildings and structures housing Group S-2 occupancies shall be subject to the requirements of Chapter 7 for location on property and for fire protection of openings. Minimum spacing between barns on the same property shall be 50 feet.
- (b) Location of buildings classified as Group S-2 occupancies shall comply with the requirements of the Zoning Regulations.

H-101.4 Area and height.

- (a) Buildings or parts of buildings classified as Group S-2 occupancies shall not exceed the areas set forth in Table 7.5, but in no case shall the area of a barn be more than 12,000 square feet, except when a fire separation wall of 1-hour fire-resistive construction is provided with a parapet wall extending at least 2 feet above the roof. Where a fire separation wall crosses a walk-around area, the barn walls shall be 1-hour fire-resistive construction for a length of 5 feet in both directions from the wall. Ceilings of the walk-around area shall be finished on the underside as for 1-hour fire-resistive construction.
- (b) Buildings or parts of buildings housing Group S-2 occupancies shall be not more than 14 feet at the highest point.
- (c) Gas appliances used in buildings housing Group S-2 occupancies shall be installed in accordance with the *EPCOT Fuel Gas Code*, and shall be vented.

SECTION H-201 SPECIAL REQUIREMENTS

H-201.1 Automatic fire-extinguishing systems. Buildings or parts of buildings housing Group S-2 occupancies shall be provided with approved automatic fire-extinguishing systems throughout, including storage areas.

H-201.2 Use of materials.

- (a) Where metal construction is used, pressure-treated, fire-retardant wood liner shall be installed for stall walls, stall doors and other areas.
- (b) Where concrete block is used for construction of stalls, wooden kick boards shall be installed on all sides of the stall.
- (c) Roofing of barns shall be Class C, fire-retardant roofing, or better, as specified in EPCOT Standard 7-7.
- (d) Floors of stalls and tack rooms may be of any material approved for use by this Code.

H-201.3 Walk-around areas.

- (a) The minimum width of a walk-around area shall be 10 feet and the outer edge of the roof shall be at least 8 feet above the ground level.
- (b) Pitch of a roof of metal shall be not less than 3 inches in 12 inches and, when the roof is of composition shingles, the pitch shall be not less than 4 inches in 12 inches.
- (c) Walk-around areas shall be provided with electric lighting fixtures not less than 7 feet from the ground on the inside wall. The lights shall be covered with wire guards. Grounded electrical outlets shall be provided at a ratio of one for each two stalls. All electrical work shall be installed in accordance with the requirements of the *EPCOT Electrical Code*.
- (d) Water faucets shall be provided in walk-around areas at the ratio of one faucet for each five stalls, located either on the inner wall or in the outer perimeter of the walk-around area.
- (e) The outer edge of the walk-around area shall not be enclosed with fixed railing or other construction that would hinder evacuation of horses in the event of fire. Removable railings may be used.

H-201.4 Stalls.

- (a) Stalls shall be not less than 12 feet by 12 feet in dimension and shall be not higher than the minimum slope of the roof of the barn.
- (b) Stalls shall be tight, with pressure-treated, fire-retardant boards not less than 2-inch nominal dimension,

APPENDIX H—REGULATION OF COMMERCIAL STABLES

butted against each other as closely as possible to a height of not less than 7 feet. Above the height of 7 feet, nominal 1-inch pressure-treated, fire-retardant boards may be used and shall be carried flush to the ceiling.

- (c) Stall doors shall be a minimum of 4 feet wide and 9 feet high. The space above the door may be left open or screened with $\frac{1}{4}$ -inch noncorrosive wire mesh or a roof vent shall be installed along the ridge of the barn roof.
- (d) Sills for stall doors shall be at least 3 inches thick and 18 inches wide, and shall be of pressure-treated, fire-retardant wood or similar resilient, durable material. One edge of the sill shall be flush with the outside wall of the stall with the widest part of the sill extending into the stall.
- (e) Latch bolts or door-holding equipment shall be located so that halters cannot catch on them. Eye bolts for mounting webbing or cross bars shall be permanently installed on the face of the jamb.
- (f) No obstruction shall be permitted to interfere with the action of sprinkler heads in the stalls.
- (g) Electrical installations in stalls shall be permanent ceiling fixtures of a capacity to permit use of large wattage appliances for treatment of ailing horses, and shall comply with the requirements of the *EPCOT Electrical Code*.

H-201.5 Tack rooms.

- (a) Construction of tack rooms shall comply with the requirements for occupancies in Chapter 5 as to area, floor and wall finishes, ceiling height and exits. Heating and ventilating equipment shall comply with the requirements of the *EPCOT Mechanical Code* and sanitary facilities shall comply with the requirements of the *EPCOT Plumbing Code*.
- (b) Tack rooms shall be of 1-hour fire-resistive construction throughout.
- (c) Tack rooms shall be provided with grounded electrical receptacles installed in accordance with the *EPCOT Electrical Code*.
- (d) Doors and windows of tack rooms shall be screened.

H-201.6 Storage areas.

- (a) Feed shelters shall be constructed with one side open to the walk-around area and shall be detached from the barns by an opening at least 2 feet higher than the barn roof.
- (b) Floors of feed shelters shall be concrete slabs 6 inches thick.
- (c) Feed shall not be stored within 18 inches of fire sprinkler heads.
- (d) Feed shelters shall be provided with grounded electrical outlets, installed in accordance with the requirements of the *EPCOT Electrical Code*.
- (e) Storage of flammable liquids shall comply with the requirements of EPCOT Standards 5-4 and 5-5.

APPENDIX I

REGULATION OF COVERED WALKWAYS AND MALLS

SECTION I-101 ADMINISTRATIVE REQUIREMENTS

I-101.1 Purpose and scope. The purpose of this Appendix is to provide additional requirements to those contained in this Code for connections between buildings and structures, such as covered malls, covered walkways and tunnels located at, above or below grade level.

I-101.2 Definitions. The following definitions applying to this Appendix supplement the definitions contained in Chapter 2.

- (a) **Anchor building.** An exterior perimeter department store, major merchandising center or Group R-1 occupancy having direct access to a covered mall building, but having all required exits independent of the mall.
- (b) **Covered mall.** Covered or roofed interior area having a minimum horizontal dimension of 30 feet used as a pedestrian public way connecting buildings or a group of buildings housing individual or multiple tenants.
- (c) **Covered mall building.** A single 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 the mall.
- (d) **Covered walkway.** Roofed, unobstructed walkway connecting buildings, used as a passageway for pedestrians, having a minimum horizontal dimension of 30 feet and where less than 50 percent of the perimeter is enclosed.
- (e) **Enclosed walkway.** Roofed, unobstructed walkway connecting buildings, used as a passageway for pedestrians having a minimum horizontal dimension of 30 feet, and where 50 percent or more of the perimeter of the walkway is enclosed.
- (f) **Kiosk.** Within a mall, shall not exceed 200 square feet.
- (g) **Mall.** A roofed or covered common pedestrian area within a covered mall building, which serves as access for two or more tenants and may have three levels that open to each other.
- (h) **Tunneled walkway.** Unobstructed underground walkway connecting buildings, used as a passageway for pedestrians.

SECTION I-201 CONSTRUCTION REQUIREMENTS

I-201.1 Covered malls.

- (a) Covered malls shall be of Type I or II construction as set forth in Table 7-5 for the applicable Group B occupancy. The area of covered malls may be tripled when the mall is provided with an approved automatic fire-extinguishing system, except that the unlimited areas

permitted in Subsection 712.3 shall not apply to covered mall.

- (b) The roof construction and supporting members of a covered mall shall comply with the requirements of Subsection 601.1(b) and Table 6.2 for the type of construction permitted for buildings connected by the mall, but shall be not less than 1 hour of heavy timber construction.
- (c) When permitted in a mall roof assembly, concealed spaces shall be separated from the adjoining buildings by not less than 1-hour fire-resistive construction.
- (d) Hose cabinets shall be provided for each 200 feet of mall length.

I-201.2 Covered walkways. A covered walkway may be of any type of construction permitted by this Code when the walls and openings at the point of connection of the walkway to the building are protected in accordance with the requirements of Chapter 7 to prevent spread of fire from one building to another. The covered walkway shall not contribute to the building area or the number of stories or height of connected buildings.

- (a) Covered walkways shall be not less than 10 feet in length and 44 inches in width. The total width shall not exceed 30 feet.
- (b) The length of exit access travel shall not exceed 300 feet.
- (c) Covered walkways over a public way shall also comply with Section 402.
- (d) See Section 401 for requirements for the protection of pedestrians during construction or demolition.

I-201.3 Enclosed walkways. An enclosed walkway shall be of the type of construction required for the buildings connected by the walkway. Separation between the enclosed walkway and the building to which it is connected, except when used as a required exit, shall be of not less than 2-hour fire-resistive construction. Openings in the walls of the building to which the enclosed walkway is connected shall be protected by an approved opening protective having a 1½-hour fire-resistive rating. The enclosed walkway shall not contribute to the building area or the number of stories or height of connected buildings.

- (a) Enclosed walkways shall be not less than 10 feet in length and 44 inches in width. The total width shall not exceed 30 feet.
- (b) The length of exit access travel shall not exceed 200 feet.
- (c) Enclosed walkways shall be mechanically or naturally ventilated.
- (d) Enclosed walkways over a public way shall also comply with Section 402.

I-201.4 Tunneled walkways. A tunneled walkway shall be of a type of noncombustible construction or construction approved by the Building Official for location underground. Separation between the tunneled walkway and the buildings to which it is connected shall be of not less than 2-hour fire-resistive construction. Openings in the walls shall be protected by an approved opening protective having a 1½-hour fire-resistive rating.

SECTION I-301 EXIT REQUIREMENTS

I-301.1 Covered mall. At least one-half of the required exit width for buildings connected by a covered mall shall lead to the outside by means other than through the mall. The covered mall connecting buildings shall have not less than two independent exits located as remotely as practical from each other. These exits shall have a total width equal to that required for the exits from all buildings within 100 feet travel distance to the mall exits. The maximum distance of travel to an exit measured within the mall shall not exceed 200 feet. To provide free travel in the mall to the outside, each side of the mall floor area shall be provided with unobstructed space, not less than 12 feet wide parallel to the building lines and extending to the exit from the mall. This floor shall be designed to carry the weight of fire trucks.

I-301.2 Exits.

- (a) The occupant load for the covered mall building, assuming all portions including individual tenant spaces and the mall to be occupied at the same time, shall be determined by dividing the gross area by 30 for covered mall buildings containing up to 150,000 square feet of gross area, by 40 for covered mall buildings containing between 150,001 and 350,000 square feet of gross area, and by 50 for covered mall buildings containing more than 350,000 square feet of gross area. Exit requirements for the gross leasable area of the covered mall building shall be based on the occupant load thus determined. The occupant load of anchor stores opening into the mall shall be based on other provisions of this Code and need not be included in computing the total number of occupants for the mall.
- (b) For exit purposes, the mall may be considered to be a public way.
- (c) The maximum distance of travel from any point within a mall to the exterior, an exit enclosure, a horizontal exit or an exit passageway shall not exceed 200 feet.
- (d) Each individual occupancy within the covered mall building shall be provided with exits in accordance with other provisions of this Code. Travel distance may be measured to the entrance to the mall.

I-301.3 Egress doors.

- (a) One-half of the required units of exit width for tenant spaces connected to a covered mall shall lead to the outside by means other than through the mall, except that when a tenant space does not exceed 2,250 square feet in area and the distance of travel from any point in

the space to the entrance to the mall does not exceed 75 feet, only one egress door shall be required.

- (b) When a tenant space is located at the intersection of two covered malls or has exposure on two different covered malls, such tenant space, when in excess of 2,250 square feet in area, shall have at least two separate egress doors both of which may lead through the covered malls providing the egress doors are located as remote from each other as practical.
- (c) Anchor stores shall provide the required number and width of exits 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.
- (d) The dead-end length of a mall shall not exceed twice its width.
- (e) The total width of exit doors from a covered mall building shall be sufficient to accommodate the entire calculated occupant load exclusive of the anchor stores.
- (f) The minimum exit width from a mall shall be 66 inches.
- (g) The aggregate required width of exits shall be divided approximately equally around the mall.
- (h) When exit passageways are present to provide a secondary exit from a tenant space, doors to the corridor shall be 1-hour fire doors. Such doors shall be self-closing and be so maintained or shall be automatic closing by smoke detection.
- (i) 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.
- (j) Tenant spaces, requiring more than one exit, may have one of the exits through an adjoining or intervening room that provides a direct, obvious and unobstructed means of travel to an exit corridor, exit enclosure or until egress is provided from the building, provided the exit does not pass through the restrooms, kitchens, closets or spaces used for similar purposes.

I-301.4 Mall width.

- (a) The minimum width of the mall shall be 30 feet.
- (b) There shall be a minimum of 12 feet clear exit width to a height of 8 feet between any projection of a tenant space bordering the mall to the nearest kiosk, vending machine, bench, display opening or other obstruction to exit travel.
- (c) The mall width shall be sufficient to accommodate the occupant load emptying into the immediately adjacent mall as determined by Section 803.

SECTION I-401 SMOKE VENTING

I-401.1 Smoke-control system. A mechanically operated air-handling system shall be installed in covered mall buildings, which will restrict the movement of smoke to the general area of fire origin and maintain the egress system in a condition that is safe.

I-401.2

- (a) The smoke-control system shall be designed in accordance with Section 720. The smoke-control system shall go into operation immediately following actuation of the smoke detector. The smoke-control system shall be as follows:

Smoke detectors shall be provided as follows:

1. A minimum of one area-type smoke detector in each tenant space having an opening to the mall. Such detector shall be located at each opening to the mall.
 2. Area-type smoke detectors or approved projected beam detectors shall be installed to monitor the mall area that can contain combustible loading, such as kiosks or displays. Such installations shall be engineered to distinguish fire in the mall from fire in the tenant space.
- (b) The smoke-control equipment for the mall shall be separate from that serving tenant spaces.
- (c) The covered mall building shall be compartmented into smoke-control zones. Smoke-control zones shall be separated from each other by construction having a fire-resistive time period of not less than 1 hour. Walls between tenant spaces used to separate smoke-control zones shall extend from the floor to the underside of the floor or roof above.
- (d) A smoke barrier shall be provided separating the tenant ceiling space from the mall ceiling space.
- (e) A smoke-control zone shall coincide with the area of coverage of a single sprinkler supply. Within that sprinkler zone, there may be one or more air-moving systems, but no single smoke-control zone shall be larger than the sprinkler area.

I-401.3 Acceptance testing. The equipment shall be tested in accordance with Subsection 702.18. Final acceptance of the system shall be in the presence of the Building Official to confirm that the system is operating in compliance with the requirements of this Subsection.

SECTION I-501**AUTOMATIC FIRE SUPPRESSION SYSTEMS**

I-501.1 The covered mall building shall be provided with an automatic fire suppression system conforming to the provisions of NFPA 13. In addition to these provisions, the automatic fire suppression system shall comply with the following:

- (a) All automatic fire suppression system control valves shall be electrically supervised by an approved central station, proprietary or remote station alarm service, which will give an audible signal at a constantly attended station. (See NFPA 71 or 72.)
- (b) The automatic fire suppression system shall be complete and operative throughout all occupied space in

the covered mall building prior to occupancy of any of the tenant spaces. Unoccupied tenant space shall be similarly protected unless provided with approved alternative protection.

**SECTION I-601
HOSE CONNECTIONS**

I-601.1 There shall be a hose outlet connected to a supply capable of delivering 250 gallons per minute at each of the following locations:

- (a) Within the mall at the entrance to an exit passage or exit corridor.
- (b) At each floor level landing within enclosed stairways opening directly onto the mall.
- (c) Adjacent to principle exterior entrances to the mall.

I-601.2 Hose outlets shall be installed to comply with the requirements of NFPA 14 with regard to materials, installation methods and testing.

Exceptions:

1. Risers and laterals of standpipe systems not located within an enclosed stairway need not be protected by a degree of fire resistance equal to that required for vertical enclosures in the covered mall building.
2. In buildings where more than one standpipe is provided, they need not be interconnected.
3. Piping may be hydraulically sized.

APPENDIX J

GROUP S-4 OCCUPANCIES AND MANUFACTURED BUILDINGS

SECTION J-101 ADMINISTRATIVE REQUIREMENTS

J-101.1 Scope. The provisions of this Appendix shall apply to:

- (a) Group S-4 occupancies including mobile homes, campers, trailers and manufactured buildings not intended for human occupancy; and
- (b) Manufactured buildings used for occupancies other than Group S-4.

J-101.2 Definitions.

- (a) **Cluster.** The locating of two or more individual units or groups with allowable separation, connected by a common walkway or deck that may be used by one or more tenants.
- (b) **Grouping.** The physical connecting of two or more independent units, with no separation between units, to form one larger unit for use by a single tenant; excluding those units designed and manufactured as multiple units when assembled to become one unit.
- (c) **Kiosk.** A kiosk is defined as a small structure, no larger than 200 square feet, which may be portable through more extensive disassembly, but is primarily intended as permanent. It may be constructed on- or off-site, then anchored and connected to utilities as permanent.
- (d) **Manufactured building.** A structure, transported on a separate vehicle in one or more sections, designed to be used as dwelling, commercial, institutional, storage, industrial structures with permanent foundation, which may include plumbing, heating and air conditioning, and electrical manufactured in accordance with the Florida Manufactured Building Act of 1979, in Section 553, Part IV, of the Florida Statutes, and administered and promulgated by the Rules and Regulations of the Florida Department of Business and Professional Regulation (DBPR).
- (e) **Mobile home.** Any residential unit constructed to standards promulgated by the U.S. Department of Housing and Urban Development, and administered by the Florida Department of Transportation and the DBPR.
- (f) **Recreational vehicle.** A vehicular-type unit primarily designed as temporary living quarters for recreational, camping or travel use, which either has its own motive power, or is mounted on or towed by another vehicle. The basic entities are: travel trailer, camping trailer, truck camper and motor home as defined in Chapter 320 of the Florida Statutes.
- (g) **Shed.** A shed is defined as a manufactured or site-built building not exceeding 200 square feet in size, and is used only for storage.

(h) **Temporary construction trailers.** A temporary building used for construction purposes has been defined as any building or shed that is temporary, does not exceed 8 feet in width and 32 feet in length, is used for the storage of materials and equipment, and may include a small office for a construction superintendent to use for functions that are exclusively for construction purposes. Temporary manufactured buildings, which meet this definition, are exempt from the requirements of the following: accessibility, DBPR approval, sealed engineering, energy calculations and emergency egress illumination.

(i) **Trailer.** An automotive drawn vehicle, mounted on wheels, designed to serve wherever parked as a dwelling.

J-101.3 Permits.

- (a) Mobile homes and manufactured buildings hereafter located in the District, installed for more than 10 days, shall require a permit. Temporary installations less than 10 days shall not require a permit unless electrical and/or plumbing connections are supplied to the trailer. Any supporting electrical, mechanical or plumbing shall require a separate permit, regardless of the number of days that the mobile home, trailer or manufactured building is in use. Regardless of the number of days in use, the trailer or manufactured building shall meet the requirements of the *EPCOT Accessibility Code for Building Construction*.
- (b) Each application for a permit shall be accompanied by two sets of plans that show the anchoring, piers and tie downs from the manufacturer, and a site or location plan.

J-101.4 Inspections. Mobile homes, manufactured buildings and other occupied mobile units shall be inspected by the Department of Building and Safety before utilities are connected, and when changes of tenancy occur prior to activation of electric power.

J-101.5 Manufactured buildings more than three sections wide or 3,200 square feet shall be fully sprinklered in accordance with EPCOT Standard 7-10.

J-101.6 Annual inspections. All permanent mobile homes, manufactured buildings and structures shall be inspected on an annual basis by the Reedy Creek Department of Building and Safety.

Exception: Temporary construction trailers and structures, temporary trailers or manufactured structures are exempt from the annual inspection requirement.

J-101.6.1 Annual inspection fees shall be charged in accordance with the Department of Building and Safety inspection fee schedule for annual inspections.

Exception: Group R-3 occupancies shall be exempt from annual inspection fees.

SECTION J-201 STANDARD ADOPTED

J-201.1 Purpose.

- (a) Mobile homes and manufactured buildings, because of the manner of their construction, assembly and use, and that of their systems, components and appliances (including heating, plumbing and electrical systems) like other finished products having concealed vital parts, may present hazards to the health, life and safety of persons, and to the safety of property unless properly manufactured. It is the policy and purpose of the District to provide protection to the public against possible hazards and, for that purpose, to prohibit the location of mobile homes that are not so constructed as to provide reasonable safety and protection.
- (b) There is hereby adopted the recommended principles of construction issued as ANSI A119.1 and amended from time to time by the American National Standards Institute (ANSI), successor to the U.S. American Standards Institute (USASI), applicable to mobile homes as defined herein.

J-201.2 Scope.

- (a) No person, firm or corporation may manufacture or locate any mobile home that has been constructed unless such mobile home, its components, systems and appliances have been constructed and assembled in accordance with the Standards herein defined.
- (b) Any mobile home or manufactured building that bears the label or seal of compliance of a recognized testing laboratory having follow-up inspection services approved by the District (such as Underwriter's Laboratories, Inc., or similar testing service) shall be deemed to be in full compliance with the standards and rules and regulations prescribed herein. All mobile home units bearing such label or seal shall be acceptable as meeting these requirements without further inspection or fees except where required for zoning, utility connections, foundation and anchorage permits. Any mobile home unit not bearing such label or seal shall be subject to inspection by the Department of Building and Safety for compliance with the herein described Standard.

SECTION J-301 BLOCKING AND ANCHORING TRAILERS, AND SECURING MOBILE HOMES AND TRAVEL TRAILERS

J-301.1 Piers, tie downs and anchors. All foundation systems for mobile homes shall be installed by a licensed installer and shall be in accordance with the mobile home manufacturer's approved plans. For manufactured buildings, the foundation system shall be in accordance with this Code, and with plans and calculations signed and sealed by a Florida professional engineer or registered architect. All anchoring products shall be approved by the Building Official.

- (a) Mobile homes and manufactured buildings shall be placed upon piers, anchored and secured in accordance with the following provisions within 10 days after

locating in a trailer park or other approved area, or within 4 hours after the issuance of a hurricane alert by the U.S. Weather Bureau, whichever may be sooner.

- (b) Travel trailers, during the official hurricane season (June 15 to November 15) shall be placed upon piers, anchored and secured in accordance with the following provisions within 10 days after locating in a trailer park or other approved area, or within 4 hours after the issuance of a hurricane alert by the U.S. Weather Bureau, whichever may be sooner.
- (c) The following shall be the minimum standards for blocking, anchoring and securing mobile homes, manufactured buildings and travel trailers:
 1. **Piers.**
 - 1.1. Pier foundations shall be installed directly under the main frame (or chassis) of the mobile home, manufactured building or travel trailer. The piers shall not be farther apart than 10 feet on centers, and the said main frame (or chassis) front or back, shall not extend farther than 5 feet beyond the center line of the end piers.
 - 1.2. All grass and organic material shall be removed and the pier foundation placed on stable soil. All piers shall be placed on footings of solid concrete not less than 16 inches by 16 inches by 4 inches or an approved pad.
 - 1.3. Piers less than 40 inches in height shall be constructed of open- or closed-cell, 8-inch by 8-inch by 16-inch concrete blocks (with open cells placed vertically upon the footer). Single-stacked block piers shall be installed within the 16-inch dimension perpendicular to the main (I-beam) frame. The piers shall be covered by a 2-inch by 8-inch by 16-inch-long pressure-treated wood cap or with an 8-inch by 16-inch by 4-inch solid concrete cap. Leveling shims shall be pressure-treated wood or an approved plastic wedge not exceeding 1½ inches in height. The steel frame shall not be in direct contact with concrete.
 - 1.4. Piers between 40 and 80 inches in height and all corner piers more than three blocks high shall be double blocked with blocks interlocked and capped with a 4-inch by 16-inch solid concrete block.
 - 1.5. Piers more than 80 inches in height shall be constructed in accordance with Paragraph 1.4, and they shall be laid in concrete mortar and steel reinforcing bars inserted in block cells filled with concrete.
 2. **Tie downs.** Tie-down anchors shall be placed in accordance with approved manufacturer's plans and/or FAC 15C-1. Tie-down straps shall not be in direct contact with concrete.
 3. **Ground anchors.** An approved ground anchor shall be one of the following:

- 3.1. A steel screw auger with a minimum $\frac{5}{16}$ -inch-diameter rod with welded eye on one end and a minimum auger diameter of 6 inches on the other end. The auger shall penetrate at least $3\frac{1}{2}$ feet below the ground surface.
- 3.2. A steel $\frac{5}{16}$ -inch-welded eyebolt with a 6-inch hook or a steel U-shaped, $\frac{5}{8}$ -inch rod with two 3-inch hooks, cast into a reinforced 4-inch concrete slab not less than 75 square feet in area.
- 3.3. A steel $\frac{5}{8}$ -inch-welded eyebolt or a steel U-shaped, $\frac{5}{8}$ -inch rod, cast 6 inches into a poured-in-place rock concrete dead-man at least 6 inches in diameter and 2 feet deep.
- 3.4. Other types of ground anchors may be approved by the Building Official if he deems them the equivalent of the foregoing specifications.

When the manufacturer's installation instructions are not available, piers, blocking, tie downs and ground anchors shall be installed in accordance with the Division of Motor Vehicles Bureau of MH/RV Construction Installer Licensing Program.

J-301.2 Notice of regulations to park occupants. Trailer or mobile home park owners or operators shall notify all park occupants at time of occupancy of the provisions of these regulations and shall post copies of these regulations in conspicuous locations within the park.

SECTION J-401 TRAILER PARKS AND CAMPING FACILITIES

J-401.1 Compliance. Trailer parks and camping facilities shall comply with the provisions of the Land Use Regulations of the District and, in addition, each installation shall be in accordance with the provisions of this Code, the *EPCOT Plumbing Code*, the *EPCOT Electrical Code* and the *EPCOT Fuel Gas Code*.

SECTION J-501 GROUP S-4 OCCUPANCIES

J-501.1 Scope. This Section shall apply to Group S-4 occupancies, including mobile homes, unoccupied manufactured buildings, recreational vehicles, trailers and sheds.

J-501.2 Requirements.

J-501.2.1 Access. Access to mobile homes, manufactured buildings, recreational vehicles and trailers shall be in accordance with Subsection 1407.1 of the *EPCOT Fire Prevention Code*.

J-501.2.2 Separation. Separation between mobile homes, manufactured buildings, recreational vehicles, trailers and other similar units shall be a minimum horizontal, clear and unobstructed distance of 15 feet.

J-501.2.3 Separation between mobile homes, manufactured buildings, recreational vehicles and trailers and a

permanent structure shall be a minimum horizontal, clear and unobstructed distance of 25 feet.

Exception: When the permanent structure has a fire-rated wall exposed to the Group S-4 occupancy, the distance may be reduced to 15 feet with the Building Official's approval.

J-501.2.4 Electrical systems. All applicable electrical systems and equipment shall be in accordance with the *EPCOT Electrical Code*.

J-501.3 Cluster or grouping.

J-501.3.1 Mobile homes, recreational vehicles, trailers and manufactured buildings may be arranged in clusters and/or groups when a minimum fire water flow of 1,000 gallons per minute is accessible.

J-501.3.2 Covered walkways, platforms and decks shall be sprinkled and square footage shall be added to square footage of units since they are considered as one building.

J-501.3.3 Separation of groups or clusters shall be in accordance with this Section.

J-501.3.4 Construction site locations. All such units covered by this Chapter and utilized as construction offices or storage facilities shall comply with the separation requirements set forth in this Section.

J-501.3.5 Semi-trailers. Semi-trailers used for storage may be parked in groups of four trailers with a minimum separation between groups of 15 feet.

SECTION J-601 MANUFACTURED BUILDINGS

J-601.1 Occupancy. Manufactured buildings shall have their occupancy classification based on the actual use of the structure.

J-601.2 Manufactured buildings less than four units wide or containing less than 3,200 square feet in area shall be provided with an approved single-station or multiple-station smoke detector installed in all common areas of the structure and in accordance with NFPA 72. The smoke detector(s) shall be located and installed in accordance with the manufacturer's recommendations. Where more than one detector is required, the detectors shall be wired in such a manner that the actuation of any detector will actuate all smoke detector notification alarms on the same circuit. The notification alarm shall be a combination audible/visual notification appliance. The audible signal shall be temporal, the visual indicator shall be a strobe rated at 177 candelas. These smoke detectors shall receive their operating power from a dedicated AC power breaker, and shall be supervised and remotely monitored.

Exception: With the approval of the Building Official, monitoring may not be required.

J-601.3 Manufactured buildings four or more units wide or greater than or equal to 3,200 square feet shall be provided with a fire sprinkler system and a fire alarm system complying with Section 1418 of the *EPCOT Fire Prevention Code*.

(a) If the combined cubic feet per minute of the air-handling units exceeds 15,000, complete area smoke

detection is required in lieu of duct detectors, and any smoke detector in alarm will shut down all air-handling units.

■ **J-601.4 Occupancy separation.** Manufactured buildings shall have the following separations:

- (a) Minimum of 25 feet between any manufactured building and a permanent building.
- (b) Minimum of 15 feet between any manufactured building.

■ **J-601.5 Decks and canopies.** Manufactured buildings interconnected with combustible decking or an overhead awning shall have the total square footage of the decks, canopies or awnings added to the area of the manufactured building(s) to determine compliance with Section 1420 of the *EPCOT Fire Prevention Code*.

Exception: Any connecting combustible walkway not more than 5 feet in width without an overhead awning.

SECTION J-701 KIOSKS

J-701.1 Requirements. Kiosks and similar structures (temporary or permanent) shall meet the following requirements:

- (a) Combustible kiosks or other structures shall not be located within buildings unless constructed of the following materials:
 - 1. Fire-retardant-treated wood complying with Section 1010.
 - 2. Foam plastics having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with the exhibit booth protocol in UL 1975.
 - 3. Aluminum composite material (ACM) having a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E84 or UL 723.
- (b) Where located within a building and a roof or cover equal to or greater than 16 square feet is provided on the kiosk or similar structure, automatic fire suppression and detection must be installed within the kiosk. Standalone kiosks outdoors do not require automatic fire suppression.
- (c) Kiosks installed outside of buildings shall be designed to meet the wind design criteria in accordance with Section 904 for permanent or temporary structures, respectively.

APPENDIX K

**TENTATIVE REQUIREMENTS PERTAINING
TO HEAT RADIATION BETWEEN BUILDINGS**

This Appendix is reserved for the location of tentative requirements pertaining to heat radiation between buildings as may be computed and accepted as an alternative to those specific separation distances shown in Table 6.2.

APPENDIX L

TENTATIVE DESIGN CRITERIA FOR FIRE PROTECTION OF EXTERIOR STRUCTURAL ELEMENTS

SECTION L-101 OBJECTIVE

L-101.1 Objective.

- (a) The objective of this Section is to establish acceptable design rules for estimating the temperature rise of exterior structural elements when used without fire-resistive protection. It is hereby recognized that an alternative approach to basic fire protection design may be an analysis of external heat transfer and calculation of the amount of protection, if any, which is needed.
- (b) Where it is determined that fire protection is needed, it shall be provided in accordance with EPCOT Standard 6-1.

SECTION L-201 APPROVED OCCUPANCIES AND FIRE LOADS

L-201.1 Approved occupancies and fire loads.

- (a) Fire load shall be calculated for each floor of the building and shall be based on the higher of the fire loadings for the occupancy classifications as set forth in Paragraph (b). Minor accessory areas for which the fire loading exceeds the fire loading of the principal occupancy shall be permitted when complying with the provisions of Subsection 502.1(c).
- (b) For the purpose of this Section, design analytical methods shall be limited to the following building occupancies, and the fire loading shall be as set forth herein.

A-1	10 pounds per square foot of floor area
A-2	10 pounds per square foot of floor area
A-3	10 pounds per square foot of floor area
A-4	10 pounds per square foot of floor area
AA	10 pounds per square foot of floor area
B-1	Mercantile — 20 pounds per square foot of floor area
B-1	Office Buildings — 10 pounds per square foot of floor area
B-2	Mercantile — 20 pounds per square foot of floor area
B-2	Office Buildings — 10 pounds per square foot of floor area
D-1	10 pounds per square foot of floor area
D-2	10 pounds per square foot of floor area

D-3 10 pounds per square foot of floor area

E-1 10 pounds per square foot of floor area

E-2 10 pounds per square foot of floor area

E-3 10 pounds per square foot of floor area

R-1 10 pounds per square foot of floor area

R-2 10 pounds per square foot of floor area

R-3 10 pounds per square foot of floor area

SECTION L-301 CRITERIA ADOPTED

L-301.1 Criteria. Exterior structural steel elements. The fire endurance of exterior steel elements may be determined by analytical methods and procedures set forth in “Fire Safe Structural Steel,” *A Design Guide*, First Edition, March 1979, as published by the American Iron and Steel Institute.

SECTION L-401 ADMINISTRATIVE REQUIREMENT

L-401.1 The design of exterior structural steel elements in accordance with the criteria set forth in this Section shall be signed and sealed by a registered architect or engineer who is qualified in the field of fire protection design and practice. Evidence of this qualification shall be provided to the Building Official upon application for plan review.

APPENDIX M

REGULATIONS FOR CONSTRUCTION OF MOTION PICTURE AND TELEVISION SOUNDSTAGES

SECTION M-101 ADMINISTRATIVE REQUIREMENTS

M-101.1 Scope. This Appendix shall apply to the construction, alterations, repair and maintenance of motion picture television soundstages, hereinafter referred to as studios.

M-101.2 Definition.

- (a) **Studio.** An establishment, room or building in which motion pictures are made, or where radio or television programs are produced or where recordings are made.

M-101.3 Criteria. The requirements of this Appendix shall supplement the provisions of this Code. Where there is a conflict between the provisions of this Code and Appendix, the requirements of this Appendix shall apply.

M-101.4 Design. The design of studios, theaters, theater stages, enclosed platforms and motion picture projection rooms shall comply with Chapter 9.

M-101.5 Construction of materials. The type of construction and materials of construction shall conform to the requirements as set forth in Section M-201 and as defined in this Code.

M-101.6 Exits. Exits shall be provided in accordance with Section M-301.

M-101.7 Fire protection. Fire protection of structural members shall be as set forth in Chapter 6 and EPCOT Standard 6-1.

M-101.8 Construction of theater stages, enclosed platforms, motion picture projection rooms and open-air event or performance platforms. Construction of theater stages, enclosed platforms, motion picture projection rooms and open-air event or performance platforms shall be in accordance with Appendix G.

M-101.9 Electrical wiring. Electrical wiring shall comply with the *EPCOT Electrical Code*.

SECTION M-201 DESIGN, CONSTRUCTION AND FIRE PROTECTION OF STUDIOS

M-201.1 Construction. Studios shall be Type I, II or IV protected.

M-201.2 Area and height.

- (a) Type I—no limit.
(b) Type II—no limit.
(c) Type IV Protected—no limit.
(d) A building containing a studio, as defined in this Appendix, requires a 60-foot separation on all sides from other buildings, of which 30 feet must be maintained clear.

M-201.3 Sprinkler requirements. Studios shall be sprinklered in accordance with NFPA 13 as extra hazard location.

- (a) Studio buildings shall be sprinklered above and below the grid system and catwalks. Catwalks less than 3 feet in width are exempt from this requirement.
(b) Fire hose cabinets shall have a 2½-inch outlet reduced to 1½ inches complete with 100 feet of hose.
(c) Fire hose cabinets shall be located so that all parts of the studio are within 20 feet of a nozzle attached to 100 feet of hose in accordance with NFPA 14.
(d) Fire hose cabinets shall be installed in all mechanical rooms.
(e) Studios shall be provided with sufficient quantity of 2½-inch outlets on each roof.

M-201.4 Design.

- (a) The design of roof, catwalk and grid system shall be for the maximum design loading. All design calculations shall be submitted prior to application for permit.
(b) Roof design loads shall be posted.
(c) Catwalk and grid design loads shall be posted.
(d) All structural members shall be designed with the provisions of Chapter 9.

M-201.5 Catwalks and grids. Catwalk and grid systems shall be of noncombustible construction. Fire-retardant-treated lumber shall not be used as a substitute for noncombustible.

M-201.6 Floor drains. Studios shall be provided with one floor drain for each 7,000 square feet or fraction thereof. Drains shall be connected to holding ponds of sufficient design and capacity.

M-201.7 Clearance. The location of all sets, cycloramas and scenery inside a studio shall be approved by the Reedy Creek Fire Prevention Division and the Department of Building and Safety.

M-201.8 Interior finish. Soundproofing of walls shall be fiberglass or fire-retardant cloth covered with chicken wire. Interior finishes and sets shall not be less than Class III in accordance with Section 711.

SECTION M-301 EXITS AND EMERGENCY LIGHTING

M-301.1 Exits.

- (a) Studios shall have exits located at not more than 100 feet intervals on all perimeter walls. All exits shall be installed in accordance with Chapter 8.

(b) Catwalks shall have at least two means of exit, one of which may be a ladder. No catwalk shall have more than one 20-foot dead end.

1. Maximum travel distance on catwalks to 200 feet.
2. A width of not less than 22 inches is permitted.

(c) All exit doors shall be a minimum of 36 inches in width.

M-301.2 Emergency lighting.

- (a) All exits shall be equipped with approved exit signs in accordance with Section 812 and the *EPCOT Electrical Code*.
- (b) Studios shall be provided with emergency illumination of not less than 1 footcandle intensity at the floor level and on the stairs.

**SECTION M-401
SEATING AREAS**

M-401.1 Spacing. Spacing of seats shall be in accordance with Section 816.

M-401.2 When a live audience is present, there shall be available a minimum of two exterior exits on opposite sides of the seating area.

M-401.3 Each seating area is to have two rear exits plus two front exits.

M-401.4 Occupant load. The maximum occupancy load for any live audience show shall be limited by an approved seating plan approved by the Reedy Creek Fire Prevention Division and the Department of Building and Safety. Any studio with permanent fixed seating shall have the occupant content determined as set forth in Chapter 8.

APPENDIX N

REGULATIONS FOR MEMBRANE STRUCTURES AND TENTS

SECTION N-101 ADMINISTRATIVE

N-101.1 Scope. This Appendix shall apply to permanent and temporary air-supported, air-inflated and tensioned-membrane structures, collectively known as membrane structures; tents greater than 400 square feet used as complete buildings; and as roofs or other portions of buildings or other types of construction. Tents and membrane structures shall also comply with the applicable provisions of EPCOT Standard 5-8 not otherwise covered by this Appendix.

N-101.2 Plans and specifications. A site plan detailing the location of the tent in relation to buildings and parking, a floor plan and a complete scope of work shall be submitted.

A description of the intended use of the tent with complete interior floor plan showing, but not limited to, exits, aisles, doors, kitchens, stages or performance platforms, light trusses, scaffolds, pyrotechnic locations, tables and seating shall also be indicated on the plans.

N-101.3 Definitions. For the purpose of this Appendix, the following terms shall have the meanings indicated in this Section. Other terms shall be as defined in the Chapter 2 or shall have their ordinarily accepted meanings as the context may imply.

- (a) **Air-inflated structure.** A building or portion thereof whose shape is maintained by air pressurization of unoccupied cells or tubes. A system of cables, bands, webbing, ropes or similar tensile elements may be used to restrain the membrane and transfer the tensile forces to supports.
- (b) **Air-supported structure.** A building or portion thereof whose shape is attained by air pressure and where the pressurized space may be occupied. A system of cables, bands, webbing, ropes or similar tensile elements may be used to restrain the membrane and transfer the tensile forces to supports.
- (c) **Tension membrane structure.** A nonpressurized membrane structure wherein the membrane is pre-stressed and the structural support system includes cables and/or rigid elements to maintain the structural form.
- (d) **Tent.** Any structure, enclosure or shelter constructed of canvas or pliable material supported by any manner, except by air or the contents it protects.

N-101.4 Criteria. The requirements of this Appendix shall supplement the provisions of this Code. Where there is a conflict between the provisions of this Code and Appendix, the requirements of this Appendix shall apply.

N-101.5 Design. The design of membrane structures shall comply with Section N-201 and Chapter 9.

N-101.6 Construction and materials. The type of construction and materials of construction shall conform to the

requirements as set forth in Section N-201 and as defined in this Code.

N-101.7 Exits. Exits shall be provided in accordance with Chapter 8.

N-101.8 Exit signage. All exits shall be clearly marked with exit signage. Tents with 750 square feet or more shall illuminate all exit signs and have a back-up power supply.

Exception: Open-sided tents.

N-101.9 Egress illumination. See Section 813 for egress illumination requirements.

N-101.10 Occupant load. Tents containing 750 square feet or more shall post the maximum occupant load complying with Section 802.

N-101.11 Fire department access. Fire Department access lanes shall remain clear between tents, or tents and structures.

N-101.12 Electrical. Electrical wiring shall comply with the *EPCOT Electrical Code*.

N-101.13 Fire protection. All membrane structures shall be in accordance with Subsection 503.13.

N-101.14 Mechanical. Heating, ventilating and air-conditioning installations shall conform to the requirements of the *EPCOT Mechanical Code*.

N-101.15 Temporary toilet fixtures. Additional permanent or temporary toilet fixtures shall be provided in accordance with *EPCOT Plumbing Code* Table 403.1 when the temporary occupant load is in addition to the original occupant load.

SECTION N-201 MATERIALS

N-201.1 General. All material used in the construction of membrane structures shall conform to the requirements of this Section or to applicable provisions of this Code.

N-201.2 Membrane. All membranes shall be classified as either Class I or II.

N-201.3 Class I. A Class I membrane shall comply with the requirements of Subsections N-201.7, N-201.8, N-201.9 and N-201.10.

N-201.4 Class II. A Class II membrane shall comply with the requirements of Subsections N-201.7, N-201.9 and N-201.10.

N-201.5 Interior liners. All interior liners, installed for decorative, acoustical, thermal insulation or other purposes shall comply with the requirements of Subsections N-201.6, N-201.8 and N-201.9.

N-201.6 Testing. All membranes shall be tested for flammability in accordance with the provisions of this Section.

N-201.7 Flame resistance. Membranes shall perform as specified in Table N-1 when tested in accordance with the provisions of the large and small scale tests of EPCOT Stan-

Standard 5-8. Membranes shall be tested both as produced and after accelerated weathering in accordance with EPCOT Standard 5-8.

The test report shall contain the actual performance of the fabric for each criteria.

The test shall be conducted with the following additional provisions:

- (a) Place a horizontal layer of dry, absorbent surgical cotton 12 inches below the bottom edge of the specimen. The cotton layer shall be approximately 20 inches square with a freestanding thickness of 1/4 inch.
- (b) No test specimen shall drip molten or flaming particles that ignite the cotton.

**TABLE N-1
NFPA 701 CRITERIA**

Maximum After Flame	2.0 seconds
Maximum Melt/Drip Flame Time	0.0 seconds
Maximum Length of Char or Destroyed Material	
Maximum Average of 10 Specimens	3 1/2 inches
Maximum for Any Specimen	4 1/2 inches

N-201.8 Combustibility. Membranes shall have a base fabric of material meeting the test requirements set forth in ASTM E136. The coated fabric shall have a potential heat of not more than 3,000 Btu/ft² as determined by tests conducted in accordance with NFPA 259.

N-201.9 Exterior exposure. All membranes shall be classified as to their resistance to exterior fire exposure when tested in accordance with ASTM E108. The minimum classification for membranes shall be Class C. The tests shall be conducted at a slope of 5:12. The test decks and conditions of classification of ASTM E108 shall be modified as follows:

- (a) **Test decks.**
 - 1. Membranes shall not be tested over a deck. Membranes shall be stretched over a frame to provide a test panel of the size specified for the test deck for the specific test being conducted.
 - 2. Membranes limited to use for air-supported structures may be attached to the top of an airtight chamber to provide a test panel of the size specified for the test being conducted. The chamber shall be pressurized to a level representative of the in-use conditions. The side and end panels of the chamber shall be of a material to enable viewing of the underside of the fabric test specimen.
 - 3. Membranes limited to use for air-inflated structures may be attached to a frame to provide a test panel of the size specified for the test being conducted and inflated to a pressure representative of the in-use pressure.

(b) **Conditions of classifications.** A membrane material must meet the following conditions when subjected to the particular class of fire tests:

- 1. At no time during or after the intermittent flame, spread of flame or burning brand test shall any portion of the membrane material be blown off or fall through the test specimen in the form of flaming or glowing brands that continue to glow after reaching the floor; or portions of the membrane fall away in the form of particles that continue to glow after reaching the floor.
- 2. At no time during the Class A, B or C intermittent flame tests, or the Class A or B burning brand tests, shall there be sustained flaming of the underside of the membrane. If flaming does occur, conduct another series of tests, during which no sustained flaming shall occur.
- 3. In the Class C burning brand tests, there may be sustained flaming on the underside of the membrane of not more than 20 percent of the brands applied.
- 4. During the spread of flame test, the flaming shall not spread beyond 6 feet for Class A, 8 feet for Class B and 13 feet (the top of the membrane) for Class C. There shall be no significant lateral spread of flame from the path directly exposed to the test flame.

N-201.10 Flame spread. All membranes, including interior liners, exposed to the interior of the building shall have a flame spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84. Membranes shall be mounted for testing on poultry netting as described in ASTM E84. Membranes shall not be bonded to a substrate.

**SECTION N-301
DESIGN**

N-301.1 General. Membrane structures that provide the complete enclosure for the occupied space shall be considered as complete buildings and subject to the requirements of this Section.

N-301.2 Location on property. Permanent membrane structures and tents shall have a horizontal separation greater than 30 feet.

Exception: Horizontal separations of 30 feet or less shall be permitted when an exterior wall is provided in accordance with Table 6.2 and the wall has a minimum fire-resistance rating of 1 hour. The exterior wall shall extend from ground level to the height where the slope of the tangent to the membrane structure or tent exceeds 30 degrees from the vertical, but in no case is less than 8 feet above the first-floor level.

There shall be a 15-foot minimum clear distance between temporary tents and permanent structures.

Temporary tents having an aggregate area of 15,000 square feet or more shall be located not less than 25 feet from

any other tent or 50 feet from any building or structure measured from the sidewall of the tent.

Exception: Exterior covered walkways without sidewalls may be used between tents or structures when not exceeding 15 feet in width and shall comply with all other separation requirements of this Section.

N-301.3 Height. Membrane structures and tents shall be limited to one story in height, but shall not be limited in number of feet to height.

N-301.4 Area. For determining allowable area, the construction type for a membrane structure shall be based on the support system. Air-supported membrane structures shall not exceed the allowable areas listed in Table 7.5 for Type IV unprotected construction.

N-301.5 Area increases permitted by Section 712 shall be permitted.

N-301.6 Occupancy separation. A permanent membrane structure building, which is occupied by more than one use group, shall comply with Section 502.

N-301.7 Mixed construction. Membrane structures shall be permitted to be utilized as specified in this Section as a portion of buildings of other types of construction. Height and area limits shall be as specified for the type of construction and occupancy of the building.

N-301.8 Class I membrane. A Class I membrane shall be permitted for use as the roof or as a skylight of any building or atrium of a building of any type of construction provided it is at least 20 feet above any floor, balcony or gallery, and has a horizontal separation greater than 15 feet from the edge of the membrane.

N-301.9 Class II membrane. A Class II membrane shall be permitted to be used as the roof or as a skylight on buildings of Types III, IV-Unprotected, V and VI construction provided it is at least 20 feet above any floor, balcony or gallery and has a horizontal separation greater than 15 feet from the edge of the membrane.

N-301.10 Air-inflated structures. Air-inflated, air-supported (inflatable) structures shall comply with the provisions of ASTM F2374.

SECTION N-401 STRUCTURAL

N-401.1 General. The design, materials and construction of the building shall be based upon plans and specifications by a licensed architect or engineer licensed by the state to practice as such.

N-401.2 Loads. The structure shall be designed and constructed to sustain all dead loads, loads due to tensioning or inflation, and live loads, including wind.

APPENDIX O
RESERVED

APPENDIX P

REGULATIONS COVERING BUILDING DEAD LOADS

SECTION P-101 OBJECTIVES

P-101.1 Purpose. The purpose of this Appendix is to ensure proper consideration of the building dead loads. The capacity of the building should be such that minor relocation of sprinklers, ducts, lights, or that minor interior decorating and remodeling will not require a structural check.

P-101.2 Scope. These loadings cover all buildings not specifically exempted by the Building Official. The loads are minimum and the structural engineer-of-record is responsible for all loadings and for ensuring larger loads are used if required. The loadings given will primarily be for systems, etc.

P-101.3 Special loads. The structural engineer-of-record shall see that any special considerations are addressed. These may be for equipment supports or systems that exceed the minimum, such as large ducts or large pipes that need to be supported beneath or suspended from above.

P-101.4 Drawings. On the drawings, each roof and floor plan shall show (preferably near the plan title) the design dead and live load. In the drawing notes, a typical floor and/or roof dead loads shall be broken down adequately to show how the design dead load was arrived at. This may include such items as roofing, framing, insulation, allowances for sprinklers, mechanical ducts, lights, wiring, ceilings or future ceilings, etc.

SECTION P-201 BUILDING DEAD LOAD REQUIREMENTS

P-201.1 Dead load minimum.

- (a) The dead loads used shall not be less than the actual constructed dead loads or reasonably anticipated loadings for that building to function at its permitted occupancy group.
- (b) All metal pre-engineered buildings shall use a 10-pound-per-square-foot (psf) collateral load or greater. The drawings shall show the design dead load of the framing system. The frame (purlins and girts are excluded) shall be capable of carrying a minimum 1,000-pound concentrated load on any point (not simultaneous with other live loads).
- (c) The following items, when used, shall not be less than the minimums given without special permission of the Building Official:

Steel Joist	3 psf
Mechanical Duct Allowance	4 psf
Sprinklers	1 psf
Lights	1 psf
Wiring	1psf
Ceilings	3 psf

APPENDIX Q

REGULATION OF ANIMAL SUPPORT FACILITIES

SECTION Q-101 ADMINISTRATIVE REQUIREMENTS

Q-101.1 Scope. The requirements of this Appendix shall apply to animal support facilities and their appurtenances hereafter constructed, erected, maintained, repaired or altered within the District. Such buildings and structures shall be classified as Group S, Division 8, in accordance with Table 5.1 and Subsection 516.1.

Q-101.2 Definition.

- (a) **Animal support facility.** A barn, stable, stall, room or building in which exotic, wild animals are housed, fed and maintained. Animal support facilities are distinguished from commercial stables and barns, and domestic tame animals as defined by Appendix H. Exterior corrals, paddocks or other fenced holding areas may be attached to these buildings.

Q-101.3 Criteria. The requirements of this Appendix shall supplement the provisions of this Code. Where a conflict may arise between the provision of this Code and Appendix, the requirements of the Appendix shall apply.

Q-101.4 Structural design. Structural design shall be subject to the requirements of Chapter 9. Structural design criteria for walls and fence assemblies providing animal containment shall be based on the following assumptions:

ANIMAL	HORIZONTAL FORCE	HEIGHT ABOVE GRADE OF LOAD APPLICATION
Bull Elephant	10,000 lbs	7'-0"
Female Elephant	8,000 lbs	7'-0"
Hippopotamus	4,000 lbs	4'-0"
Rhinoceros	4,000 lbs	4'-0"
Lion	500 lbs	5'-0"
Cheetah	100 lbs	4'-0"
Giraffe	1,600 lbs	8'-0"
All Other Animals	500 lbs	4'-0"

Q-101.5 Construction and materials. The type of construction and materials of construction shall conform to the requirements as set forth in Section Q-201 and as defined in this Code.

Q-101.6 Exits. Exits shall be provided in accordance with Section Q-301 and as defined in this Code.

Q-101.7 Fire protection. Fire protection of structural members shall be as set forth in Chapter 6 and EPCOT Standard 6-1.

Q-101.8 HVAC, plumbing, electrical design. Heating, ventilation, and air-conditioning (HVAC), plumbing and electrical design of buildings and structures housing Group S-8 occupancies shall be subject to the requirements of the *EPCOT*

Mechanical Code, the *EPCOT Plumbing Code* and the *EPCOT Electrical Code*.

SECTION Q-201 DESIGN, CONSTRUCTION AND FIRE PROTECTION

Q-201.1 Location on property. Building and structures housing Group S-8 occupancies shall be subject to the requirements of Chapter 7. The following exceptions shall apply for location on property and for fire protection of exterior openings:

- (a) Openings in walls of buildings housing Group S-8 occupancies shall not be required to be protected, except within 5 feet of an adjacent property line.
- (b) Roof eaves shall not extend beyond a point one-half the distance to the property line from an exterior wall, nor one-half the distance between adjacent Group S-8 buildings.
- (c) Minimum spacing between buildings housing Group S-8 occupancies shall be 16 feet.

Q-201.2 Construction. Building and structures housing Group S-8 occupancies shall be Type I, II, III or IV Unprotected.

Q-201.3 Area and height. Exterior corrals, paddocks or other fenced holding area attached to buildings and structures housing Group S-8 occupancies shall not be additive to calculated floor areas. If such exterior areas are partially or totally covered by extended roof structures integral with the building, the lines of primary structure supporting such roofed areas shall be considered "exterior wall lines" when determining location on property as set forth in Subsection Q-201.1.

(a) Type I	No Limit
(b) Type II	No Limit
(c) Type III	20,000 ft ² - 30 ft high
(d) Type IV Unprotected	26,000 ft ² - 30 ft high

Q-201.4 Use of materials. Interior and exterior stall and paddock fencing, doors and gates may be moisture-retardant-treated wood no less than 1½ inches net thickness secured to steel frames and supports as required.

Q-201.5 Sprinkler requirements.

- (a) Buildings and structures housing Group S-8 occupancies are not required to be provided with an automatic fire-extinguishing system, except at areas of the following usage:
 1. Rooms and/or spaces used for the storage of animal feed, such as sacked or openly stored grain and feed pellets, baled alfalfa and grain stalks, hay and straw bedding materials.

APPENDIX Q—REGULATION OF ANIMAL SUPPORT FACILITIES

2. Rooms and/or spaces occupied by animal keepers, including spaces where keeper's tack, equipment, materials and supplies are stored.
 3. Rooms and/or spaces housing building services, including mechanical, hydraulic and electrical equipment.
- (b) Sprinkler design may be based on a fire protection system utilizing a 2-inch to 2½-inch riser from domestic water service if the total protected area requires 10 heads or less.

Q-201.6 Fire alarm systems. All buildings and structures housing Group S-8 occupancies shall be provided with smoke detectors installed in accordance with Subsection 503.12(b).

Exceptions:

1. A Fire alarm control panel is not required. Detectors and water-flow switch monitoring on sprinkler systems shall report back to a constantly attended monitoring station.
2. Local audible alarms shall not be installed due to the possibility of creating unnecessary panic among the animals. Strobe light(s) shall be installed as a local fire alarm notification in lieu of audible alarms.

SECTION Q-301 EXITS AND EMERGENCY LIGHTING

Q-301.1 Occupant load. Occupant load in buildings and structures housing Group S-8 occupancies shall be taken for spaces occupied by human keepers and handlers only. Animal population counts and spaces, including transfer and keeper aisles, do not contribute to calculation of occupant load.

- (a) All exits for human occupancy shall be installed in accordance with Chapter 8.
- (b) Catwalks shall have at least two means of exit, one of which may be a ladder. No catwalk shall have more than one 20-foot dead end.

Q-301.2 Exit signs and emergency lighting. Buildings and structures housing Group S-8 occupancies shall be equipped with approved exit signs and emergency illumination for spaces occupied by human keepers and handlers as required by Section 813 and the *EPCOT Electrical Code*.

APPENDIX R

SWIMMING POOLS AND BATHING PLACES

SECTION R-101 ADMINISTRATIVE REQUIREMENTS

R-101.1 Public swimming pools and bathing places. Public swimming pools and bathing places shall comply with the design and construction standards of this Section.

Note: Other administrative and programmatic provisions may apply. [See Department of Health (DOH) Rule 64E-9, Florida Administrative Code (F.A.C.) and Chapter 514 of the Florida Statutes (F.S.)]

Exceptions:

1. Private pools and water therapy facilities connected with facilities connected with hospitals, medical doctors' offices and licensed physical therapy establishments shall be exempt from supervision under this Appendix.
2. (a) Pools serving no more than 32 condominium or cooperative units, which are not operated as a public lodging establishment, shall be exempt from supervision under this Appendix, except for water quality.
(b) Pools serving condominium or cooperative associations of more than 32 units and whose recorded documents prohibit the rental or sublease of the units for periods of less than 60 days are exempt from supervision under this Appendix, except that the condominium or cooperative owner or association must file applications with the Department of Building and Safety and obtain construction plans approval and permitting.

R-101.2 Definitions—general.

ABOVE-GROUND/ON-GROUND POOL. See “Swimming pool.”

BACKWASH PIPING. See “Filter waste discharge piping.”

BARRIER. A fence, wall, building wall or a combination thereof that completely surrounds the swimming pool and obstructs access to the swimming pool.

BATHING LOAD. The maximum number of persons allowed in the pool or bathing place at one time.

BODY FEED. Filter aid fed into a diatomite-type filter throughout the filtering cycle.

CARTRIDGE FILTER. A filter using cartridge-type filter elements.

CHEMICAL PIPING. Piping that conveys concentrated chemical solutions from a feeding apparatus to the circulation piping.

CIRCULATION PIPING SYSTEM. Piping between the pool structure and the mechanical equipment. Usually includes suction piping, face piping and return piping.

COLLECTOR TANK. A reservoir, with a minimum of 2.25 square feet of water surface area open to the atmosphere, from

which the recirculation or feature pump takes suction, which receives the gravity flow from the main drain line and surface overflow system or feature water source line, and that is cleanable.

COMBINATION VALVE. A multipart valve intended to perform more than one function.

DESIGN HEAD. Total head requirement of the circulation system at the design rate of flow.

D.E. The Diatomaceous Earth that is used as a filter aid in D.E.-type filters. For the purpose of this definition, it also includes alternative filter aids that have been approved in accordance with NSF/ANSI Standard 50-2007, and accepted by the filter manufacturer.

DIATOMITE (DIATOMACEOUS EARTH). A type of filter aid.

DIATOMITE-TYPE FILTER. A filter designed to be used with filter aid.

EFFECTIVE BARRIER. A barrier that consists of a building, or equivalent structure, plus a 48-inch minimum height fence on the remaining sides or a continuous 48-inch minimum height fence. All access through the barrier must have one or more of the following safety features: alarm, key lock or self-locking doors and gates. Safety covers that comply with the American Society for Testing Materials Standard F 1346-91 (2003) may also be considered as an effective barrier.

FACE PIPING. Piping with all valves and fittings, which is used to connect the filter system together as a unit.

FILTER. Any apparatus by which water is clarified.

FILTER AID. A nonpermanent type of filter medium or aid, such as diatomite, alum, etc.

FILTER CARTRIDGE. A disposable or renewable filter element that generally employs no filter aid.

FILTER ELEMENT. That part of a filter that retains the filter medium.

FILTER MEDIUM. Fine material that entraps the suspended particles and removes them from the water.

FILTER RATE. Average rate of flow per square foot of filter area.

FILTER ROCK. Specially graded rock and gravel used to support filter sand.

FILTER SAND. A specially graded type of permanent filter medium.

FILTER SEPTUM. That part of the filter element in a diatomite-type filter upon which a cake of diatomite or other nonpermanent filter aid may be deposited.

FILTER WASTE DISCHARGE PIPING. Piping that conducts waste water from a filter to a drainage system. Connec-

tion to drainage system is made through an air gap or other approved methods.

FRESH WATER. Those waters having a specific conductivity less than a solution containing 6,000 parts per million (ppm) of sodium chloride.

HIGH RATE SAND FILTER. A sand filter designed for flows in excess of 5 gallons per minute per square foot (gpm/ft²).

HOT TUB. See “Swimming pool.”

IN-GROUND POOL. See “Swimming pool.”

INLET FITTING. Fitting or fixture through which circulated water enters the pool.

INTERACTIVE WATER FEATURES. A structure designed to allow for recreational activities with recirculated, filtered and treated water, but having minimal standing water. Water from the interactive fountain type features is collected by gravity below grade in a collector tank or sump. The water is filtered, disinfected and then pumped to the feature spray discharge heads.

MAIN OUTLET. Outlet at the deep portion of the pool through which the main flow of water leaves the pool when being drained or circulated.

MARKING OR MARKINGS. The placement and installation of visual marking cues to help patrons identify step, bench and swimout outlines, slope break location, depth designations, and “NO ENTRY” and “NO DIVING” warnings. When markings are specified by this Code to be dark, the term dark shall mean a Munsell Color Value from zero to four.

MODIFICATION. Any act that changes or alters the original characteristics of the pool as approved. For example, changes in the recirculation systems, decking, treatment systems, disinfection system and pool shape are modifications.

PERIMETER OVERFLOW GUTTER. A level trough or ledge around the inside perimeter of the pool containing drains to clean the pool water surface.

PLUNGE POOL. The receiving body of water located at the terminus of a recreational water slide.

POOL. See “Swimming pool.”

POOL DEPTHS. The distance between the floor of the pool and the maximum operating water level.

POOL FLOOR. The interior pool bottom surface, which consists of that area from a horizontal plane up to a maximum of a 45-degree slope.

POOL PLUMBING. All chemical, circulation, filter waste discharge piping, deck drainage and water-filling system.

POOL TURNOVER. The circulation of the entire pool volume through the filter system. Pool volume shall be determined from the design water level, which is the normal operating water level; for gutter-type pools, the design water level is the horizontal plane of the upper lip of the gutter and for skimmer pools it is the centerline of the skimmer opening.

POOL WALL. The interior pool side surfaces, which consist of that area from a vertical plane to a 45-degree slope.

PORTABLE POOL. A prefabricated pool that may be erected at the point of intended use and may be subsequently disassembled and re-erected at a new location. Generally, installed on the surface of the ground and without excavation.

PRECOAT. In a diatomite-type filter, the initial coating or filter aid placed on the filter septum at the start of the filter cycle.

PRECOAT POT. A container with a valved connection to the suction side of the recirculation pump of a pressure D.E.-type filter system used for coating the filter with D.E. powder or NSF/ANSI Standard 50-2007 and manufacturer approved substitute filter aid.

PUBLIC SWIMMING POOL OR PUBLIC POOL. A water-tight structure of concrete, masonry or other approved materials, which is located either indoors or outdoors, used for bathing or swimming by humans, and filled with a filtered and disinfected water supply, together with buildings, appurtenances and equipment used in connection therewith. A public swimming pool or public pool shall mean a conventional pool, spa-type pool, wading pool, special-purpose pool or water recreation attraction, to which admission may be gained with or without payment of a fee and includes, but is not limited to, pools operated by or serving camps, churches, cities, counties, day care centers, group home facilities for eight or more clients, health spas, institutions, parks, state agencies, schools, subdivisions, or the cooperative living-type projects of five or more living units, such as apartments, boardinghouses, hotels, mobile home parks, motels, recreational vehicle parks and townhouses. The term does not include a swimming pool located on the grounds of a private residence.

RAPID SAND FILTER. A filter designed to be used with sand as the filter medium and for flows not to exceed 5 gpm/ft².

RECEPTOR. An approved plumbing fixture or device of such material, shape and capacity as to adequately receive the discharge from indirect waste piping, so constructed and located as to be readily cleaned.

RECIRCULATION SYSTEM. The system of piping and mechanics designed to remove the water from the pool then filter, disinfect and return it to the pool.

RETURN PIPING. That portion of the circulation piping that extends from the outlet side of the filters to the pool.

SALINE WATER. Those waters having a specific conductivity in excess of a solution containing 6,000 ppm of sodium chloride.

SEPARATION TANK. A device used to clarify filter rinse or waste water. Sometimes called a reclamation tank.

SKIM FILTER. A surface skimmer combined with a vacuum diatomite filter.

SLIP RESISTANT. Having a textured surface that is not conducive to slipping under contact of bare feet unlike glazed tile or masonry terrazzo and nontextured plastic materials. Manufactured surface products shall be designated by the manufacturer as suitable for walking surfaces in wet areas.

SPA, NONPORTABLE. See “Swimming pool.”

SPA POOL. A pool used in conjunction with high-velocity air or water.

SPA, PORTABLE. Nonpermanent structure intended for recreational bathing, in which all controls, water heating and water circulating equipment are an integral part of the product and which is cord-connected (not permanently electrically wired).

SPECIAL-PURPOSE POOL. A public pool used exclusively for a specific, supervised purpose, including spring-board or platform diving training, SCUBA diving instruction, and aquatic programs for persons with disabilities, and preschool or kindergarten children.

SUCTION PIPING. That portion of the circulation piping located between the pool structure and the inlet side of the pump, and usually includes main outlet piping, skimmer piping, vacuum piping and surge tank piping.

SURFACE SKIMMER. A device generally located in the pool wall that skims the pool surface by drawing pool water over a self adjusting weir.

SWIM SPA. A pool used in conjunction with a directional flow of water against which one swims.

SWIMMING POOL. Any structure intended for swimming or recreational bathing that contains water more than 24 inches deep. This includes in-ground, above-ground and on-ground swimming pools, hot tubs and spas.

SWIMMING POOL, INDOOR. A swimming pool that is totally contained within a structure and surrounded on all four sides by walls of said structure.

SWIMMING POOL, OUTDOOR. Any swimming pool that is not an indoor pool.

SWIMMING POOL, PRIVATE. Any structure intended for and restricted to the use of a single dwelling unit, located in a residential area, that is intended for swimming or recreational bathing and contains water over 24 inches deep, including but not limited to inground, aboveground and onground swimming pools, hot tubs and nonportable spas.

SWIMMING POOL SLIDE. A slide designed by its manufacturer to discharge over the sidewall of a swimming pool.

SWIMMING POOL, RESIDENTIAL. That which is intended for noncommercial use.

TURNOVER TIME. The time, in hours, required for the circulation system to filter and recirculate a volume of water equal to the pool volume.

VACUUM FITTING. A fitting in the pool that is used as a convenient outlet for connecting the underwater suction cleaning equipment.

VACUUM PIPING. The piping from the suction side of a pump connected to a vacuum fitting located at the pool and below the water level.

WADING POOL. A shallow pool designed to be used by children.

WASTE PIPING. See “Filter waste discharge piping.”

WATER ACTIVITY POOL. A water recreation attraction that has water-related activities, such as rope ladders, rope swings, cargo nets and other similar activities.

WATER RECREATION ATTRACTION. A facility with design and operational features that provide patrons recreational activity and purposefully involves immersion of the body, partially or totally, in the water. Water recreation attractions include water slides, river rides, water course rides, water activity pools, interactive water features and wave pools, and any additional pool within the boundaries of the attraction.

WATER SLIDES. A water recreation attraction ride that is characterized by having trough-like or tubular flumes or chutes.

WATER THEME PARK. A complex with controlled access, fenced and gated attractions where guests enter through a limited number of entrances upon purchase of a ticket. These facilities are permanent and consist of multiple water recreation attractions. Lifeguards are present during all operating hours.

WATER THERAPY FACILITIES. As used in Section 514.0115(1), F.S., are pools used exclusively for water therapy to treat a diagnosed injury, illness or medical condition, wherein the therapy is provided under the direct supervision of a Florida-licensed physical therapist, occupational therapist or athletic trainer; pursuant to a prescription by a physician or a physician’s assistant (PA) licensed pursuant to Chapters 458 or 459, F.S., a podiatrist licensed pursuant to Chapter 461, F.S., or an advanced registered nurse practitioner (ARNP) licensed pursuant to Chapter 464, F.S.; and the prescribing physician, PA, podiatrist or ARNP, authorizes a plan of treatment justifying use of the pool for health care purposes.

WAVE POOL. A water recreation attraction that is characterized by wave action.

WET DECK AREA. The 4-foot-wide, unobstructed pool deck area around the outside of the pool water perimeter, curb, ladders, handrails, diving boards, diving towers, or pool slides, waterfalls, water features, starting blocks, planters or lifeguard chairs.

WIDTH AND/OR LENGTH. Actual water dimension taken from wall to wall at the maximum operating water level.

ZERO DEPTH ENTRY POOL. A pool where the pool floor continues to slope upward to a point where it meets the surface of the water and the pool deck.

R-101.3 General. This Appendix prescribes minimum design, construction, and operation requirements.

R-101.3.1 Where adequate standards do not exist and these rules do not provide sufficient guidance for consideration of innovations in design, construction, and operation of proposed swimming pools or water recreation attractions, the department will establish requirements necessary to protect the health and safety of the pool patrons.

R-101.3.2 All pools that do not meet the definition of private pools are public pools.

R-101.3.3 The Americans with Disabilities Act of 1990 may relate to public pools and should be reviewed by the design engineer and the pool owner.

R-101.3.4 Sizing. The bathing load for conventional swimming pools, wading pools, interactive water features, water activity pools less than 24 inches deep, and special-purpose pools shall be computed on the basis of one person per 5 gpm of recirculation flow. The bathing load for spa-type pools shall be based on one person per each 10 square feet of surface area. The filtration system for swimming pools shall be capable of meeting all other requirements of these rules while providing a flowrate of at least 1 gpm for each living unit at transient facilities and $\frac{3}{4}$ gpm at nontransient facilities. Recreational vehicle sites, campsites and boat slips designated for live-aboards shall be considered a transient living unit. For properties with multiple pools, this requirement includes the cumulative total gpm of all swimming pools, excluding spas, wading pools and interactive water features. All other types of projects shall be sized according to the anticipated bathing load and proposed uses. For the purpose of determining minimum pool size only, the pool turnover period used cannot be less than 3 hours.

SECTION R-102 SWIMMING POOL CONSTRUCTION STANDARDS

R-102.1 Standards. The design, equipment, operation installation, new construction and rehabilitation of pools shall be in accordance with the following standards:

- (a) ANSI/NSPI-1, *Standard for Public Swimming Pools*, 2003
- (b) ANSI/NSPI-2, *Standard for Public Spas*, 1999
- (c) ANSI/APSP-7, *Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs and Catch Basins*, 2006

R-102.2 Pool structure. Pools shall be constructed of concrete or other impervious and structurally rigid material. All pools shall be water tight, free from structural cracks and shall have a nontoxic, smooth and slip-resistant finish. All materials shall be installed in accordance with manufacturer's specifications unless such specifications violate Chapter 64E-9, (F.A.C.), rule requirements or the approval criteria of NSF/ANSI Standard 50-2007 or NSF/ANSI Standard 60-2005.

- (a) Floors and walls shall be white or pastel in color and shall have the characteristics of reflecting rather than absorbing light. Tile used in less than 5 feet of water must be slip resistant. A minimum 4-inch tile line, each a minimum size of 1 inch on all sides shall be installed at the water line, but shall not exceed 12 inches in height if a dark color is used. Gutter-type pools may substitute 2-inch tile, each a minimum size of 1 inch on all sides, along the pool wall edge of the gutter lip.
- (b) One-inch square tile may be used if the licensed contractor provides a signed written certification to the approving department engineer that the adhesive used on the 1-inch square tile has a manufacturer's tested shear strength of at least 250 pounds per square inch (psi) and the manufacturer has specified the adhesive for use underwater to adhere the type of tile used [vit-

reous (glass) or ceramic]. Tiles shall not have sharp edges exposed that could cause bather injury.

R-102.3 Dimensions.

R-102.3.1 Dimensional standards. Dimensional standards for competition-type pools shall be those published by the National Collegiate Athletic Association, 1998; Federation Internationale de Natation Amateur (FINA), 1998-2000 Handbook; 1998-1999 Official Rules of Diving & Code Regulation of United States Diving Inc.; 1998 United States Swimming Rules and Regulations; and National Federation of State High School Associations, 1997-1998, which are incorporated by reference in this Code.

R-102.3.2 Walls and corners. All pool walls shall have a clearance of 15 feet perpendicular to the wall (as measured at design water level from gutter lip to gutter lip, or on skimmer pools, from vertical wall to vertical wall). Offset steps, spa coves, spa pools and wading pools, are exempt from this clearance requirement. Where interior steps protrude into the pool resulting in less than 15 feet of clearance from any wall, such protrusion shall not exceed 6 feet on any perpendicular line from a tangent to any pool wall from which the steps emanate. The upper part of pool walls in areas 5 feet deep or less shall be within 5 degrees vertical for a minimum depth of $2\frac{1}{2}$ feet from which point the wall may join the floor with a maximum radius equal to the difference between the pool depth and $2\frac{1}{2}$ feet. The upper part of pool walls in areas more than 5 feet deep shall be within 5 degrees vertical for a minimum depth equal to the pool water depth minus $2\frac{1}{2}$ feet from which point the wall may join the floor with a maximum radius of $2\frac{1}{2}$ feet. Corners shall be a minimum 90-degree angle. The corner intersections of walls that protrude or angle into the pool water area shall be rounded with a minimum radius of 2 inches. This radius shall be continued through the top of the gutter edge; chamfering is allowed. Pool coping shall not overhang into the pool more than $1\frac{1}{2}$ inches.

R-102.3.3 Pool floor slope and slope transition. The radius of curvature between the floor and walls is excluded from these requirements. Multiple floor levels in pools are prohibited.

R-102.3.3.1 Floor slope shall be uniform. The floor slope shall be a maximum one unit vertical in 10 units horizontal and a minimum of one unit vertical in 40 units horizontal in areas 5 feet deep or less. The floor slope shall be a maximum one unit vertical in three units horizontal in areas more than 5 feet deep.

R-102.3.3.2 Any transition in floor slope shall occur at a minimum of 5 feet of water depth. A slope transition must have a 2- to 6-inch-wide dark contrasting tile marking across the bottom and must extend up both sides of the pool at the transition point. The marking shall be continuous, except for recessed grouting. A slope transition must have a safety line mounted by use of recessed cup anchors, 2 feet before the contrasting marking, towards the shallow end. The safety line shall have visible floats at maximum 7 feet intervals.

R-102.3.4 Pool depths. The minimum water depth shall be 3 feet in shallow areas and 4 feet in deep areas.

R-102.4 Markings.

R-102.4.1 Depths and markings. Depth and markings shall meet the following criteria:

- (a) The minimum water depth shall be 3 feet in shallow areas and 4 feet in deep areas.
- (b) Permanent depth markings followed by the appropriate full or abbreviated words “FEET,” “FT” or “INCHES,” “IN” shall be installed in minimum 4-inch-high numbers and letters on a contrasting background. Depth markers shall indicate the actual pool depth, within 3 inches, at normal operating water level when measured 3 feet from the pool wall. Symmetrical pool designs with the deep point at the center may be allowed provided a dual marking system is used that indicates the depth at the wall and at the deep point.
- (c) At a minimum, the markings shall be located on both sides of the pool at the shallow end, slope break, deep-end wall and deep point (if located more than 5 feet from the deep-end wall). Depth markings shall be legible from inside the pool and also from the pool deck. The maximum perimeter distance between depth markings is 25 feet. Pool size and geometry may necessitate additional depth marking placements about all sides of the pool to meet this requirement.
- (d) When a curb is provided, the depth markings shall be installed on the inside and outside or top of the pool curb. When a pool curb is not provided, the depth markings shall be located on the inside vertical wall at or above the water level and on the edge of the deck within 2 feet of the pool water. When open-type gutter designs are utilized, depth markers shall be located on the back of the gutter wall.
- (e) When deck-level perimeter overflow systems are utilized, additional depth marking signs shall be posted nearby or placed on adjacent fencing or walls, and the size shall be increased so they are recognizable from inside the swimming pool. Alternatively, tile depth markers may be placed at the top of the pool wall just under the water level. Depth markers placed on the pool deck shall be within 3 feet of the water.
- (f) Those areas of the pool that are not part of an approved diving bowl shall have dark contrasting tile, 4-inch-high “NO DIVING” markings installed along the perimeter of the pool on the top of the pool curb or deck within 2 feet of the pool water with a maximum perimeter distance of 25 feet between markings. A 6-inch tile with a 4-inch or larger red, international “NO DIVING” symbol may be substituted for the “NO DIVING” markings.
- (g) All markings shall be tile, except that pools constructed of fiberglass, thermoplastic or stainless steel may substitute other type markings when it

can be shown that said markings are permanent and will not fade over time. This exemption does not extend to concrete pools that are coated with fiberglass. Tile alternative examples include stone or manufactured plaques with engraved or sandblasted numbers and characters with permanent paint. Permanent appliques may be used for fiberglass, thermoplastic or stainless steel pools. All markings installed on horizontal surfaces shall have a slip-resistant finish. Markings shall be flush with the surrounding area where placed and recessed, if necessary, to provide a smooth finish that will avoid creation of an injury hazard to bathers. Pools that are not conducive to tile can employ other equivalent markings as previously stated.

R-102.4.2 Designs or logos. Any design or logo on the pool floor or walls shall be such that it will not hinder the detection of a human in distress, algae, sediment or other objects in the pool, and written approval must be obtained from the department prior to installation.

R-102.4.3 Lane markings. Pools that are not intended to be utilized for officially sanctioned competition may install lap lane markings provided they meet the following criteria: The markings must be 2 to 6 inches wide; they must terminate 5 feet from the end wall in a “T” with the “T” bar at least 18 inches long; they must be placed at 7-foot intervals on center; and be no closer than 4 feet from any sidewall, steps or other obstructions. Floating rope lines associated with lap lanes must not obstruct the entrance or exit from the pool and are prohibited when the pool is open for general use.

R-102.4.4 Targets. Pools that are not intended for officially sanctioned competition may have a 2- to 6-inch-wide, 18-inch by 18-inch target (+) installed on the pool wall.

R-102.5 Color. Pool floors and walls shall be white or light pastel in color and shall have the characteristic of reflecting rather than absorbing light.

Exception: A dark color may be used if (1) a tile line (minimum 4 inches, maximum 12 inches) is installed at the water line or (2) if 2-inch tile is installed along the pool wall edge of the gutter lip for gutter-type pools.

R-102.6 Access. All pools shall have a means of access every 75 feet of pool perimeter with a minimum of two, located so as to serve both ends of the pool. In addition, an access point shall be provided at the deep portion, if the deep portion is not at one end of the pool. When the deep portion of the pool is more than 30 feet wide, both sides of this area shall have a means of access. Access shall consist of ladders, stairs, recessed treads or swimouts, and may be used in combination. All treads shall have a slip-resistant surface.

R-102.6.1 Ladders. Ladders shall be of the cross-braced type, constructed of corrosion-resistant materials and securely anchored into the pool deck. Clearance between the ladder and pool wall shall be between 3 to 6 inches. Ladders shall extend at least 28 inches and not more than 40 inches above the pool deck. Ladder bottom braces shall have intact end caps or bumpers that rest firmly against the pool wall. The top rung of the ladder shall be at or below

the water level on open gutter pools and not more than 12 inches below the deck or curb top on all other type pools.

R-102.6.2 Recessed treads. Recessed treads shall be installed flush with the wall and shall be a minimum 5 inches wide, 10 inches long, with a maximum vertical distance of 12 inches between treads.

R-102.6.3 Stairs. Stairs shall have a minimum tread width of 10 inches and a maximum width of 48 inches for a minimum tread length of 24 inches and a maximum riser height of 10 inches. Treads and risers between the top and bottom treads shall be uniform to within $\frac{1}{2}$ inch in width and height. The riser heights shall be measured at the marked step edges and the differences in elevation shall be considered the riser heights. The front $\frac{3}{4}$ to 2 inches of the tread and the top 2 inches of the riser shall be tile, dark in color, contrasting with the interior of the pool. Tile shall be slip resistant. Bullnose tile that is slip resistant may be used when the $\frac{3}{4}$ -inch segment is placed on the tread or horizontal surface and the 2-inch segment is placed on the riser or vertical surface. Where the gutter is used as the top step, the tile on the gutter for the width of the steps shall be slip resistant. Vinyl liner and fiberglass pools may use other material for the step edge marking, provided the material is permanent, permanently secured, dark in color, nonfading and slip resistant.

R-102.6.4 Swimouts. Swimouts shall extend 18 to 24 inches back from the pool wall, shall be 4 to 5 feet wide; a maximum of 12 inches below the deck, unless stairs are provided in the swimout; and located only in areas of the pool greater than 5 feet deep. Pools that do not utilize a continuous perimeter overflow system must provide a wall return inlet in the swimout for circulation. A permanent, dark, contrasting colored band of tile shall be installed at the intersection of the pool wall and the swimout, and must extend 2 inches on the horizontal and vertical surfaces. Tile must be slip resistant. Bullnose tile may be substituted and installed in accordance with Subsection R-102.6.3.

R-102.6.5 Handrails and grabrails. Handrails shall be provided for all stairs, and shall be anchored in the bottom step and the deck. Where “figure 4” deck-mounted-type handrails are used, they shall be anchored in the deck and extend laterally to any point vertically above the bottom step. Grabrails must be mounted in the pool deck at each side of recessed steps. Handrails and grabrails shall extend between 28 and 40 inches above the step edge and deck.

R-102.6.6 Disabled access. Permanent or portable steps, ramps, handrails, lifts or other devices designed to accommodate disabled individuals in swimming pools may be provided. Lifts mounted into the pool deck shall have a minimum 4-foot-wide deck behind the lift mount.

R-102.7 Obstructions. The pool water area shall be unobstructed by any type structure unless justified by engineering design as a part of the recirculation system. Engineering design and material specifications shall show that such structures will not endanger the pool patron, can be maintained in a sanitary condition, and will not create a problem for sani-

tary maintenance of any part of the pool, pool water or pool facilities. Structures in accordance with this Subsection shall not be located in a diving bowl area or within 15 feet of any pool wall.

Exceptions:

1. Stairs, ladders and ramps, necessary for entrance/exit from the pool are not considered obstructions.
2. Underwater seat benches may be installed in areas less than 5 feet deep. Bench seats must be 14 to 18 inches wide and must have a dark contrasting tile marking on the seat edge extending 2 inches on the horizontal and vertical surface. Tile shall be slip resistant. Bullnose tile may be substituted and installed in accordance with Subsection R-102.6.3. Vinyl liner, stainless steel and fiberglass pools may use other material for the bench-edge marking as detailed in Subsection R-102.4.1(g), provided the material is permanently secured, dark in color, nonfading and slip resistant. Benches shall not protrude into the 15-foot clearance requirement of this Subsection.

R-102.8 Diving areas. Diving facilities shall meet the minimum requirements of the FINA dimensions for diving facilities in accordance with the 2005-2009 FINA Handbook and include the following:

- (a) Diving boards or platforms with heights of less than the established standard shall meet the dimensional requirements of the next greater height.
- (b) Diving boards, platforms and ladders shall have a non-absorbent, slip-resistant finish and be of sufficient strength to safely carry the anticipated loads. Diving equipment 1 meter and greater shall have guardrails, which extend to the edge of the pool wall. All diving boards more than 21 inches from the deck shall be provided with a ladder. Diving boards or platforms shall not be installed on curved walls where the wall enters into the defined rectangular diving area specified in this Subsection. Adjacent platform and diving boards shall be parallel.
- (c) The location of pool ladders shall be such that the distance from the ladder to any point on a diving board or platform centerline is not less than the plummet to sidewall dimension (b) indicated in the FINA standards. Trampoline-type diving facilities are prohibited.
- (d) Diving targets may be installed in accordance with FINA standards.

SECTION R-103 POOL APPURTENANCES

R-103.1 Decks and walkways.

R-103.1.1 Pool wet decks shall be constructed of concrete or other nonabsorbent material having a smooth, slip-resistant finish. Wet deck area finishes shall be designed for such use and shall be installed in accordance with the manufacturer’s specifications. Wooden decks and walkways are prohibited.

R-103.1.2 Pool wet decks shall be uniformly sloped at a minimum of 2 percent to a maximum of 4 percent away from the pool or to deck drains to prevent standing water. Textured deck finishes that provide pitting and crevices of more than $\frac{3}{16}$ -inch deep that accumulate soil are prohibited. If settling or weathering occurs that would cause standing water, the original slopes shall be restored or corrective drains installed. When a curb is provided, the deck shall not be more than 10 inches below the top of the curb.

R-103.1.3 Pool wet decks shall have a minimum unobstructed width of 4 feet around the perimeter of the pool, pool curb, ladders, handrails, diving boards, diving towers and slides.

R-103.1.4 Traffic barriers shall be provided, as needed, so that parked vehicles do not extend over the deck area.

R-103.1.5 Walkways shall be provided between the pool and sanitary facilities, and shall be constructed of concrete or other nonabsorbent material having a smooth, slip-resistant finish for the first 15 feet of the walkway measured from the nearest pool water's edge. A hose bibb with a vacuum breaker shall be provided to allow the deck to be washed down with potable water.

R-103.1.6 Ten percent of the deck along the pool perimeter may be obstructed. Obstructions shall have a wet deck area behind or through them, with the near edge of the walkways within 15 feet of the water, except approved slide obstructions shall have the near edge of the walkways within 35 feet of the water. These obstructions must be protected by a barrier or must be designed to discourage patron access. When an obstruction exists in multiple areas around the pool, the minimum distance between obstructions shall be 4 feet.

R-103.1.7 Food or drink service facilities shall not be located within 12 feet of the water's edge.

R-103.1.8 The vertical clearance above the pool deck shall be at least 7 feet.

R-103.1.9 All public pools shall be surrounded by a minimum 48-inch-high fence or other approved substantial barrier. The fence shall be continuous around the perimeter of the pool area that is not otherwise blocked or obstructed by adjacent buildings or structures, and shall adjoin with itself or abut to the adjacent members. Access through the barrier or fence shall be through self-closing, self-latching lockable gates of 48-inch minimal height from the floor or ground with the latch located a minimum of 54 inches from the bottom of the gate or at least 3 inches below the top of the gate on the pool side. Doors opening into the pool area from dwelling units, such as homes, apartments, hotel rooms and motel rooms, shall be self-closing and self-latching. If the self-closing, self-latching gate is also self-locking and is operated by a key lock, electronic opener or integral combination lock, then the operable parts of such locks or openers shall be 34 inches minimum and 48 inches maximum above the finished floor or ground. Gates shall open outward away from the pool area. A latched, lockable gate shall be placed in the fence within 10 feet of the closest point

between the pool and the equipment area for service access.

Instead of a fence, permanent, natural or man-made features, such as bulkheads, canals, lakes, navigable waterways, etc., adjacent to a pool may be permitted as a barrier when approved. When evaluating such barrier features, the applicable governing body may perform onsite inspections, and review evidence, such as surveys, aerial photographs, water management agency standards and specifications, and any other similar documentation to verify, at minimum, the following: The barrier feature is not subject to natural changes, deviations or alterations, and is capable of providing an equivalent level of protection as that provided by a structure, and the barrier feature clearly impedes, prohibits or restricts access to the pool.

Screened pool enclosures shall be provided with solid surfaces or have framing members spaced so that a 4-inch sphere can not pass on the bottom 3 feet to be considered a barrier. Safety covers shall not satisfy this requirement.

R-103.1.9.1 Barriers.

R-103.1.9.1.1 Outdoor swimming pools. Outdoor swimming pools shall be provided with a barrier complying with Subsections R-103.1.9.1.1.1 through R-103.1.9.1.1.8.

Exception: Water recreation attractions and specialized pools.

R-103.1.9.1.1.1 The top of the barrier shall be at least 48 inches above grade measured on the side of the barrier that faces away from the swimming pool. The maximum vertical clearance between grade and the bottom of the barrier shall be 2 inches measured on the side of the barrier that faces away from the swimming pool. Where the top of the pool structure is above grade, the barrier may be at ground level or mounted on top of the pool structure. Where the barrier is mounted on top of the pool structure, the maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 4 inches.

R-103.1.9.1.1.2 The barrier may not have any gaps, openings, indentations, protrusions or structural components that could allow a young child to crawl under, squeeze through or climb over the barrier as herein described. One end of a removable child barrier shall not be removable without the aid of tools. Openings in any barrier shall not allow passage of a 4-inch-diameter sphere.

R-103.1.9.1.1.3 Solid barriers that do not have openings shall not contain indentations or protrusions, except for normal construction tolerances and tooled masonry joints.

R-103.1.9.1.1.4 Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches, the horizontal members shall be located on the swimming pool side of the

fence. Spacing between vertical members shall not exceed $1\frac{3}{4}$ inches in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed $1\frac{3}{4}$ inches in width.

R-103.1.9.1.1.5 Where the barrier is composed of horizontal and vertical members, and the distance between the tops of the horizontal members is 45 inches or more, spacing between vertical members shall not exceed 4 inches. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed $1\frac{3}{4}$ inches in width.

R-103.1.9.1.1.6 Maximum mesh size for chain link fences shall be a $2\frac{1}{4}$ -inch square unless the fence is provided with slats fastened at the top or bottom that reduce the openings to no more than $1\frac{3}{4}$ inches.

R-103.1.9.1.1.7 Where the barrier is composed of diagonal members, the maximum opening formed by the diagonal members shall be no more than $1\frac{3}{4}$ inches.

R-103.1.9.1.1.8 Access gates, when provided, shall be self-closing, shall comply with the requirements of Subsections R-103.1.9.1.1.1 through R-103.1.9.1.1.7 and shall be equipped with a self-latching locking device located on the pool side of the gate. Where the operable part of the latch device release is located no less than 54 inches above the latch-side deck surface, the device release mechanism may be located on either side of the gate and so placed that it cannot be reached by a young child over the top or through any opening or gap from the outside. Gates that provide access to the swimming pool must open outward away from the pool. The gates and barrier shall have no opening greater than $\frac{1}{2}$ inch within 18 inches of the release mechanism.

Exception: If the self-closing, self-latching gate is also self-locking and is operated by a key lock, electronic opener or integral combination lock, then the operable parts of such locks or openers shall be 34 inches minimum and 48 inches maximum above the finish floor or ground.

R-103.2 Bridges and overhead obstructions. Bridges and overhead obstructions over the pool shall be designed so they will not introduce any contamination to the pool water. The minimum height of the bridge or obstruction shall be at least 8 feet from the bottom of the pool and at least 4 feet above the surface of the pool. Minimum 42-inch-high handrails shall be provided along each side of the bridge. The walking surfaces shall be constructed of concrete or other nonabsorbent mate-

rial having a smooth, slip-resistant finish. Pool coping shall not overhang into the pool more than $1\frac{1}{2}$ inches.

SECTION R-104 ELECTRICAL SYSTEMS

R-104.1 Electrical equipment and wiring. Electrical equipment wiring and installation, including the grounding of pool components, shall conform with the *National Electrical Code*.

R-104.2 Lighting. Artificial lighting shall be provided at all swimming pools, which are to be used at night or which do not have adequate natural lighting, so that all portions of the pool, including the bottom, may be readily seen without glare.

R-104.2.1 Outdoor pool lighting. Lighting shall provide a minimum of 3 footcandles of illumination at the pool water surface and the pool wet deck surface. Underwater lighting shall be a minimum of $\frac{1}{2}$ watt per square foot of pool water surface area.

R-104.2.2 Indoor pool lighting. Lighting shall provide a minimum of 10 footcandles of illumination at the pool water surface and the pool wet deck surface. Underwater lighting shall be a minimum of $\frac{8}{10}$ watt per square foot of pool surface area.

R-104.2.3 Underwater lighting. Underwater lighting shall utilize transformers and low-voltage circuits with each underwater light being grounded. The maximum voltage for each light shall be 15 volts and the maximum incandescent lamp size shall be 300 watts. The location of the underwater lights shall be such that the underwater illumination is as uniform as possible and shall not be less than 18 inches below the normal operating water level determined by the centerline of the skimmer or top lip of the gutter. All underwater lights, which depend upon submersion for safe operation, shall have protection from overheating when not submerged. Underwater lighting requirements can be waived when the overhead lighting provides at least 15 footcandles of illumination at the pool water surface and pool wet deck surface. Alternative lighting systems that use 15 volts or less, or use no electricity in the pool or on the pool deck, such as light emitting diode (LED) or fiber optic systems, may be utilized if the applicant demonstrates to reasonable certainty that the system development has advanced to the point where the department is convinced that the pool illumination is equal to the requirements in Subsections R-104.2.1 and R-104.2.2.

R-104.2.4 Overhead wiring. Overhead service wiring shall not pass within an area extending a distance of 10 feet horizontally away from the inside edge of the pool walls, diving structures, observation stands, towers or platforms. Allowances for overhead conductor clearances to pools that meet the safety standards in the NEC may be used instead. Electrical equipment wiring and installation included in the grounding of pool components shall comply with the NEC.

**SECTION R-105
EQUIPMENT AREA OR ROOMS**

R-105.1 Outdoor equipment. Equipment designated by the manufacturer for outdoor use may be located in an equipment area; all other equipment must be located in an equipment room or enclosure. Plastic pipe subject to a period of prolonged sunlight exposure must be coated to protect it from ultraviolet-light (UV) degradation. An equipment area shall be surrounded with a fence at least 4 feet high on all sides not confined by a building or equivalent structure. A self-closing and self-latching gate with a permanent locking device shall be provided if necessary for access. An equipment room shall be protected on at least three sides and overhead. Any fence or gate installed shall use members spacing that shall not allow passage of a 4-inch-diameter sphere. The fourth side may be a gate, fence or open if otherwise protected from unauthorized entrance. An equipment enclosure shall be lockable or otherwise protected from unauthorized access.

R-105.2 Indoor equipment. Equipment not designated by the manufacturer for outdoor use shall be located in an equipment room. An equipment room shall be protected on at least three sides and overhead. The fourth side may be a gate, fence or open if otherwise protected from unauthorized entrance.

R-105.3 Materials. The equipment enclosure, area or room floor shall be of concrete or other nonabsorbent material having a smooth, slip-resistant finish, and shall have positive drainage, including a sump pump if necessary. Ancillary equipment, such as a heater, not contained in an equipment enclosure or room, shall necessitate an equipment area as previously described.

R-105.4 Ventilation. Equipment rooms shall have either forced draft or cross ventilation. All below-grade equipment rooms shall have a stairway access with forced draft ventilation or a fully louvered door and powered intake within 6 inches of the floor. Where stairway access is not necessary to carry heavy items into the below-grade room or vault, a “ship’s ladder” may be used, if specified by the design engineer who must consider anticipated workload, including equipment removal; the ladder slope, tread height and width; and construction material of the ladder.

R-105.5 Access. The opening to equipment room or area shall be a minimum 3 feet by 6 feet and shall provide easy access to the equipment.

R-105.6 Size. The size of the equipment enclosure, room or area shall provide working space to perform routine operations. Clearance shall be provided for all equipment as prescribed by the manufacturer to allow normal maintenance operation and removal without disturbing other piping or equipment. In rooms with fixed ceilings, the minimum height shall be 7 feet.

R-105.7 Lighting. Equipment rooms or areas shall be lighted to provide 30 footcandles of illumination at floor level.

R-105.8 Storage. Equipment enclosures, rooms or areas shall not be used for storage of chemicals emitting corrosive fumes or for storage of other items to the extent that entrance to the room for inspection or operation of the equipment is impaired.

R-105.9 Hose bibs. A hose bibb with vacuum breaker shall be located in the equipment room or area.

**SECTION R-106
PLUMBING SYSTEMS**

R-106.1 Sanitary facilities. Swimming pools with a bathing load of 20 persons or less may utilize a unisex restroom. Pools with bathing loads of 40 persons or less may utilize two unisex restrooms or meet the requirements of Table R-106.1. Unisex restrooms shall meet all the requirements for materials, drainage and signage as indicated in Subsections R-106.1.1 through R-106.1.4. Each shall include a water closet, diaper changing table, urinal and lavatory. Pools with a bathing load larger than 40 persons shall provide separate sanitary facilities labeled for each sex. The entry doors of all restrooms shall be located within a 200-foot walking distance of the nearest water’s edge of each pool served by the facilities.

Exception: Where a swimming pool serves only a designated group of residential dwelling units and not the general public, pool-side sanitary facilities are not required if all living units are within a 200-foot horizontal radius of the nearest water’s edge, are not more than three stories in height unless serviced by an elevator, and are each equipped with private sanitary facilities.

R-106.1.1 Required fixtures. Fixtures shall be provided as indicated in Table R-106.1. The fixture count in this Table is deemed to be adequate for the pool and pool deck area that is up to three times the area of the pool surface provided.

When multiple fixture sets are required and separate facilities are provided for each sex, the fixtures used in ancillary family-style restrooms can be used to meet the requirements of this Subsection.

One diaper changing table shall be provided at each restroom. Diaper changing tables are not required at restrooms where all pools served are restricted to adult use only. Swim diapers are recommended for use by children that are not toilet trained. Persons that are ill with diarrhea can not enter the pool.

**TABLE R-106.1
PUBLIC SWIMMING POOL—REQUIRED FIXTURE COUNT**

MEN’S RESTROOM			
SIZE OF POOL	URINALS	WC	LAVATORY
0 – 2,500 square feet	1	1	1
2,501 – 5,000 square feet	2	1	1
5,001 – 7,500 square feet	2	2	2
7,501 – 10,000 square feet	3	2	3
WOMEN’S RESTROOM			
SIZE OF POOL	URINALS	WC	LAVATORY
0 – 2,500 square feet	0	1	1
2,501 – 5,000 square feet	0	5	1
5,001 – 7,500 square feet	0	6	2
7,501 – 10,000 square feet	0	8	3

Note: An additional set of fixtures shall be provided in the men’s restroom for every 7,500 square feet or major fraction thereof for pools greater than 10,000 square feet. Women’s restrooms shall have a ratio of three to two water closets provided for women as the combined total of water closets and urinals provided for men. Lavatory counts shall be equal.

R-106.1.2 Outside access to facilities shall be provided for bathers at outdoor pools. Where the restrooms are located within an adjacent building and the restroom doors do not open to the outside, the restroom doors shall be within 50 feet of the buildings exterior door. If the restrooms are not visible from any portion of the pool deck, signs shall be posted showing directions to the facilities. Directions shall be legible from any portion of the pool deck; letters shall be a minimum of 1 inch high.

R-106.1.3 Sanitary facility floors. Floors of sanitary facilities shall be constructed of concrete or other non-absorbent materials; shall have a smooth, slip-resistant finish; and shall slope to floor drains. Carpets, duckboards and footbaths are prohibited. The intersection between the floor and walls shall be covered where either floor or wall is not made of waterproof materials, such as tile or vinyl.

R-106.1.4 Hose bibb. A hose bibb with vacuum breaker shall be provided in or within 25 feet of each restroom to allow for ease of cleaning.

R-106.2 Rinse shower. A minimum of one rinse shower shall be provided on the pool deck of all outdoor pools within 20 feet of the nearest pool water's edge.

R-106.3 Cross-connection prevention. An atmospheric break or approved backflow prevention device shall be provided in each pool water supply line that is connected to a public water supply. Vacuum breakers shall be installed on all hose bibbs.

R-106.4 Plastic pipes. Plastic pipe subject to a period of prolonged sunlight exposure shall be coated to protect it from UV light degradation.

R-106.5 Recirculation and treatment systems.

R-106.5.1 Equipment testing. Recirculation and treatment equipment, such as filters, recessed automatic surface skimmers, ionizers, ozone generators, disinfection feeders and chlorine generators, shall be tested and approved using ANSI Standard 50-2007, which is incorporated by reference. If standards do not exist for a specific product, the manufacturer must work with the National Sanitation Foundation (NSF) or other American National Standards Institute-approved (ANSI) agencies to develop such standards.

R-106.5.2 Volume. The recirculation system shall be designed to provide a minimum of four turnovers of the pool volume per day. Pools that are less than 1,000 square feet at health clubs shall be required to provide eight turnovers per day.

R-106.5.3 System design. The design pattern of recirculation flow shall be 100 percent through the main drain piping and 100 percent through the perimeter overflow system or 60 percent through the skimmer system.

R-106.5.3.1 Perimeter overflow gutters. The lip of the gutter shall be uniformly level with a maximum tolerance of $\frac{1}{4}$ inch between the high and low areas. The bottom of the gutter shall be level or slope to the drains. The spacing between drains shall not exceed 10 feet for 2-inch drains or 15 feet for $2\frac{1}{2}$ -inch drains, unless

hydraulically justified by the design engineer. Gutters may be eliminated along pool edges for no more than 15 feet and this shall not exceed 10 percent of the perimeter (at least 90 percent of the perimeter shall be guttered). In areas where gutters are eliminated, handholds shall be provided within 9 inches of the water surface. Handhold design shall be approved by the department prior to construction.

R-106.5.3.1.1 Either recessed-type or open-type gutters shall be used. Special designs can be approved provided they are within limits of sound engineering practice. Recessed-type gutters shall be at least 4 inches deep and 4 inches wide. No part of the recessed gutter shall be visible from a position directly above the gutter sighting vertically down the edge of the deck or curb. Open-type gutters shall be at least 6 inches deep and 12 inches wide. The gutter shall slope 2 inches, $\pm\frac{1}{4}$ inch, from the lip to the drains. The gutter drains shall be located at the deepest part of the gutter.

R-106.5.3.1.2 All gutter systems shall discharge into a collector tank.

R-106.5.3.1.3 The gutter lip shall be tiled with a minimum of 2-inch tile on the pool wall, each a minimum size of 1 inch on all sides. The back vertical wall of the gutter shall be tiled with glazed tile.

Exception: Stainless steel gutter systems when it can be shown that the surfaces at the waterline and back of the gutter are easily cleanable.

R-106.5.3.2 Recessed automatic surface skimmers. Recessed automatic surface skimmers may be utilized when the pool water surface area is 1,000 square feet or less excluding offset stairs and swimouts, and the width of the pool is not more than 20 feet.

R-106.5.3.2.1 Volume. The recessed automatic surface skimmer piping system shall be designed to carry 60 percent of the pool total design flow rate with each skimmer carrying a minimum 30 gpm. One skimmer for every 400 square feet or fraction thereof of pool water surface area shall be provided.

R-106.5.3.2.2 Location. Prevailing wind direction and the pool outline shall be considered by the designer in the selection of skimmer locations. The location of skimmers shall be such that the interference of adjacent inlets and skimmers is minimized. Recessed automatic surface skimmers shall be installed so that there is no protrusion into the pool water area. The deck or curb shall provide for a handhold around the entire pool perimeter and shall not be located more than 9 inches above the mid point of the opening of the skimmer.

R-106.5.3.2.3 Equalizers. Recessed automatic surface skimmers shall be installed with an equalizer valve and an equalizer line when the skimmer piping system is connected directly to pump suction. If installed, the equalizer valve shall be a spring-loaded vertical check valve that will not allow direct

suction on the equalizer line. Float valves are prohibited. The equalizer line inlet shall be installed at least 1 foot below the normal pool water level and the equalizer line inlet shall be protected by an ASME/ANSI A112.19.8 compliant cover/grate. The equalizer line shall be sized to handle the expected flow with a 2-inch minimum line size.

R-106.5.3.2.4 Wall-inlet fitting. A wall-inlet fitting shall be provided directly across from each skimmer.

R-106.5.3.2.5 Waterline tile. A minimum 6-inch waterline tile shall be provided on all pools with automatic skimmer systems, each a minimum size of 1 inch on all sides. Glazed tile that is smooth and easily cleanable shall be utilized.

R-106.5.4 Pumps. If the pump or suction piping is located above the water level of the pool, the pump shall be self-priming. Pumps that take suction prior to filtration shall be equipped with a hair and lint strainer. The recirculation pump shall be selected to provide the required recirculation flow against a minimum total dynamic head of 60 feet unless hydraulically justified by the design engineer. Vacuum D.E. filter system pumps shall provide at least 50 feet of total dynamic head. Should the total dynamic head required not be appropriate for a given project, the design engineer shall provide an alternative.

R-106.5.5 Filters. Filters sized to handle the required recirculation flow shall be provided.

R-106.5.5.1 Filter capacities. The maximum filtration rate, in gallons per minute per square foot of filter area, shall be: 15 (20 if so approved using the procedure stated in Subsection R-106.5.2) for high-rate sand filters, 3 for rapid sand filters, 0.075 for pleated cartridge filters and 2 for D.E.-type filters.

R-106.5.5.2 Filter appurtenances.

R-106.5.5.2.1 Pressure filter systems. Pressure filter systems shall be equipped with an air relief valve; influent and effluent pressure gauges with minimum face size of 2 inches reading 0 to 60 psi; and a sight glass when a backwash line is required.

R-106.5.5.2.2 Vacuum filter systems. Vacuum filter systems shall be equipped with a vacuum gauge that has a 2-inch face and reads from 0 to 30 inches of mercury.

R-106.5.5.2.3 D.E. systems. A precoat pot or collector tank shall be provided for D.E. systems.

R-106.5.5.3 Filter tanks and elements. The filter area shall be determined on the basis of effective filtering surfaces with no allowance given for areas of impaired filtration, such as broad supports, folds or portions that may bridge. D.E. filter elements shall have a minimum 1-inch clear spacing between elements up to a 4-square-foot effective area. The spacing between filter elements shall increase $\frac{1}{8}$ inch for each additional square foot of filter area or fraction thereof above an effective filter area of 4 square feet. All cartridges used in public pool filters shall be permanently marked with

the manufacturer's name, pore size and area in square feet of filter material. All cartridges with end caps shall have the permanent markings on one end cap. Vacuum filter tanks shall have covered intersections between the wall and the floor, and the tank floor shall slope to the filter tank drain. The D.E. filter tank and elements shall be installed such that the recirculation flow draw down does not expose the elements to the atmosphere whenever only the main drain valve is open or only the surface overflow gutter system valve is open.

R-106.5.6 Piping. All plastic pipe used in the recirculation system shall be imprinted with the manufacturer's name and the NSF-potable water logo for potable water applications. Size, schedule and type of pipe shall be included on the drawings. Plastic pipe subject to a period of prolonged sunlight exposure shall be coated to protect it from UV light degradation.

R-106.5.7 Valves. Return lines, main drain lines and surface overflow system lines shall each have proportioning valves.

R-106.5.8 Flow velocity. Pressure piping shall not exceed 8 feet per second, except that precoat lines with higher velocities may be used when necessary for agitation purposes. The flow velocity in suction piping shall not exceed 6 feet per second, except that flow velocities up to 10 feet per second in filter assembly headers will be acceptable. Main drain systems and surface overflow systems, which discharge to collector tanks, shall be sized with a maximum flow velocity of 3 feet per second. The filter and vacuuming system shall have the necessary valves and piping to allow filtering to pool, vacuuming to waste, vacuuming to filter, complete drainage of the filter tank, backwashing for sand, and pressure D.E.-type filters and precoat recirculation for D.E.-type filters.

R-106.5.9 Inlets. All inlets shall be adjustable with wall-type inlets being directionally adjustable and floor-type inlets having a means of flow adjustment. Floor inlets shall be designed and installed such that they do not protrude above the pool floor, and all inlets shall be designed and installed so as not to constitute sharp edges or protrusions hazardous to pool bathers. Floor inlets for vinyl liner and fiberglass pools shall be smooth with no sharp edges, and shall not extend more than $\frac{3}{8}$ inches above the pool floor. Wall inlets shall be installed a minimum of 12 inches below the normal operating water level unless precluded by the pool depth or intended for a specific acceptable purpose.

R-106.5.9.1 Pools 30 feet in width or less, with wall inlets only, shall have enough inlets such that the inlet spacing does not exceed 20 feet based on the pool water perimeter.

R-106.5.9.2 Pools 30 feet in width or less, with floor inlets only, shall have a number of inlets provided such that the spacing between adjacent inlets does not exceed 20 feet and the spacing between inlets and adjacent walls does not exceed 10 feet.

R-106.5.9.3 A combination of wall and floor inlets may be used in pools 30 feet in width or less only if require-

ments of Subsection R-106.5.9.1 or R-106.5.9.2 are fully met.

R-106.5.9.4 Pools greater than 30 feet in width shall have either floor inlets only, or a combination of floor inlets and wall inlet. Pools with floor inlets only shall have a number of floor inlets provided such that the spacing between adjacent inlets does not exceed 20 feet, and the spacing between inlets and an adjacent wall does not exceed 10 feet.

R-106.5.9.5 Pools greater than 30 feet in width, with a combination of wall and floor inlets, shall have the number of wall inlets such that the maximum spacing between the wall inlets is 20 feet and floor inlets are provided for the pool water area beyond a 15-foot perpendicular distance from all walls. The number of floor inlets shall be such that the spacing between adjacent inlets does not exceed 20 feet, and the distance from a floor inlet and an adjacent wall does not exceed 25 feet. Floor inlets shall be designed and installed such that they do not protrude more than $\frac{5}{8}$ inch above the pool floor, and all inlets shall be designed and installed so as not to constitute sharp edges or protrusions hazardous to pool bathers.

R-106.5.9.6 The flow rate through each inlet shall not exceed 15 gpm.

R-106.5.10 Main drain outlets. All pools shall be provided with an outlet at the deepest point.

R-106.5.10.1 The depth at the outlet must not deviate more than 3 inches from the sidewall.

R-106.5.10.2 Outlets shall be covered by a secured grating that requires the use of a tool to remove and whose open area is such that the maximum velocity of water passing through the openings does not exceed $1\frac{1}{2}$ feet per second at 100 percent of the design recirculation flow. Main drain covers/grates shall comply with the requirements of ASME/ANSI A112.19.8 and the water velocity of this Subsection.

R-106.5.10.3 Multiple outlets, equally spaced from the pool sidewalls and from each other, shall be installed in pools where the deep portion of the pool is greater than 30 feet in width.

R-106.5.10.4 If the area is subject to high ground water, the pool shall be designed to withstand hydraulic uplift or shall be provided with hydrostatic relief devices.

R-106.5.10.5 The main drain outlet shall be connected to a collector tank. The capacity of the collector tank shall be at least 1 minute of the recirculated flow unless justified by the design engineer. Vacuum filter tanks are considered collector tanks.

R-106.5.11 Water makeup control. An automatic and manual water makeup control shall be provided to maintain the water level at the lip of the overflow gutter or at the mouth of the recessed automatic surface skimmers, and shall discharge through an air gap into a fill pipe or collector tank. Over-the-rim fill spouts are prohibited.

R-106.5.12 Cleaning system. A portable or plumbed-in vacuum cleaning system shall be provided. All vacuum pumps shall be equipped with hair and lint strainers. When the system is plumbed in, the vacuum fittings shall be located to allow cleaning the pool with a 50-foot maximum length of hose. Vacuum fittings shall be mounted approximately 12 inches below the water level, flush with the pool walls, and shall be provided with a spring-loaded safety cover or flush plug cover, which shall be in place at all times when the pool is not being vacuumed. Bag-type cleaners, which operate as ejectors on potable water supply pressure, shall be protected by a vacuum breaker. Cleaning devices shall not be used while the pool is open to bathers.

R-106.5.13 Rate-of-flow indicators. A rate-of-flow indicator, reading in gallons per minute, shall be installed on the return line. The rate-of-flow indicator shall be properly sized for the design flow rate and shall be capable of measuring from one-half to at least $1\frac{1}{2}$ times the design flow rate. The clearances upstream and downstream from the rate-of-flow indicator shall comply with manufacturer's installation specifications.

R-106.5.14 Heaters. Pool heaters shall comply with nationally recognized standards acceptable to the department and to the design engineer. Pools equipped with heaters shall have a fixed thermometer mounted in the pool recirculation line downstream from the heater outlet. Thermometers mounted on heater outlets do not meet this requirement. A sketch of any proposed heater installation, including valves, thermometer, pipe sizes and material specifications, shall be included in the application for permit prior to installation. Piping and influent, effluent and bypass valves, which allow isolation or removal of the heater from the system, shall be provided. Materials used in solar and other heaters shall be nontoxic and acceptable for use with potable water. Heaters shall not prevent the attainment of the required turnover rate.

R-106.5.15 Pool waste water disposal. Pool waste water shall be discharged through an air gap; disposal shall be to sanitary sewers, storm sewers, drain fields or by other means; shall be approved by Reedy Creek Planning and Engineering; and obtain all necessary permits. Disposal of water from pools using D.E. powder shall be accomplished through separation tanks that are equipped with air bleed valves, bottom drain lines and isolation valves, or through a settling tank with final disposal being acceptable to Reedy Creek Planning and Engineering. D.E. separator tanks shall have a capacity, as rated by the manufacturer, equal to the square footage of the filter system. All lines shall be sized to handle the expected flow. There shall not be a direct physical connection between any drain from a pool or recirculation system and a sewer line.

R-106.5.16 Addition of chemicals. Disinfection and pH adjustment shall be added to the pool recirculation flow using automatic feeders meeting the requirement of NSF/ANSI 50. All chemicals shall be fed into the return line after the pump, heater and filters unless the feeder was designed by the manufacturer and approved by the NSF to

feed to the collector tank or to the suction side of the pump.

R-106.5.16.1 Gas chlorination. When gas chlorination is utilized, the chlorinator shall be capable of continuously feeding a chlorine dosage of 6 milligrams per liter (mg/L) to the recirculated flow of the filtration system. The application point for chlorine shall be located in the return line downstream of the filter, recirculation pump, heater and flow meter, and as far as possible from the pool.

R-106.5.16.1.1 Gas chlorinators shall be located in above-grade rooms and in areas that are inaccessible to unauthorized persons.

R-106.5.16.1.1.1 Chlorine rooms shall have: continuous forced draft ventilation capable of a minimum of one air change per minute with an exhaust at floor level to the outside, a minimum of 30 footcandles of illumination with the switch located outside, and the door shall open out and shall not be located adjacent to the filter room entrance or the pool deck. A shatterproof, gas-tight inspection window shall be provided.

R-106.5.16.1.1.2 Chlorine areas shall have a roof and shall be enclosed by a chain-link-type fence at least 6 feet high to allow ventilation and prevent vandalism.

R-106.5.16.1.2 A gas mask or a self-contained breathing apparatus, approved for use in chlorine gas-contaminated air, shall be provided and shall be located out of the area of possible contamination.

R-106.5.16.1.3 When booster pumps are used with the chlorinator, the pump shall use recirculated pool water supplied via the recirculation filtration system. The booster pump shall be electrically interlocked with the recirculation pump to prevent the feeding of chlorine when the recirculation pump is not operating.

R-106.5.16.1.4 A means of weighing chlorine containers shall be provided. When 150-pound cylinders are used, platform-type scales shall be provided and shall be capable of weighing a minimum of two full cylinders at one time. The elevation of the scale platform shall be within 2 inches of the adjacent floor level, and the facilities shall be constructed to allow easy placement of full cylinders on the scales.

R-106.5.16.1.5 Each cylinder shall be secured at all times, with 150-pound cylinders maintained in an upright position. A protective cap shall be in place at all times when the cylinder is not connected to the chlorinator.

R-106.5.16.2 Hypohalogenation and electrolytic chlorine generators. The hypohalogenation-type feeder and electrolytic chlorine generators shall be adjustable from 0 to full range. A rate-of-flow indicator is required on erosion-type feeders. The feeders shall be capable of continuously feeding a dosage of 6 mg/L the minimum required turnover flow rate of the filtration

systems. Solution feeders shall be capable of feeding the dosage using a 10-percent sodium hypochlorite solution or 5-percent calcium hypochlorite solution, whichever disinfectant is to be utilized at this facility. To prevent the disinfectant from siphoning or feeding directly into the pool or pool piping under any type failure of the recirculation equipment, an electrical interlock with the recirculation pump shall be incorporated into the system for electrically operated feeders. The minimum size of the solution reservoirs shall be at least 50 percent of the maximum daily capacity of the feeder. The solution reservoirs shall be marked to indicate contents.

R-106.5.16.3 Feeders for pH adjustment. Feeders for pH adjustment shall be provided on all pools, except spa pools of less than 100 square feet of pool water surface area and pools utilizing erosion-type chlorinators feeding chlorinated isocyanurates. pH adjustment feeders shall be positive displacement type, shall be adjustable from 0 to full range, and shall have an electrical interlock with the circulation pump to prevent discharge when the recirculation pump is not operating. When soda ash is used for pH adjustment, the maximum concentration of soda ash solution to be fed shall not exceed $\frac{1}{2}$ pound soda ash per gallon of water. Feeders for soda ash shall be capable of feeding a minimum of 3 gallons of the above soda ash solution per pound of gas chlorination capacity. The minimum size of the solution reservoirs shall not be less than 50 percent of the maximum daily capacity of the feeder. The solution reservoirs shall be marked to indicate the type of contents.

R-106.5.16.4 Ozone-generating equipment. Ozone-generating equipment may be used for supplemental water treatment on public swimming pools subject to the conditions of this Subsection.

R-106.5.16.4.1 Ozone-generating equipment electrical components and wiring shall comply with the requirements of the NEC and the manufacturer shall provide a Certificate of Conformance. The process equipment shall be provided with an effective means to alert the user when a component of this equipment is not operating.

R-106.5.16.4.2 Ozone-generating equipment shall meet NSF/ANSI 50.

R-106.5.16.4.3 The concentration of ozone in the return line to the pool shall not exceed 0.1 mg/L.

R-106.5.16.4.4 The injection point for ozone-generating equipment shall be located in the pool return line after the filtration and heating equipment, prior to the halogen injection point, and as far as possible from the nearest pool return inlet with a minimum distance of 4 feet. Injection methods shall include a mixer, contact chamber or other means of efficiently mixing the ozone with the recirculated water. The injection and mixing equipment shall not prevent the attainment of the required turnover rate of the recirculation system. Ozone-generating equipment shall be equipped with a check valve between the genera-

tor and the injection point. Ozone-generating equipment shall be equipped with an airflow meter and a means to control the flow.

R-106.5.16.4.5 Ventilation requirements. Ozone-generating equipment shall be installed in equipment rooms with either forced draft or cross draft ventilation. Below-grade equipment rooms with ozone generators shall have forced draft ventilation and all equipment rooms with forced draft ventilation shall have the fan control switch located outside the equipment room door. The exhaust fan intake for forced draft ventilation and at least one vent grille for cross draft ventilation shall be located at floor level.

R-106.5.16.4.6 A self-contained breathing apparatus designed and rated by its manufacturer for use in ozone-contaminated air shall be provided when ozone generator installations are capable of exceeding the maximum pool water ozone contact concentration of 0.1 mg/L. The self-contained breathing apparatus shall be available at all times and shall be used at times when the maintenance or service personnel have determined that the equipment room ozone concentration exceeds 10 mg/L. Ozone generator installations that require the self-contained breathing apparatus shall also be provided with Draeger-type detector tube equipment, which is capable of detecting ozone levels of 10 mg/L.

Exception: In lieu of the self-contained breathing apparatus, an ozone detector capable of detecting 1 mg/L may be used. Said detector shall be capable of stopping the production of ozone, venting the room and sounding an alarm once ozone is detected.

R-106.5.16.5 Ionization units may be used as supplemental water treatment on public pools subject to the conditions of this Subsection.

R-106.5.16.5.1 Ionization equipment and electrical components and wiring shall comply with the requirements of the NEC and the manufacturer shall provide a certification of conformance.

R-106.5.16.5.2 Ionization equipment shall meet NSF/ANSI 50 or equivalent; shall meet UL standards; and shall be electrically interlocked with recirculation pump.

R-106.5.16.6 UV light disinfectant equipment may be used as supplemental water treatment on public pools [and additional treatment on interactive water features (IWF)] subject to the conditions of this Subsection and manufacturer’s specifications. UV light is encouraged to be used to eliminate or reduce chlorine-resistant pathogens, especially the protozoan *Cryptosporidium*.

(a) UV equipment and electrical components and wiring shall comply with the requirements of the NEC and the manufacturer shall provide a certification of conformance to the department.

(b) UV equipment shall meet UL standards, and shall be electrically interlocked with recirculation pump(s) on all pools and with feature pump(s) on an IWF such that when the UV equipment fails to produce the required dosage as measured by an automated sensor, the feature pump(s) are disabled so the water features do not operate.

(c) UV equipment shall be validated by a capable party that it delivers the required and predicted UV dose at the validated flow, lamp power and water UV transmittance conditions, and has complied with all professional practices summarized in the US Environmental Protection Agency’s *Ultraviolet Disinfectant Guidance Manual*, dated November, 2006, which is publication number EPA 815-R-06-007, available from the Florida Department of Health at <http://www.floridashealth.org/Environment/water/swim/index.html> or at http://www.epa.gov/safewater/disinfection/lt2/pdfsguide_lt2_uvguidance.pdf.

(d) UV equipment shall constantly produce a validated dosage of at least 40 milliJoules per square centimeter at the end of lamp life.

(e) The UV equipment shall not be located in a side stream flow, and shall be located to treat all water returning to the pool or water features.

SECTION R-107 WADING POOLS

R-107.1 General. Wading pools shall meet the requirements of Subsections R-101.3 through R-106.5, unless otherwise indicated. Wading pools and associated piping shall not be physically connected to any other swimming pools and have no minimum width dimensions requirements.

R-107.2 Depths. Wading pools shall have a maximum depth of 2 feet. The depth at the perimeter of the pool shall be uniform and shall not exceed 12 inches. However, where department-approved zero depth entry designs are used, this uniform depth requirement must be met only on the remainder of the pool outside the zero depth entry portion. The pool floor shall not be more than 12 inches below the deck unless steps and handrails are provided. Depth and “NO DIVING” markers are not required on wading pools.

R-107.3 Recirculation. Wading pools shall have a minimum of one turnover every hour. Lines from main drains shall discharge into a collector tank.

R-107.3.1 Skimmer equalizer lines, when required, shall be plumbed into the main drain installed in the pool floor with a grate covering.

R-107.3.2 The grate cover shall be sized so as not to allow the flow to exceed 1½ feet per second when the equalizer line is operating.

R-107.4 Inlets. Wading pools with 20 feet or less of perimeter shall have a minimum of two, equally spaced adjustable inlets.

R-107.5 Emergency drainage. All wading pools shall have drainage to waste without a cross connection through a quick-opening valve to facilitate emptying the wading pool should accidental bowel or other discharge occur.

R-107.6 Vacuuming. Wading pools with 200 square feet or more of pool water surface area shall have provisions for vacuuming.

R-107.7 Wading pool decks. When adjacent to swimming pools, wading pools shall be separated from the swimming pool by a barrier or fence of a minimum of 48 inches in height with self-latching and self-closing gates. When adjacent to areas less than 1 foot deep of zero depth entry pools, the fence or effective barrier is required if the water edges are less than 40 feet apart. Wading pools shall have a minimum 10-foot-wide deck around at least 50 percent of their perimeter, with the remainder of the perimeter deck being at least 4 feet wide. There shall be at least 10 feet between adjacent swimming pools and wading pools.

R-107.8 Lighting. Wading pools are exempt from underwater lighting requirements but shall have overhead lighting installed for night use.

SECTION R-108 SPA POOLS

R-108.1 General. Spa pools shall meet the requirements of Subsections R-101.3 through R-106.5, unless specifically indicated otherwise.

R-108.2 Color, pattern, finish. The color, pattern or finish of the pool interior shall not obscure the existence or presence of objects or surfaces within the pool.

R-108.3 Water depths. Spa-type pools shall have a minimum water depth of 2½ feet and a maximum water depth of 4 feet, except that swim spa pools may have a maximum water depth of 5 feet. Depth markers and “NO DIVING” markers are not required on spa-type pools with 200 square feet or less of water surface area.

R-108.4 Steps and handrails. Steps or ladders shall be provided, and shall be located to provide adequate entrance to and exit from the pool. The number of sets of steps or ladders required shall be on the basis of one for each 75 feet, or major fraction thereof, of pool perimeter. Step sets for spa-type pools with more than 200 square feet of pool water surface area shall comply with Subsection R-102.6. Step sets for spa-type pools with 200 square feet or less of pool water surface area shall comply with the following: Step treads shall have a minimum width of 10 inches for a minimum continuous tread length of 12 inches. Step riser heights shall not exceed 12 inches. Intermediate treads and risers between the top and bottom treads and risers shall be uniform in width and height, respectively. Contrasting markings on the leading edges of the submerged benches and the intersections of the treads and risers are required to be installed in accordance with Subsections R-102.6 and R-102.7.

R-108.4.1 Handrails shall be provided for all sets of steps, and shall be anchored in the bottom step and in the deck. Handrails shall be located to provide maximum access to

the steps and handrails shall extend 28 inches above the pool deck.

R-108.4.2 Where “figure 4” handrails are used, they shall be anchored in the deck and shall extend laterally to any point vertically above the bottom step. Handrails shall be located to provide maximum access to the steps and handrails shall extend 28 inches above the pool deck.

R-108.5 Decks. Decks shall have a minimum 4-foot-wide unobstructed width around the entire pool perimeter, except that pools of less than 120 square feet of pool water surface area shall have a minimum 4-foot-wide unobstructed continuous deck around a minimum of 50 percent of the pool perimeter. Decks less than 4 feet wide shall have barriers to prevent their use. Decks shall not be more than 10 inches below the top of the pool. For pools of 120 square feet or greater, 10 percent of the deck along the pool perimeter may be obstructed.

R-108.6 Therapy or jet systems.

R-108.6.1 The return lines of spa-type therapy or jet systems shall be independent of the recirculation-filtration and heating systems.

R-108.6.2 Therapy or jet pumps shall take suction from the collector tank. Collector tank sizing shall take this additional gallonage into consideration.

R-108.7 Filtration system inlets. Spa-type pools with less than 20 feet of perimeter shall have a minimum of two, equally spaced adjustable inlets.

R-108.8 Filtration recirculation. Spa-type pools shall have a minimum of one turnover every 30 minutes. The piping, fittings and hydraulic requirements shall be in accordance with Subsection R-106.5. All recirculation lines to and from the pool shall be individually valved with proportional flow-type valves in order to control the recirculation flow.

R-108.9 Vacuuming. Spa-type pools of more than 200 square feet of pool water surface area shall have provisions for vacuuming.

R-108.10 Combination spas/pools. When spa pools are part of a conventional swimming pool, the spa pool area shall be offset from the main pool area with the same water depth as the main pool area. The spa pool shall meet all the spa pool requirements of this Appendix, and the deck area at the spa shall be protected by connected 30-inch-high stanchions. The deck perimeter at the offset spa area shall not exceed 15 percent of the entire swimming pool perimeter. All benches shall have contrasting markings on the leading edges of the intersection of the bench seats. If tile is used, it shall be slip resistant.

R-108.11 Portable and wooden spa pools. Portable and wooden-type spa pools are prohibited.

SECTION R-109 WATER RECREATION ATTRACTIONS AND SPECIALIZED POOLS

R-109.1 General. Water recreation attraction projects shall be designed and constructed within the limits of sound engineering practice. Design engineers may consult with the Depart-

ment of Building and Safety in reference to concepts of design variations and to areas where potential problems may exist. In addition to the requirements of this Section, compliance is required with Subsections R-101.3 through R-106.5 depending upon the pool design and function. Additionally, all pools listed in this Section shall have a 2-hour turnover rate unless otherwise noted.

R-109.2 Water slides.

R-109.2.1 Water slide plunge pool. Plunge pools shall be constructed of concrete or other structurally rigid impervious materials, with a nontoxic, smooth and slip-resistant finish. The plunge pool design shall meet the criteria of Subsections R-109.2.1.1 through R-109.2.1.6.

R-109.2.1.1 Plunge pool water depth. The minimum plunge pool operating water depth at the slide flume terminus shall be 3 feet. This depth shall be maintained for a minimum distance of 10 feet in front of the slide terminus from which point the plunge pool floor may have a constant upward slope to allow a minimum water depth of 2 feet at the base of the steps. The floor slope shall not exceed one in 10. The plunge pool water depth shall be commensurate with safety and the ease of exit from the plunge pool.

R-109.2.1.2 Plunge pool dimension. The plunge pool dimension between any slide flume exit or terminus and the opposite side of the plunge pool shall be a minimum of 20 feet excluding steps.

R-109.2.1.3 Slide flume terminus.

R-109.2.1.3.1 The slide flume terminus shall be designed by the design engineer who can demonstrate to the department's satisfaction that riders will be adequately slowed prior to discharge so as to prevent injury or harm to the rider upon impact with the plunge pool water. The slide terminus shall be flush with the pool wall and located at or below the pool water level.

R-109.2.1.3.2 The minimum distance between any plunge pool sidewall and the outer edge of any slide terminus shall be 5 feet. The minimum distance between adjacent slide flumes shall be 6 feet.

R-109.2.1.3.3 A minimum length of slide flume of 10 feet shall be perpendicular to the plunge pool wall at the exit end of the flumes.

R-109.2.1.4 Plunge pool main drains. The plunge pool shall have a minimum of one main drain with separate piping and valve to the filtration system collector tank. The velocity through the openings of the main drain grate shall not exceed $1\frac{1}{2}$ feet per second at the design flow rate of the recirculation pump. The main drain piping shall be sized to handle 100 percent of the design flow rate of the filtration system with a maximum flow velocity of 3 feet per second.

R-109.2.1.5 Plunge pool floor slope. The plunge pool floor shall slope to the main drains and the slope shall not exceed one in 10.

R-109.2.1.6 Plunge pool decks.

R-109.2.1.6.1 Width. The minimum width of plunge pool decks along the exit side shall be 10 feet.

R-109.2.1.6.2 Slopes. All plunge pool decks shall slope to the plunge pool or pump reservoir; deck drains, which discharge to waste; or other acceptable means. All slopes shall be between 2- and 4-percent grade.

R-109.2.2 Run out lanes.

R-109.2.2.1 Run out lanes may be utilized in lieu of a plunge pool system, provided they are constructed to the slide manufacturer's specifications and are approved by the design engineer of record.

R-109.2.2.2 Five-foot-wide walkways shall be provided adjacent to run out lanes.

R-109.2.2.3 Minimum water level indicator markings shall be provided on both sides of the run out trough to ensure adequate water for the safe slowing of pool patrons.

R-109.2.2.4 Water park personnel shall be provided at the top of the slides and at the run out.

R-109.2.3 Pump reservoirs. Pump reservoirs shall be made of concrete or other impervious material with a smooth, slip-resistant finish. Pump reservoirs shall be for the slide pump intakes, but where properly sized may also be used as a collector tank for the filter system. Pump reservoir designs shall meet the criteria of Subsections R-109.2.3.1 through R-109.2.3.5.

R-109.2.3.1 Pump reservoir volume. The minimum reservoir volume shall be equal to 2 minutes of the combined flow rate, in gpm of all filter and slide pumps.

R-109.2.3.2 Pump reservoir security. Pump reservoirs shall be accessible only to authorized individuals.

R-109.2.3.3 Pump reservoir maintenance accessibility. Access decks shall be provided for the reservoir such that all areas are accessible for vacuuming, skimming and maintenance. The decks shall have a minimum width of 3 feet and shall have a minimum slope of 3:10 away from the reservoir.

R-109.2.3.4 Pump reservoir slide pump intakes. The slide pump intakes shall be located in the pump reservoir and shall be designed to allow cleaning without danger of operator entrapment.

R-109.2.3.5 The pump reservoir shall be fed by main drains within the plunge pool itself (either in the floor or sidewall). They shall have the maximum flow velocity of $1\frac{1}{2}$ feet per second through the main drain grating and 3 feet per second through piping to the reservoir.

R-109.2.4 Slide pump check valves. Slide pumps shall have check valves on all discharge lines.

R-109.2.5 Perimeter overflow gutters or skimmers. Plunge pools and pump reservoirs shall have a perimeter

overflow gutter system or skimmer, which shall be an integral part of the filtration system.

R-109.2.5.1 Perimeter overflow gutter systems. Perimeter overflow gutter systems shall meet the requirements of Subsection R-106.5.3.1, except that gutters are not required directly under slide flumes or along the weirs that separate plunge pools and pump reservoirs.

R-109.2.5.2 Surface skimmers. Surface skimmers may be used in lieu of perimeter overflow gutters, and shall be appropriately spaced and located according to the structural design. Unless an overflow gutter system is used, surface skimmers shall be provided in the plunge pool and in the pump reservoir, and the skimmer system shall be designed to carry 60 percent of the filtration system design flow rate with each skimmer carrying a minimum 30 gpm. All surface skimmers shall meet the requirements for NSF commercial approval as set forth in NSF/ANSI 50, which is incorporated by reference in these rules, including an equalizer valve in the skimmer and an equalizer line to the pool wall on systems with direct connection to pump suction.

R-109.2.6 Water slide recirculation-filtration equipment.

R-109.2.6.1 Recirculation rate. The recirculation-filtration system of water slides shall recirculate and filter a water volume equal to the total water volume of the facility in a period of 3 hours or less.

R-109.2.6.2 Filter areas. Minimum filter area requirements shall be twice the filter areas specified for the recirculation rates stipulated in Subsection R-106.5.5.1. The filtration system shall be capable of returning the pool water turbidity to 5/10 Nephelometric Turbidity Units within 8 hours or less after peak bather load.

R-109.2.6.3 Hair and lint strainer. Any filtration system pump, which takes suction directly from the plunge pool and reservoir, shall have a minimum 8-inch-diameter hair and lint strainer on the suction side of the pump.

R-109.2.7 Disinfection. The disinfection equipment shall be capable of feeding 12 mg/L of halogen to the continuous recirculation flow of the filtration system.

R-109.2.8 Slide design and construction is the responsibility of a professional engineer licensed in Florida and the applicant.

R-109.2.9 A lockable gate shall be provided at the stair or ladder entrance to the slide.

R-109.2.10 Upon construction completion, a professional engineer licensed in Florida shall certify that the slide was constructed in accordance with the manufacturer's specifications and is structurally sound.

R-109.3 Water activity pools.

R-109.3.1 Water activity pools shall be designed and constructed within the limits of sound engineering practice. The design engineer may consult with the Department

prior to preparation and submission of engineering plans and specifications for water activity pools.

R-109.3.2 Water activity pools shall be constructed of concrete or other structurally rigid, impervious materials with a nontoxic, smooth and slip-resistant finish. These pools shall be of such shape and design as to be operated and maintained in a safe and sanitary manner.

R-109.3.3 The recirculation-filtration system of water activity pools shall be capable of a minimum of one turnover every 2 hours for water activity pools more than 2 feet deep, and in 1 hour for these pools that are 2 feet deep or less.

R-109.3.4 Those portions of the activity pool where the water depth will not allow for the proper installation of underwater lighting, shall be provided with 6 footcandles of lighting on the deck and the water surface.

R-109.3.5 Fence requirements shall be in accordance with Subsection R-107.7.

R-109.3.6 Play features with an overhead clearance of less than 4 feet shall be blocked or barricaded to preclude children becoming entrapped.

R-109.4 Wave pools.

R-109.4.1 Wave pools shall be designed and constructed within the limits of sound engineering practice.

R-109.4.2 Wave pools shall be constructed of concrete or other impervious materials with a smooth, slip-resistant finish. These pools shall be of such shape and design as to be operated and maintained in a safe and sanitary manner.

R-109.4.3 The recirculation-filtration system of wave pools shall be capable of a minimum of one turnover every 3 hours.

R-109.4.4 Floors shall be sloped in accordance with the manufacturer's or design engineer's specifications, however, they shall not exceed the slope limits of Subsection R-102.3.3.

R-109.5 River rides.

R-109.5.1 River rides shall be constructed within the limits of sound engineering practice. The design engineer may consult with the Department of Building and Safety prior to preparation and submission of engineering plans and specifications for river rides.

R-109.5.2 River rides shall be constructed on concrete or other impervious materials with a nontoxic, smooth and slip-resistant finish. These rides shall be of such shape and design as to be operated in a safe and sanitary manner.

R-109.5.3 The recirculation-filtration system of the river ride shall be capable of a minimum of one turnover every 3 hours.

R-109.5.4 The maximum water depth of the river ride shall not exceed 3 feet unless justified to the department's satisfaction by the design engineer.

R-109.5.5 Decking shall be provided at the entrance and exit points as necessary to provide safe patron access, but shall not be smaller than 10 feet in width and length. Addi-

tional decking along the ride course is not required, except that decking shall be required, at lifeguard locations and emergency exit points.

R-109.5.6 Access and exit shall be provided at the start and end of the ride, and additional exit locations shall be located along the ride course as necessary to provide for the safety of the patrons.

R-109.5.7 Propulsion jets shall be installed in the walls of the river ride. In the alternative, propulsion jets may be installed in the floor if they are covered by a grate that will inhibit entrapment or injury of the pool patrons' feet or limbs.

R-109.6 Zero depth entry pools.

R-109.6.1 Zero depth entry pools shall have a continuous floor slope from the water edge to the deep end.

R-109.6.2 The deck-level perimeter overflow system with grate shall be provided at the water's edge across the entire zero depth portion of the pool.

R-109.6.3 The pool deck may slope toward the pool for no more than 5 feet, as measured from the overflow system grate outward. Beyond this area, the deck shall slope away from the pool in accordance with Subsection R-102.3.3.

R-109.6.4 No-entry, shallow water signs shall be provided along the pool wall edge where the water depth is less than 3 feet deep. No-entry signs shall be slip-resistant, shall have 4-inch-high letters, shall be located within 2 feet of the pool edge and shall be spaced no more than 15 feet apart.

R-109.6.5 Additional inlets shall be provided in areas of less than 18 inches deep. The numbers and location shall be such as to double the flow rate into this area.

R-109.6.6 The recirculation-filtration system shall have a minimum of one turnover every 2 hours in the area of the pool that is 3 feet deep or less. In the remainder of the pool where the depth is greater than 3 feet, the system shall have a maximum 6-hour turnover rate. The design plans submitted by the applicant shall provide the volume of water in the pool area of 3 feet depth and less, the volume of water in the pool area greater than 3 feet in depth, and the total volume in the pool for determination of minimum circulation flow. The volume calculations shall provide verification that the correct volume of water is used to determine the minimum flow at the 2-hour and 6-hour flow requirements.

R-109.6.7 Those portions of the zero depth entry pool, where the water depth will not allow for the proper installation of underwater lighting, shall be provided with 6 footcandles of lighting on the deck and water.

R-109.6.8 Play structures in a zero depth entry area (in depths of 0 to 3 feet) may be within 15 feet of the pool walls, but shall comply with sound engineering requirements for the safety of pool patrons.

R-109.7 Special-purpose pools.

R-109.7.1 General. Special-purpose pool projects may deviate from the requirements of other Sections of these rules provided the design and construction are within the

limits of sound engineering practice. Only those deviations necessary to accommodate the special usage shall be allowed and all other aspects of the pool shall comply with the requirements of this Section and with Subsections R-101.3 through R-106.5. The design engineer may consult with the department prior to preparation and submission of engineering plans for special-purpose pools.

R-109.7.2 A special-purpose pool may incorporate ledges that do not overhang into the pool.

R-109.7.3 The operating permit shall state the purpose for which the pool is to be used.

R-109.8 Interactive water features (IWFs).

R-109.8.1 Waters discharged from all fountain or spray features shall not pond on the feature floor, but shall flow by gravity through a main drain fitting to a below-grade sump or collection system, which discharges to a collector tank. The minimum size of the collector tank shall be equal to the volume of 2 minutes of the combined flow of all feature pumps and the filter pump. Smaller tanks may be utilized if hydraulically justified by the design engineer. Adequate access shall be provided to the sump or collector tank. Stairs or a ladder shall be provided, as needed, to ensure safe entry into the tank.

R-109.8.2 An automatic skimmer system shall be provided in the collector tank. A variable height skimmer may be used or a custom surface skimmer device may be substituted if deemed appropriate by both the design engineer and the department.

R-109.8.3 Chemical feeders shall be provided in accordance with Subsection R-106.5, except that the disinfection feeder shall be capable of feeding 12 ppm of free chlorine to the filter return piping (based upon a hypothetical 30 minute turnover of the contained volume within the system).

R-109.8.4 If night operation is proposed, 6 footcandles of light shall be provided on the pool deck and the water feature area. Lighting that may be exposed to the feature pool water shall not exceed 15 volts, shall be installed in accordance with manufacturer's specifications and be approved for such use by UL or NSF.

R-109.8.5 All electrical work shall comply with the NEC that is incorporated by reference.

R-109.8.6 Hydraulics.

R-109.8.6.1 The filter system shall filter and chemically treat all water that is returned to the spray features. The filter system shall draft from the collector tank and return filtered and treated water directly to the spray features. Excess water not required by the spray features shall be returned to the collector tank.

R-109.8.6.2 The water feature pump shall draft from the collector tank.

R-109.8.6.3 Alternatively, the contained volume of the system may be filtered and chemically treated based upon a 30-minute turnover of the contained volume with 100 percent returned to the collector tank by manifold piping. If this alternative is chosen, all water returned to

the spray feature(s) must also be treated with UV disinfection equipment to accomplish protozoan destruction in accordance with sound engineering and the requirements of Subsection R-106.5.16.6. This alternative must have the ability to feed 6 milligrams per liter free chlorine to the feature water as it is returned to the spray feature. The UV disinfection equipment shall be electrically interconnected such that whenever it fails to produce the required UV dosage, the water spray features pump(s) and flow will be immediately stopped.

R-109.8.6.4 The flow rate through the feature nozzles of the water features shall be such as not to harm the patrons and shall not exceed 20 feet per second unless justified by the design engineer and by the fountain system manufacturer.

R-109.8.6.5 An automatic water level controller shall be provided.

R-109.8.6.6 An overflow waste line with air gap shall be provided.

R-109.8.6.7 A means of vacuuming and completely draining the tank(s) shall be provided.

R-109.8.6.8 Where the filter system described in Subsection R-109.8.6.1 is utilized, a second filter system and disinfection system shall be provided to treat the water in the collector tank when the feature/filter pump is not in operation. Said system shall be capable of filtering the total volume of water in the collector tank in 30 minutes and the disinfection system shall be capable of providing 12 mg/L of disinfectant to this flow rate.

R-109.8.6.9 IWFs shall be fenced in the same fashion as wading pools as noted in Subsection R-107.7. Where the IWF is at least 50 feet from all other pools and is not designed to have any standing water, fencing requirements should be carefully considered by the applicant to control usage, but are not required by rule.

R-109.8.6.10 A minimum 4-foot-wide wet deck area shall be provided around all IWFs. The wet deck shall meet the requirements of Subsection R-103.1, however, up to 50 percent of the perimeter may be obstructed.

R-109.8.6.11 IWFs shall be constructed of concrete or other impervious and structurally rigid material.

R-109.8.6.12 Floor slopes of an IWF shall be a maximum 1 foot vertical in 10 feet horizontal and a minimum of 1 foot vertical in 50 feet horizontal.

R-109.8.7 Water theme parks. Shall meet all other aspects of these rules for the features provided.

R-109.8.7.1 Rules and regulations for water theme parks shall be posted in minimum 1-inch letters at each entrance to the park and shall contain the following:

- (a) No food, drink, glass or animals in the pool or on the pool decks.
- (b) Park operating hours ___ A.M. to ___ P.M.
- (c) Shower before entering.
- (d) Do not swallow the pool water.

R-109.8.7.2 Showers shall be provided at or near the entrance (queue) to a water recreation attraction.

R-109.8.7.3 Water theme parks are exempt from the fencing requirements of Subsection R-103.1.9, except that pools designed for small children shall be fenced when located within 50 feet of a pool with water depths of 3 feet or more.

R-109.8.7.4 Sanitary facilities within a water theme park shall be as near to the water recreation attractions as prudent to ensure patron use, but not more than 200 feet walking distance from any exit of a water attraction.

SECTION R-110 MODIFICATIONS

R-110.1 Modifications. Modifications include nonequivalent changes or additions to the recirculation system, treatment equipment, physical structure or appurtenances. Replacement of the pool or spa shell is considered to be construction of a new facility and shall be processed as such. The installation of new decking is not considered a modification if it is installed in compliance with Subsection R-103.1, and deck markings are upgraded in accordance with Subsection R-102.4. Resurfacing the pool interior to original nontoxic, slip-resistant and smooth specifications, or equivalent replacement of equipment, is not considered a modification. However, the following items shall be addressed during resurfacing projects:

R-110.1.1 The lip of the gutter must be leveled to within $\frac{1}{4}$ inch between the highest and lowest point, and the downward slope from the lip to the drain must be maintained as originally designed or increased, but shall not exceed new construction standards.

R-110.1.2 Tile step markings must be installed meeting the requirements of Subsection R-102.6.3.

R-110.1.3 Where applicable, the slope break marking must be installed meeting the requirements of Subsection R-102.3.3.2 and the safety line must be installed 2 feet before the marking.

R-110.1.4 Depth markers and “NO DIVING” markers must be installed in accordance with Subsection R-102.4.

R-110.1.5 The pool ladder must have a 3- to 6-inch clearance from the pool wall. New cross-braced ladder(s) shall be installed in place of noncross-braced ladder(s) in compliance with Subsection R-102.6.1 during a pool resurfacing.

R-110.1.6 Should resurfacing works affect the step riser heights, no riser shall exceed 12 inches and the intermediate risers shall be made uniform.

R-110.1.7 When fiberglass is used to resurface a pool, any existing tile shall not be covered by the fiberglass finish.

R-110.1.8 The applicable governing body shall be notified, in writing, of any proposed pool resurfacing or upgrades to decking at least 10 days prior to commencement. The notification shall include an itemized list of all proposed work that is to be performed, the license number

APPENDIX R—SWIMMING POOLS AND BATHING PLACES

of the contractor selected and shall indicate that all work will meet the requirements of this Section.

R-110.1.9 Recessed treads that protrude from the pool wall shall be removed and replaced with a cross-braced ladder or reconstructed to meet the requirements of Subsection R-102.6.2.

R-110.2 The painting of pools shall not be considered a modification provided the following conditions are met:

- (a) Only paints designated by the manufacturer as pool paints are used.
- (b) All step stripes, slope break markers and safety line, and depth and “NO DIVING” markings shall be provided to comply with the applicable provision(s) of this Section.

R-110.3 The installation of copper or copper/silver ionization units and ozone generators capable of producing less than a pool water ozone contact concentration of 0.1 mg/L shall not be considered a pool modification provided compliance when the following is met:

- (a) The ionization or ozone generator unit complies with Paragraph 64E-9.007(16)(e), F.A.C.
- (b) The manufacturer provides one set of signed and sealed engineering drawings indicating the following:
 - 1. The unit does not interfere with the design flow rate.
 - 2. The unit and the typical installation meet the requirements of the NEC.
 - 3. A copper test kit and information regarding the maximum allowed copper and silver level and the minimum required chlorine level shall be available to the pool owner.
 - 4. The unit shall meet the requirements of the NSF/ANSI 50.
- (c) At least 7 days before the time of installation, the installer will provide a photocopy of the engineering drawings and a letter of intent identifying the pool on which the unit is to be installed.
- (d) Upon completion of the installation, a professional engineer or electrician licensed in the State of Florida shall provide a letter, to the county health department, indicating the unit was properly installed in accordance with the typical drawings, the NEC and with local codes.

EPCOT STANDARD 5-1

ELEVATORS, DUMBWAITERS, ESCALATORS, MOVING WALKS, MANLIFTS AND TRANSPORTING ASSEMBLIES

SECTION 5-1.101 ADMINISTRATIVE REQUIREMENTS

5-1.101.1 Scope. The requirements of this Standard shall apply to the design, construction, installation, operation, inspection, testing, maintenance, alteration and repair of elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, special-purpose elevators, manlifts, conveyors, cableways, derricks, hoists, jacks, slings, cranes, parking elevators and aerial passenger tramways.

Where these types of transporting devices are provided as an integral feature of an amusement ride or device, and where they differ significantly from the generic, conventional description in appearance, and in purpose, function, and use, those transporting devices shall be considered to be amusement rides and devices and shall be consistent with the applicable requirements set forth in EPCOT Standard 5-13.

5-1.101.2 Criteria.

- (a) Design, construction and operation of all devices enumerated in Subsection 5-1.101.1 and the devices to which they may be attached, or of which they are an integral part, shall comply with the requirements of the Florida Department of Business and Professional Regulation; the applicable provisions of this Code and the *EPCOT Mechanical Code*; and with the requirements of this Standard.
- (b) Such devices shall be in accordance with established principles of civil and mechanical engineering as specified in the nationally recognized Standards listed in Appendix A and this Standard, as applicable.
- (c) The Building Official may approve written specifications applicable to the design, construction, operation and maintenance of transporting assemblies not covered specifically by this Standard or the referenced standards incorporated herein. Such devices and equipment shall be consistent with the applicable criteria of this Subsection.
- (d) Where applicable, the following Standards shall be considered as part of this Standard:
 1. *Safety Code for Elevators and Escalators*, ASME A17.1 with A17.1a/CSA B44a Addenda, and the *Guide for Inspection of Elevators, Escalators, and Moving Walks*, ASME A17.2.
 2. *Safety Standard for Belt Manlifts*, ASME A90.1.
 3. *Safety Code for Conveyors, Cableways and Related Equipment*, ASME B20.1.
 4. *Safety Code for Existing Elevators and Escalators*, ASME A17.3.
 5. *Safety Standard for Platform Lifts and Stairways Chairlifts*, ASME A18.1.

Specifically Excluded:

- a. ASME A17.1 and supplements, Section 1200 General Requirements Rule 1200.1 Conformance with Safety Code for Existing Installations.
 - b. *Safety Standard for Mechanical Power-Transmission Apparatus*, ASME B15.1.
 - c. *Safety Code for Derricks*, ASME B30.6.
 - d. *Safety Code for Overhead and Gantry Cranes*, ASME B30.2.
 - e. *Safety Codes for Overhead Hoists (Underhung)*, ASME B30.16.
 - f. *Safety Code for Jacks*, ASME B30.1.
 - g. *Safety Standard for Powered Industrial Trucks*, ASTM B56.1.
 - h. *Safety Code for Aerial Passenger Tramways*, ANSI B77.1.
- (e) Glass used in elevator hoistways and elevator cars shall comply with Subsection 1005.10.

5-1.101.3 Existing installation. Elevators, dumbwaiters, escalators, moving walks and transporting assemblies existing at the time this Code and Standard were adopted may be used when they meet the requirements of the District for public safety.

5-1.101.4 Definitions. Terms and words used in this Standard have the meaning set forth in Chapter 2 and the Standards listed in Subsection 5-1.101.2(d), modified as follows:

- (a) **Alteration.** Any change to equipment, including its parts, components and/or subsystems, other than maintenance, repair or replacement.
- (b) **Automatic.** Self-activating, self-acting and self-regulating mechanism performing a required act at a predetermined point in an operation.
- (c) **Automobile parking elevator.** Elevator located either in a stationary or horizontal moving hoistway that is:
 1. Used solely for parking automobiles where attendants are normally stationed only on the receiving level.
 2. Where each automobile is moved on or off the elevator directly into parking spaces or cubicles in line with the elevator.
 3. Where an automobile is moved either under its own power or by a power-driven transfer device.
- (d) **Conveyance.** Elevator, escalator, dumbwaiter, manlift, automobile parking elevator, moving walk, aerial tramway, stairway chairlift, conveyor and the cableways, derricks, hoists, jacks, slings, cranes and other equipment and devices used in connection therewith.

- (e) **Conveyor.** Horizontal, inclined or vertical device for moving or transporting materials, packages or passengers in a path predetermined by the design of the device and having points of loading or discharge fixed or selective. (See ANSI B20.1.)
- (f) **Door closer.** Device to close elevator doors.
- (g) **Dual control.** Elevator equipped with automatic and manual controls.
- (h) **Elevator.** Hoisting and lowering mechanism serving two or more floors of a building or structure, equipped with a car or platform moving in guides in a vertical direction. (See this Code and ANSI A17.1.) A mechanism that is part of a registered attraction, as defined by Florida Statute 242.616 (2008), shall not be considered to be an elevator.
- (i) **Escalator.** Power-driven, inclined continuous stairways used exclusively for raising or lowering passengers.
- (j) **Hoistway (shaft).** Shaftway for travel of one or more elevators or dumbwaiters, including pit, terminating at the underside of the overhead machinery floor, or at the underside of the roof when the hoistway does not penetrate the roof.
- (k) **Manlift.** Device consisting of a power-driven endless belt provided with steps or platforms and with handholds attached to it, used for transporting persons from floor to floor, usually during construction.
- (l) **Manufacturer's agent.** The representative of the manufacturer of any device or equipment installed under the provisions of this Standard as specified in Subsection 5-1.101.1.
- (m) **Moving walk.** Passenger-carrying device on which passengers stand or walk in which the passenger-carrying surface remains parallel to its direction of motion and is uninterrupted. (For special types, see ASME A17.1.)
- (n) **Owner.** As defined in Chapter 2.
- (o) **Shaft.** See "Hoistway."
- (p) **Transporting assembly.** Manually operated, automatic or power-operated permanent or semi-permanent device (other than elevators, manlifts or dumbwaiters) used for transporting material or persons in a horizontal, vertical or inclined position or direction. Such assemblies shall include, but shall not be limited to, the following:
 1. Inclined devices with or without seats, not considered as elevators or escalators.
 2. Hoists or conveyors used for handling material during construction or demolition, or in processing industrial and commercial materials and products, as in Group B, H and I occupancies.

5-1.101.5 Responsibility. The owner shall be responsible for the safe operation and maintenance of every device and piece of equipment within the scope of this Standard as specified in Subsection 5-1.101.1.

5-1.101.6 Permits.

- (a) Application for a permit to install, relocate, alter or operate any device within the scope of this Standard shall be filed with the Building Official in accordance with the requirements of Chapter 3. When the device is approved by the Building Official, he shall issue a permit subject to the following conditions:
 1. Servicing repairs and replacements for normal maintenance made with parts using equivalent design and materials, and having equivalent strength and safety to the parts replaced, shall not require a permit, but shall be inspected and approved by the Building Official.
 2. Material hoists for construction operations shall comply with the requirements of Appendix F and with the requirements of Florida Statute 442. Such hoists may be constructed without a permit, but shall be approved by the Building Official. Men shall not be permitted to ride on material hoists, except as provided in the regulations of Florida Statute 442.
 3. No requirement in this Section nor in the manufacturers' specifications shall be construed as exempting a device that is within the scope of this Standard from compliance with the safety requirements of the District.
- (b) Application for a permit to install, relocate or alter an elevator, escalator, dumbwaiter or other transporting assembly or device specified in Subsection 5-1.101.1 shall be accepted only from persons and firms qualified under the laws of the State of Florida or the District to perform the required work.
- (c) Devices and structures within the scope of this Standard as specified in Subsection 5-1.101.1 shall not be used, nor occupied, unless they are in full compliance with the requirements of this Code and Standard.

SECTION 5-1.201 TESTING AND INSPECTION

5-1.201.1 Load tests. Passenger-carrying devices shall be tested and approved before being placed in service, as follows:

- (a) Elevators, escalators, moving walks, wheelchair lifts and special-purpose elevators as specified in ANSI A17.1.
- (b) Temporary devices.

5-1.201.2 Periodic inspections.

- (a) The owner shall cause periodic inspections to be made of any device regulated by this Standard in accordance with the times and schedules established by the Building Official. Such schedules shall include the following:
 1. Power-operated elevators, automobile parking elevators, escalators and moving walks, wheelchair lifts and special-purpose elevators; at least once each six months.

2. Elevator car and counterweight safeties, governors, and oil buffers; once every 12 months or in accordance with ANSI A17.1, whichever is the more restrictive requirement.
 3. Where no standard of inspection intervals is available in the documents of reference, the Building Official shall require inspections to be made as he considers necessary to assure safe operation of the device or equipment.
- (b) **Maintenance inspections and tests.** The owner shall cause maintenance inspections to be made by persons qualified by the District to perform such inspection under the laws of the State of Florida, of all devices and equipment specified in Subsection 5-1.101.1. Costs of such inspections and tests shall be paid by the owner. A complete and accurate report of all inspections and tests made shall be filed with the Building Official.
- (c) **Violations and unsafe equipment.** When an inspection reveals a violation of this Code or Standard, creating an unsafe condition, the Building Official shall have the authority to order discontinuance of the use of the equipment until it has been repaired, tested, replaced and reinspected in accordance with the requirements for new installations. If the Building Official finds that a violation has created a condition endangering human life, he shall cause to be placed a notice stating that the conveyance is unsafe. The notice shall be maintained in a conspicuous place until the unsafe conditions have been corrected. Such notice shall remain in place until removed by the Building Official when he is satisfied that the unsafe conditions have been corrected.
- (d) **Access for inspection.** Operational keys for fire-fighter service shall be provided in a centrally located, uniformly keyed, lock box. Location of the lock box shall be mutually agreed upon by the Reedy Creek Emergency Services, Department of Building and Safety, and the owner.

5-1.201.3 Reporting/inspections following accidents or incidents. The Building Official shall have access to the site of an accident to an elevator or other transporting device regulated by this Standard, and shall inspect the device and record all information pertaining to the accident, and shall keep an accident report on file. The site of an accident shall be protected from vandalism; and damaged construction, operating mechanisms or parts thereof shall not be removed from the site of the accident until approval has been obtained from the Building Official.

Following an accident, the elevator shall not be placed back into service until all repairs have been completed and the work inspected and approved by the Building Official.

Within five working days after any accident occurring in or upon any elevator, the Certificate of Operation holder shall report the accident to the District. Failure to timely file this report is a violation of Florida Statute and will subject the

Certificate of Operation holder to an administrative fine to be imposed by the District, in an amount not to exceed \$1,000.

SECTION 5-1.301 DESIGN AND CONSTRUCTION

5-1.301.1 Loads and stresses. Equipment and devices shall be constructed and designed to carry safely all loads to which such structures and devices may normally be subjected. Before being placed in operation and used by the public, all such devices shall be tested in accordance with the requirements of Subsection 5-1.201.1 and such other criteria as the Building Official may designate for impact, unbalanced and eccentric loads in accordance with the requirements of Chapter 9.

SECTION 5-1.401 CONVEYING SYSTEMS, ELEVATORS, ESCALATORS AND HOISTWAYS

5-1.401.1 Fire-protected enclosures.

- (a) Elevators and escalator openings through a floor/ceiling assembly shall be protected by a shaft enclosure complying with the provisions of this Section.

Exceptions:

1. Where the area of the floor opening between stories does not exceed twice the horizontal projected area of the escalators, the floor openings may be unenclosed if the floor opening involved is protected by a draft curtain in combination with closely spaced sprinklers. The draft curtain shall be located immediately adjacent to the opening, shall be 18 inches deep and shall be of substantially noncombustible material. Sprinklers, spaced not more than 6 feet apart, shall be placed 6 inches to 12 inches from the draft curtain on the side away from the opening to form a water curtain. Sprinklers in this water curtain shall be hydraulically designed to provide a discharge of 3 gallons per minute (gpm) per lineal foot of water curtain, measured horizontally around the opening with no sprinkler discharging less than 15 gpm. Nominal 1/2-inch orifice closed-head systems using sprinklers of Ordinary Temperature Classification are adequate for this purpose. When sprinklers are closer than 6 feet, cross baffles shall be provided. When sprinklers in the normal ceiling pattern are closer than 6 feet from the water curtain, it may be preferable to locate the water curtain sprinklers in recessed baffle pockets.
 2. A shaft enclosure is not required for elevator hoistways in open or enclosed parking garages that serve only the parking garage.
- (b) Not more than three elevators shall operate in the same hoistway (shaft) and a minimum rating of 2

hours shall be required for fire-resistive protection between contiguous hoistways.

- ➔ (c) In buildings housing all occupancies, elevator enclosures and machine rooms shall be of 2-hour fire-resistive construction.
- (d) Machine room doors shall be 1½-hour labeled.

Exception: Observation elevators, which are adjacent to a building wall without penetrating the separate fire-resistive areas of the building, shall comply with the provisions of ANSI A17.1.

5-1.401.2 Elevator lobbies and hoistway protection.

- (a) **Where required.** Elevator hoistway openings and enclosed elevator lobbies shall be provided where an elevator hoistway connects more than three stories.

Exceptions:

1. Protection of elevator hoistway door openings is not required where the elevator serves only open parking garages in accordance with Subsection 508.5.
2. Protection of elevator hoistway door openings is not required at the level(s) of exit discharge.
3. Enclosed elevator lobbies and protection of elevator hoistway door openings are not required on levels where the elevator hoistway opens to the exterior.
4. Where an area of refuge is required and an enclosed elevator lobby is provided to serve as an area of refuge, the enclosed elevator lobby shall comply with the *EPCOT Accessibility Code for Building Construction*.
5. Where fire service access elevators are provided, enclosed elevator lobbies shall comply with Subsection 5-1.402.

- (b) **Hoistway opening protection.** Where required protection of the elevator hoistway door opening, the protection shall be provided by one of the following:

1. An enclosed elevator lobby shall be provided at each floor to separate the elevator hoistway shaft enclosure doors from each floor by fire-resistance-rated walls in accordance with Section 707. In addition, doors protecting openings in the elevator lobby enclosure walls shall comply with Section 704 as required for corridor walls. Penetrations of the enclosed elevator lobby by ducts and air transfer openings shall be protected as required for corridors in accordance with Section 707.
2. Additional doors shall be provided at each elevator hoistway door opening that are readily openable from the car side without a key, tool, special knowledge or effort. Such door shall comply with the smoke and draft control door assembly requirements in Section 704 when tested in accordance with UL 1784 without an artificial bottom seal.
3. The elevator hoistway shall be pressurized in accordance with Subsection 720.21.

- (c) **Means of egress.** Elevator lobbies shall be provided with at least one means of egress complying with Chapter 10 and other provisions in this Code. Egress through an elevator lobby shall be permitted. Access to not less than one of the required exits shall be provided without travel through the enclosed elevator lobbies. Where the path of exit access travel passes through an enclosed elevator lobby, the level of protection required for the enclosed elevator lobby is not required to be extended to the exit unless direct access to an exit is required by other sections of this Code.

5-1.401.3 Prohibited uses, plumbing and mechanical systems.

Plumbing and mechanical systems shall not be located in an elevator shaft.

Exception: Floor drains, sumps and sump pumps shall be permitted at the base of the shaft provided they are indirectly connected to the plumbing system.

5-1.401.4 Electrical installations.

Electrical installations for elevators, escalators and similar transporting assemblies and devices shall comply with the requirements of the *EPCOT Electrical Code*. All installations shall be grounded.

5-1.401.5 Emergency power.

- (a) On buildings more than 75 feet high, emergency power shall be provided for not less than one elevator out of four or fraction thereof. In a bank of elevators, this emergency power shall be transferable to any other elevator. Emergency power shall be provided by an approved self-contained generator, set to operate within 60 seconds of a loss of normal power. The generator shall be located in a room separated from the remainder of the building by a 1-hour fire-resistive occupancy separation, except where a 2- or 3-hour occupancy separation is required by other provisions of this Code. The generator shall have a fuel supply sufficient to operate the generator for 2 hours.
- (b) Transfer between the normal and the emergency or standby power system shall comply with the provisions of ASME A17.1.

5-1.401.6 An approved pictorial permanent sign shall be installed immediately above each hall push button station on each floor reading: "In Fire Emergency, Do Not Use Elevator. Use Exit Stairs."

Exception: The emergency sign shall not be required for elevators that are part of an accessible means of egress complying with Section 407 of the *EPCOT Accessibility Code for Building Construction*.

5-1.401.7 A permanent sign shall be installed on each elevator machine room door reading "Danger—Electrical Equipment/Authorized Persons Only."

5-1.401.8 Fire protection.

- (a) Sprinklers shall not be installed in elevator hoistways and machine rooms.
- (b) Fire alarm initiating devices shall be located in the following areas:
 1. At each floor served by the elevator,
 2. Elevator machine rooms, and

3. Elevator hoistways, when required by the Building Official.

(c) For high-rise structure detection and communication systems, see Section 718.

5-1.401.9 Electrolysis protection for underground hydraulic elevator cylinders. All newly installed underground hydraulic pressure cylinders shall be encased in outer plastic containment to minimize electrolytic corrosion between the metal cylinder and ground cathode.

- (a) The plastic casing shall be capped at the bottom and all joints must be solvent or heat welded to ensure water tightness to prevent electrolysis to the hydraulic cylinders.
- (b) The plastic casing shall be constructed of polyethylene or polyvinyl chloride (PVC). The plastic pipe wall thickness must not be less than 0.125 inch.
- (c) A 1/2-inch pipe nipple with removable cap located between support channels, 6 inches above pit floor and 6 inches below pit floor, between PVC casing and cylinder for monitoring purposes.
- (d) Monitoring shall be on a monthly basis.

Note: A minimum amount of dry sand may be used to stabilize hydraulic cylinders from movement between casings and cylinders. (See Figure 5-1.)

(e) Replacements of existing hydraulic cylinders shall be protected by the aforementioned method where existing physical dimensions permit.

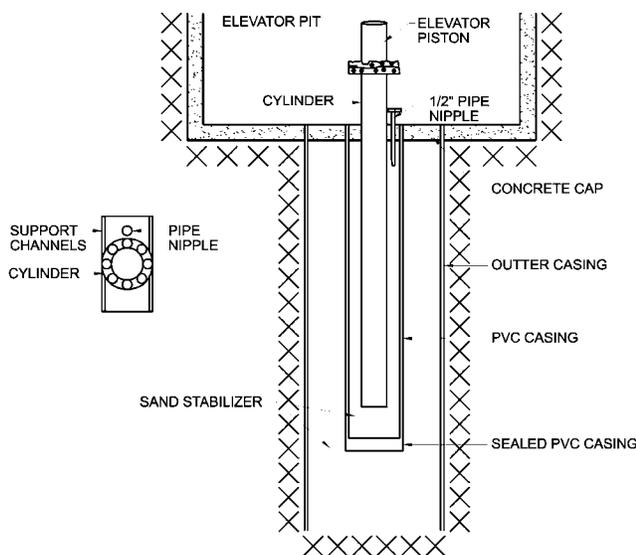


FIGURE 5-1

5-1.401.10 Machine rooms.

- (a) Elevator machine rooms and machinery spaces not located over the hoistway shall have a clear headroom of not less than 7 feet.
- (b) Spaces containing other elevator equipment shall have a clear headroom of not less than 54 inches.

(c) Access to machine rooms and machinery spaces shall conform to ASME A17.1.

(d) Venting – Elevator machine rooms that contain solid-state equipment for elevator operation shall be provided with an independent ventilation or air-conditioning system to protect against the overheating of the electrical equipment. The system shall be capable of maintaining temperatures within the range established for the elevator equipment.

(e) Pressurization – The elevator machine room serving a pressurized elevator hoistway shall be pressurized on activation of a heat or smoke detector located in the elevator machine room.

(f) Prohibited uses – Plumbing systems shall not be located in elevator equipment rooms.

5-1.401.11 Car and hoistway doors. Doors shall be provided with a door re-opening device, which will function to stop and re-open a car door and adjacent hoistway door in case the car door is obstructed while closing. Such device shall be operative at all times.

5-1.401.12 Sump pump in elevator pits. A sump pump or drain shall be provided in elevators with Firefighters Emergency Operations in accordance with ASME A17.1. An electrical outlet for damp locations in accordance with the *National Electrical Code* (NEC) shall be located within 4 feet of pump and 18 inches high from pit floor. Drains and sumps shall be installed in accordance with the *EPCOT Plumbing Code*. A sump pump cover shall be provided at floor level. In hydraulic units only, an oil separator shall be installed and water discharged indirectly into a sanitary system.

5-1.401.13 Escalator and moving walks. The exterior of trusses shall be enclosed with noncombustible materials.

5-1.401.13.1 Escalator guardrails. Escalators shall be provided with guardrails that comply with Subsection 503.11.

5-1.401.14 Elevators, escalators and moving walks with below-grade pits. Receptacles shall be ground-fault circuit interrupter type.

5-1.401.15 Elevator horizontally sliding door open and close time. The minimum time for opening size shall be as set forth in Table 401.15B.

**TABLE 401.15B
MINIMUM OPENING SIZES FOR HORIZONTALLY
SLIDING ELEVATOR DOORS**

INCHES	OPENING	SECONDS
36	Center	2.5
36	Single slide or two speed	3.1
42	Center opening	3.0
42	Single slide or two speed	4.4
48	Center	3.5
48	Single slide or two speed	4.8

5-1.401.16 Elevator car to accommodate ambulance stretcher. Any building that is more than one story must be constructed to contain at least one passenger elevator that is

operational for building occupants and fire department emergency access to all floors. The elevator car shall be of such a size and arrangement to accommodate an ambulance stretcher 24 inches by 81 inches with not less than 5-inch radius corners, in the horizontal, open position and shall be identified by the international symbol for emergency medical services (star of life). The symbol shall not be less than 3 inches high and shall be placed inside on both sides of the hoistway door frame.

5-1.401.17 Material lifts and conveyers. Material lifts and conveyers that are not classified as an elevator or dumbwaiter shall comply with ASME B20.1.

Lifts shall be permitted and inspected by the Department of Building and Safety. At the final inspection, a Certificate of Operation shall be posted in a conspicuous location in a frame with a transparent protective cover. The certificate shall be valid for one year. Inspections shall be performed every six months to certify the safety of the lift and its operation.

- (a) Lifts located in hotels, or similar buildings with overnight sleeping quarters, or subject to moving flammable material, or that penetrate a floor, shall be installed in a 2-hour fire-rated hoistway with 1½-hour “B” label hoistway doors.

Fire-rated doors shall be self-closing. Such doors may be held open for loading and unloading by a mechanical or electrical device that will release the door in case of fire.

- (b) Hoistway entrances shall have a combination electrical and mechanical lock to prevent the lift from operating with the door open or the opening of the door if the lift is 2 inches away from floor level. Means shall be provided to open the mechanical lock by a special key if the car is not at the landing. Vision panels may be used in the hoistway doors. Panel openings shall be glazed with wire glass, no less than ¼ inch thick. Openings shall reject a 6-inch ball with a maximum opening of 72 square inches.
- (c) Hoistways in an open area that do not penetrate a floor may be guarded with a wire grill or expanded metal that is at least 6 feet in height and that will reject a ball 2 inches in diameter. The doors shall have a combination mechanical and electrical lock. If the lift has an open side, front or ceiling, the hoistway shall have fixed guards on all sides. Metal guarding of hoistways in open areas and platform walls shall be so supported and braced solely as to deflect not more than 1 inch when a force of 100 pounds is applied at any point. Running clearance shall be no less than ¾ inch. Recesses or projections more than 2 inches shall be beveled at an angle of not less than 75 degrees with the horizontal.
- (d) Mechanical direction limits shall be provided to disconnect the power in both up and down directions. All hoistway wiring shall be enclosed and conform to applicable provisions of the *EPCOT Electrical Code*.
- (e) A call and send button with an emergency stop switch shall be located at each landing, arranged so it cannot

be reached from the car. A call and send button shall not be installed within the car or hoistway.

- (f) The machine room and machine spaces required for electrical installation and clearances shall comply with applicable provisions of the *EPCOT Electrical Code*. A disconnect shall disconnect power to the unit. It shall be located within sight of the power unit and controls. The controls may be located outside of the hoistway with a main disconnect. If the power unit is not in sight of the disconnect, a safety switch to prevent the operation of the unit shall be installed adjacent to the power unit and identified with a sign stating: “CAUTION! SWITCH WILL NOT REMOVE ALL POWER.” The controls shall be installed within a cabinet. The disconnect and control cabinet shall be lockable. The machine room or machine spaces shall have a guarded work light and receptacle. The receptacle shall be ground-fault circuit interrupter protected, not to exceed 20 amps. A machine room access door leading into a fire rated room or space shall be 1½-hour “B” labeled. The machine room door or access panel may require a switch to disconnect the power when the door is open. The door shall be self-closing and locking, and shall be openable only with a key. The lock shall be so arranged that the door can be opened from inside without a key. An access door that does not require body entry may be no less than 2 feet wide by 2 feet high. If body entry is required, a 24-inch by 78-inch-high door shall be provided.
- (g) The cab may be of solid or perforated metal. Perforated enclosures shall reject a ball 1½ inches in diameter. A solid metal car shall have a recessed light in the cab. Perforated enclosures may have hoistway lighting. Car doors or gates shall be provided with an electrical switch to prevent operation of the lift if the gate or door is open more than 2 inches. Lifts shall be posted with a sign that displays the lift capacity, restricts the use for materials only and prohibits riders. Lettering for such sign shall be at least 2 inches high.

Cars with only sidewalls and no ceiling shall have a sign posted in the car stating: “WARNING, MATERIAL NOT TO EXTEND PAST SIDEWALLS” in lettering at least 2 inches high.
- (h) A hydraulic pumping unit shall have an oil pressure gauge or means to connect a gauge on the pressure side of the unit. High-pressure units shall be set to bypass 10 percent above full load capacity. Car safeties shall be provided that are not direct plunger-type hydraulic lifts.
- (i) The car run-by at the top landing shall be no less than 3 inches.

Where a top is provided on the cab, the overhead clearance shall be not less than 24 inches when the car has reached its furthestmost travel. Cars with sidewalls only shall have not less than 6 inches clearance from any object to the ceiling of the hoistway, when the car has reached its furthestmost travel.
- (j) On drum-type machines, a slack cable switch shall be provided. A minimum of two ropes with a minimum

diameter of $\frac{3}{8}$ inch shall be used. The factor of safety for wire ropes shall be not less than 7.0.

5-1.401.18 Battery emergency return unit.

- (a) In the event of primary power failure, after 4 to 6 seconds, the hall and car buttons shall be inoperative, close the doors, and sound audible and visual signals to alert passengers that the car is returning to the designated level. When the car reaches the designated level, the door open button and detector will continue to operate normally after the doors open to allow passengers to exit. After the doors time out and close, the audible and visual signal will go off.

The door open button and detector will continue to operate in the car parked with the doors closed until after 5 minutes, the unit will turn off to prolong battery life.

The elevator will be able to resume normal operation when building power is restored if all elevator controls are in the normal position.

- (b) Enclosures shall be constructed as to ASME A17.5 and labeled by a nationally recognized testing laboratory. Control equipment, wiring, grounding, wiring methods, clearance and fuses shall comply with ASME A17.5, and the NEC.
- (c) A manual test switch shall be provided to test equipment for a simulated power failure. The switch shall be located outside of control enclosures and marked "TEST."

Routine inspections and tests shall be made at intervals not longer than six months. A written record indicating the inspection must be maintained on each unit and be available for review by the inspector.

- (d) A disconnecting means shall be provided to remove power from the emergency return unit when the main disconnect is in the open position.

5-1.401.19 Platform lifts. Platform lifts shall conform to the *EPCOT Accessibility Code for Building Construction*; Chapters 553 and 399 of the Florida Statutes; ASME A18.1 and A17.5; and the *National Electrical Code*.

A sign shall state: "PHYSICALLY DISABLED PERSONS ONLY. NO FREIGHT," in letters not less than 0.25 inches high and shall include the International Symbol of Accessibility. The passenger-restricting sign shall be securely fastened in a conspicuous place on the platform.

5-1.401.20 Personnel and material hoists. Personnel and material hoists shall be designed utilizing an approved method that accounts for the conditions imposed during the intended operation of the hoist device. The design shall include, but is not limited to, anticipated loads, structural stability, impact, vibration and stresses. The design shall account for the construction, installation, operation and inspection of the hoist tower, car, machinery and control equipment, guide members and hoisting mechanism. Additionally, the design of personnel hoists shall include provisions for field testing and maintenance which will demonstrate that the hoist device functions in accordance with the design. Field tests shall be

conducted on the completion of an installation or following alteration of a personnel hoist.

SECTION 5-1.402 FIRE SERVICE ELEVATORS— HIGH-RISE BUILDINGS OVER 120 FEET

5-1.402 Fire service access elevator. Elevators installed and operating in high rise buildings with an occupied floor more than 120 feet above the lowest fire department vehicle access shall have, at a minimum, two fire service access provided in accordance with this Section. Every floor of the building shall be served by a fire service access elevator. Except as modified in this Section, the fire service access elevator shall be installed in accordance with this Chapter and ASME A17.1/CSA B44.

5-1.402.1 Hoistway enclosures protection. The fire service access elevator shall be located in a shaft enclosure complying with this Code.

5-1.402.2 Hoistway lighting. When firefighters' emergency operation is active, the entire height of the hoistway shall be illuminated to not less than 1 footcandle as measured from the top of the car of each fire service access elevator.

5-1.402.3 Fire service access elevator lobby. The fire service access elevator shall open into a fire service access elevator lobby in accordance with Subsections 5-1.402.4.1 through 5-1.402.4.4.

Exception: Where a fire service access elevator has two entrances onto a floor, the second entrance shall be permitted to open into an elevator lobby in accordance with Subsection 708.14.1.

5-1.402.3.1 Access. The fire service access elevator lobby shall have direct access to an exit enclosure.

5-1.402.3.2 Lobby enclosure. The fire service access elevator lobby shall be enclosed with a smoke barrier having a minimum 1-hour fire-resistance rating, except that lobby doorways shall comply with Subsection 5-1.402.3.2.

Exception: Enclosed fire service access elevator lobbies are not required at the street floor.

5-1.402.3.3 Lobby doorways. Each fire service access elevator lobby shall be provided with a doorway that is protected with a $\frac{3}{4}$ -hour fire door assembly complying with Subsection 704.3. The fire door assembly shall also comply with the smoke and draft control door assembly requirements of Subsection 704.3(d) with the UL 1784 test conducted without the artificial bottom seal.

5-1.402.3.4 Lobby size. Each enclosed fire service access elevator lobby shall be a minimum of 150 square feet in an area with a minimum dimension of 8 feet.

5-1.402.4 Standpipe hose connection. A Class I standpipe hose connection in accordance with Subsection 715.2 and EPCOT Standard 7-14 shall be provided in the exit enclosure having direct access from the fire service access elevator lobby.

5-1.402.5 Elevator system monitoring. The fire service access elevator shall be continuously monitored at the fire

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command center by a standard emergency service interface system meeting the requirements of NFPA 72.

5-1.402.6 Electrical power. The following features serving each fire service access elevator shall be supplied by both normal power and Type 60/Class 2/Level 1 standby power:

1. Elevator equipment.
2. Elevator hoistway lighting.
3. Elevator machine room ventilation and cooling equipment.
4. Elevator controller cooling equipment.

5-1.402.6.1 Protection of wiring or cables. Wires or cables that provide normal and standby power, control signals, communication with the car, lighting, heating, air conditioning, ventilation and fire-detecting systems to fire service access elevators shall be protected by construction having a minimum 1-hour fire-resistance rating or shall be circuit integrity cable having a minimum 1-hour fire-resistance rating.

SECTION 5-1.403 SERIAL NUMBERS

5-1.403 Serial numbers. Each elevator shall have a serial number assigned by the authority having jurisdiction painted on or attached to the elevator car in plain view and also to the driving mechanism. This serial number shall be shown on all required certificates and permits.

5-1.403.1 Certificates of operation must be posted in a conspicuous location in the elevator and shall contain the text of Subsection 823.12 *Florida Statute* relating to the prohibition against smoking in elevators. The certificate must be framed with a transparent cover.

5-1.403.2 The designation “NO SMOKING,” along with the international symbol for no smoking, shall be conspicuously displayed in the interior of the elevator in the plain view of the public.

5-1.403.3 The following ASME A17.1 and ASME A17.3 rules are hereby amended to read as follows:

- (a) Rule 2.29.1 of ASME A17.1 is amended to add the following to the rule: “Each car in a multicar group shall be sequentially identified from left to right, as viewed from the elevator lobby.”
- (b) Rule 2.7.3.1 of ASME A17.1 is amended to read as follows: “Rule 2.7.3.1 General Requirements. A permanent, safe and convenient means of access to elevator machine rooms and overhead machinery spaces shall be provided for authorized persons. The key to the machine rooms and overhead machinery spaces shall be kept on the premises at all times and readily available for use by State of Florida certified Elevator Inspectors.”
- (c) Rule 3.11.3 of ASME A17.3 is amended to read as follows:

NOTE: Updates to the *Safety Code for Existing Elevators and Escalators* ASME A17.1 and ASME A17.3 which require Phase II Fire-

fighters’ Service shall apply except where Subsection 399.02(9) *Florida Statute* states Phase II Firefighters’ Service on elevators may not be enforced until July 1, 2015, or until the elevator is replaced or requires major modification, whichever occurs first, on elevators in condominiums or multifamily residential buildings, including those that are part of a continuing care facility licensed under Chapter 651, or similar retirement community with apartments, having a Certificate of Occupancy by the local building authority that was issued before July 1, 2008. This exception does not prevent an elevator owner from requesting a variance from the applicable codes before or after July 1, 2015. This Subsection does not prohibit the Building Official from granting variances pursuant to Subsection 120.542 *Florida Statute* or other applicable rules and regulations.

SECTION 5-1.404 ALTERATIONS TO ELECTRIC AND HYDRAULIC ELEVATORS AND ESCALATORS

5-1.404.1 Alterations to electric and hydraulic elevators and escalators. Alterations set forth in Part 8, ASME A17.1 to include any change to equipment, including its parts, components, and/or subsystems other than maintenance, repair, or replacement require an elevator construction permit, along with documented performance of inspections and tests, to determine conformance with ASME A17.1. A repair or replacement of equipment, parts, components or subsystems that requires inspection, tests and independent witnessing in other sections of ASME A17.1, A17.3 and A18.1 shall require an elevator construction permit.

EPCOT STANDARD 5-12

SAFETY STANDARD FOR AMUSEMENT ATTRACTIONS AND AMUSEMENT BUILDINGS

SECTION 5-12.101 ADMINISTRATIVE REQUIREMENTS

5-12.101.1 Scope. The requirements of this Standard shall apply to the design, construction, installation, use, inspection, testing, maintenance, alteration and repair of amusement buildings and attractions and structures as defined in Subsection 5-12.101.3.

5-12.101.2 Criteria.

- (a) Design, construction and use of all buildings and attractions enumerated in Subsection 5-12.101.1 shall comply with the requirements of the EPCOT Codes, Subsection 103.1 and this Standard.
- (b) Such devices shall be in accordance with established principles of engineering as specified in the nationally recognized standards listed in Appendix A, the *EPCOT Mechanical Code* and this Standard, as applicable.
- (c) The Building Official may approve written specifications applicable to the design, construction, use and maintenance of amusement attractions not covered specifically by this Standard or the referenced standards incorporated herein. Such attractions shall be consistent with the applicable criteria of this Subsection.
- (d) Where there is a conflict between requirements within the body of this Code and Standard, the requirements of the Code shall apply.

5-12.101.3 Definitions.

- (a) **Amusement attraction.** Any building or structure around, over or through that persons may move or walk without the aid of any moving device integral to the building or structure, which building or structure provides amusement, pleasure, thrills or excitement. The term does not include enterprises principally devoted to the exhibition of products of agriculture, industry, education, science, religion or the arts.
- (b) **Owner.** As defined in Chapter 2.
- (c) **Show area.** The area of an amusement building or attraction that guests are exposed to. The volume of the show area shall include all spaces not separated from the show area.
- (d) **Special amusement building.** Any building or portion thereof, whether temporary, permanent or mobile, used for amusement, entertainment or education containing a device or system that conveys passengers or provides a walkway along, around or over a course in any direction so arranged that the egress path is not readily apparent due to visual or audio distractions or is intentionally confounded, or is not readily available due to the nature of the attraction or mode of conveyance through the building or structure.

(e) **Special inspector.** An inspector not employed by the owner or the District, specifically qualified to perform inspection of amusement buildings and attractions.

(f) **Temporary amusement building or attraction.** An amusement building or attraction designed to be relocated from time to time with or without disassembly.

5-12.101.4 Responsibility. The owner shall be responsible for the safe operation and maintenance of every building and attraction within the scope of this Standard as specified in Subsection 5-12.101.1.

5-12.101.5 Permits. Application for a permit to install, relocate, substantially rebuild or substantially modify so as to change the structure or capacity of the building or attraction, or operate any building or attraction within the scope of this Standard, shall be filed with the Building Official in accordance with the requirements of Chapter 3.

SECTION 5-12.201 TESTING AND INSPECTION

5-12.201.1 Periodic inspections.

- (a) The owner/operator shall cause periodic inspections to be made of any building and attraction regulated by this Standard.
- (b) Where no standard of inspection intervals is available in the documents of reference, the Building Official shall require inspections to be made as he considers necessary to assure safe operation of the building or attraction.

5-12.201.2 Violations and unsafe conditions. When an inspection reveals a violation of this Code or Standard, creating an unsafe condition, the Building Official shall have the authority to order discontinuance of use until the violation or condition has been corrected. If the Building Official finds that a violation has created a condition endangering human life, he shall cause to be placed a notice stating that the conveyance is unsafe. The notice shall be maintained in a conspicuous place until the unsafe conditions have been corrected. Such notice shall remain in place until removed by the Building Official when he is satisfied that the unsafe conditions have been corrected.

5-12.201.3 Inspection following accidents. The Building Official shall be notified by the owner and have access to the site of an accident involving a building or attraction regulated by this Standard, provided such accident was the direct result of a building or attraction malfunction or operator error, and resulted in injury or death. The Building Official shall inspect the building or attraction and record all information pertaining to the accident, and shall keep an accident report on file. The site of an accident shall be protected from vandalism; and damaged construction, operating mechanisms or parts thereof

shall not be removed from the site of the accident until approval has been obtained from the Building Official.

Following an accident, the building or attraction shall not be placed back in service until all repairs have been completed and the work inspected and approved by the Building Official.

SECTION 5-12.301 DESIGN AND CONSTRUCTION

5-12.301.1 Types of construction. Buildings or attractions specified in Subsection 5-12.101.1 shall comply with the types of construction specified in Chapters 6 and 7. Where the type of construction is not clearly identified therein, the Building Official shall designate the required type of construction in accordance with the occupancy requirements of the building or attraction. Catwalks shall be constructed of noncombustible materials. Fire protection of steel and iron may be omitted.

5-12.301.2 Interior finish. The interior finish within amusement attractions and special amusement buildings shall be Class 1 throughout the show space and queue area in accordance with Section 711.

SECTION 5-12.401 AMUSEMENT BUILDINGS AND AMUSEMENT ATTRACTIONS

5-12.401.1 Exits.

- (a) Means of egress from amusement buildings and attractions, including stairways and platforms, ramps, fences and barricades, seats for spectators and safe dispersal areas, shall comply with the applicable requirements of Chapter 8 as specified by the Building Official.
- (b) Catwalks shall comply with the specific catwalk requirements found in Appendix M.
- (c) **Exit illumination and signs.** Exit illumination and signs shall meet the requirements of Chapter 8. Where mirrors, mazes or other designs are used that confound the means-of-egress path, approved low-level exit signs and directional path marking shall be provided and located no more than 8 inches above the walking surface on or near the egress path.

5-12.401.2 Fire prevention.

- (a) Fabrics used in amusement buildings and attractions, shall be made fire resistant in accordance with the requirements of the *EPCOT Fire Prevention Code*, and EPCOT Standards 5-13 and 6-1, as applicable. Approved fire extinguishers shall be provided where required by the *EPCOT Fire Prevention Code*. Flammable waste shall be kept in metal cans located as required in the *EPCOT Fire Prevention Code*. Gasoline or other flammable liquids and flammable gases shall not be stored in or near amusement buildings or attractions, or exitways, unless the storage area is specifically designed for such safe storage. Smoking shall be prohibited where required by the *EPCOT Fire Prevention Code*; signs shall be posted in accordance with the *EPCOT Fire Prevention Code*.

- (b) **Air compressors and equipment.** Air compressors, air compressor tanks and air compressor equipment shall be constructed, operated and maintained to ensure safe conditions. They shall be inspected at intervals established by the Building Official and a record of each inspection shall be available. Maximum allowable working pressure shall be marked on air compressors and their equipment.

5-12.401.3 Electrical wiring and equipment.

- (a) Transformers shall be enclosed and warning signs shall be posted thereon.
- (b) Overcurrent protective devices shall be provided according to the load. Such devices shall not be installed in neutral or grounding conductors.
- (c) Wiring shall not be installed on surfaces traversed by vehicles or pedestrians, except for temporary use. Such temporary wiring shall comply with Subsection 5-12.501.4(c).
- (d) Every electrically powered amusement device shall be grounded. The grounding shall be in accordance with the requirements of the *EPCOT Electrical Code*. Where noncurrent-carrying metal parts exposed to contact by passengers or operators may be energized, special grounding shall be provided. An effective ground shall be one having no greater than 25 ohms resistance. Where electric power is supplied from a privately operated generator system, the generator and its components shall be grounded when required by the Chief Electrical Inspector. All receptacles and attachment caps shall be of the grounding type.

5-12.401.4 Smoke control. A smoke control system shall be designed to control the migration of products of combustion in the show space. Upon detection of a fire, the system shall shut down the air supply to the fire floor and the return air from all nonfire floors.

- (a) Show spaces shall have a smoke exhaust system located at the ceiling. Such system shall be designed in accordance with Section 720 and shall be not less than 40,000 cubic feet per minute per smoke zone. Supply inlets shall be provided at the lowest level of the show area.
- (b) When the heights of the show area exceeds three stories, an exhaust system shall be provided as required in Paragraph (a), however, supply air shall be introduced mechanically from the floor of the show area. The capacity of the supply shall be 75 to 85 percent of the exhaust.

SECTION 5-12.501 TEMPORARY AMUSEMENT BUILDINGS AND ATTRACTIONS

5-12.501.1 Criteria. Amusement buildings or attractions designed to be moved or relocated shall comply with the applicable requirements of Sections 5-12.101, 5-12.201, 5-12.301, 5-12.401 and the provisions of this Section.

5-12.501.2 Prohibited use. Temporary amusement buildings or attractions that are not assembled in accordance with the

requirements of this Section, or that are defective, or are unsafe in any part, component, safety equipment or controls shall not be used or occupied. If the Building Official finds that a temporary amusement building or attraction presents an imminent danger, he may prohibit the use thereof and attach to such a warning notice. Such notice shall not be removed until the condition is made safe, tested and approved for use as provided in Section 310.

5-12.501.3 Inspection and certification. Inspection and certification of temporary amusement buildings and attractions shall comply with the requirements of Section 5-12.201.

5-12.501.4 Assembly and disassembly.

- (a) Temporary amusement buildings and attractions shall be assembled and disassembled in accordance with the requirements of this Subsection.
- (b) Parts or fastenings that are worn or damaged shall not be used. Close visual inspection shall be made of all parts and fastenings during assembly to discover any wear or damage and to assure that fastenings have been correctly installed.
- (c) Temporary electrical wiring used in the assembly of temporary amusement buildings and attractions shall comply with the requirements of the *EPCOT Electrical Code*. In areas where it is necessary to install temporary wiring over surfaces traversed by vehicles or pedestrians, the wiring shall be protected from wear and shall be installed so that it is not hazardous. Temporary wiring shall be removed when the temporary building or attraction is disassembled.

5-12.501.5 Air-inflated and air-supported. See Appendix N-301.10.

**SECTION 5-12.601
SPECIAL AMUSEMENT BUILDINGS**

5-12.601.1 Scope. Special amusement buildings shall meet the requirements of the appropriate assembly use group in addition to the requirements of this Section.

5-12.601.2 Smoke detectors. A supervised smoke detection system shall be installed in all special amusement buildings in compliance with EPCOT Standard 7-22. This smoke detection system shall either be cross-zoned or shall utilize an approved verification system.

Exception: Smoke detectors are not required in buildings or portions thereof that are essentially open to the outside air.

5-12.601.3 Sprinklers.

- (a) An approved automatic sprinkler system complying with EPCOT Standard 7-10 and Section 715 shall be installed in all special amusement buildings.
- (b) When the special amusement building is mobile, the sprinkler water supply may be by an approved temporary means.

5-12.601.4 System response.

- (a) The activation of two cross-zoned smoke detectors within a single protected area, a single detector monitored by an alarm verification zone or the automatic sprinkler system shall:
 1. Cause illumination of the means of egress with light of not less than 1 footcandle at the walking surface level.
 2. Stop any conflicting or confusing sounds and visuals.
 3. Activate an approved directional exit marking that will become apparent in an emergency.
- (b) Activation of any single smoke detector shall immediately sound an alarm at the building at a constantly attended location from which emergency action can be initiated.

5-12.601.5 Exit marking. Exit signs shall be installed at required exit doorways. Approved directional exit markings shall also be provided and shall include signs as set forth in the exit provisions of this Code, and be linear or strip on or near the floor identifying the exit path.

5-12.601.6 Public address system. A public address system, which may also serve as an alarm system, shall be provided and shall be audible throughout the entire special amusement building.

EPCOT STANDARD 5-13

STANDARD ON AMUSEMENT RIDES AND DEVICES

SECTION 5-13.101 ADMINISTRATIVE REQUIREMENTS

5-13.101.1 Scope.

- (a) This Standard establishes requirements for the design, manufacture, installation, inspection, testing, use and maintenance of amusement rides and devices. For those subjects for which it provides specifications, this Standard supersedes all existing EPCOT Standards.
- (b) Where amusement rides or devices resemble, in whole or in part, systems commonly used for other applications, manufacturers shall review the reference documents section of this Standard for requirements that might be appropriate to apply.
- (c) Owner/operators and manufacturers, as defined herein, shall be required to demonstrate compliance with this Standard to the Department of Building and Safety.

5-13.101.2 Purpose. The purpose of this Standard is to define program requirements for the safety of applicable amusement rides and devices.

Exceptions:

1. Exceptions to the requirements herein may, from time to time, be required. Where they occur, they shall be justified by engineering data, and only upon a sound, documented, safety basis, as approved by the Building Official.
2. The use of this Standard or future revisions of this Standard shall not require modifications of existing amusement rides and devices unless deemed necessary, on a case-by-case basis, in the interest of public safety.

5-13.101.3 Definitions.

- (a) **Aerial passenger tramway.** A passenger conveying system consisting of carriers that are not in direct contact with the ground, and in which the carriers circulate around a closed system and are propelled by a wire rope or chain. Refer to EPCOT Standard 5-1 for requirements applicable to those aspects of this system that are not specified in this Standard.
- (b) **Amusement device.** Any mechanical device or combination of devices that carries or conveys passengers on, along, around, over or through a fixed or restricted course or within a defined area for the purpose of giving its passengers amusement pleasure or excitement.
- (c) **Amusement ride.** A combination of amusement devices that constitute a total ride system.
- (d) **Amusement ride and device structures.** Structures supporting amusement rides and devices that are stati-

cally and/or dynamically loaded by the ride or device. Amusement ride and device structures shall not be considered as buildings.

- (e) **Block system.** A system used in certain rides to keep vehicles separated by dividing the ride into zones within which a single vehicle can be isolated. The vehicle's passage into and out of that zone is then monitored and coordinated with the activities in adjacent zones.
- (f) **Installation or erection.** The act of on-site construction or the physical setting up and making ready for use of a ride or device.
- (g) **Major modification.** Any change in either the structural or operational characteristics of the ride or device, which will significantly alter its performance from that specified in the manufacturer's design criteria.
- (h) **Manufacturer.** That party producing and/or supplying the physical product (ride or device) either as a system in total, or as part of a system; major modification, replacement parts or repair, including design, engineering, construction, fabrication, quality control and, if appropriate, installation.

The specific roles of the manufacturer may at times be assumed by various alternative parties within the manufacturer's or owner/operator's organization. Any party assuming the role of the manufacturer shall be required to comply with the manufacturer's responsibilities as defined in this Standard.
- (i) **Minor modification.** Any change that does not alter the structural or operational characteristics of the ride or device, nor change its performance from that specified in the manufacturer's design criteria.
- (j) **Owner/operator.** Those who operate and maintain the product (ride or device).
- (k) **Prototype.** Final operational assembly of a newly developed ride or device.

SECTION 5-13.201 DESIGN AND MANUFACTURE

5-13.201.1 Purpose. The purpose of this Section is to provide manufacturers with design references and criteria applicable to the design, manufacture and major modification of amusement rides and devices.

5-13.201.2 Referenced documents. Where applicable, the following Standards shall be considered as part of this Standard:

<i>ASTM Standards on Amusement Rides and Devices</i>	ASTM F24-2009 As compiled within the Annual Book of ASTM Standards, Volume 15.07
<i>Aluminum Construction Manual</i> by the Aluminum Association	EPCOT Standard 1002-1
American Welding Society Standards	EPCOT Standard 1009-5
<i>Automotive and Off-Highway Air Brake Reservoir Performance and Identification Requirements—Truck and Bus</i>	SAE J-10
<i>Boiler and Pressure Vessel Code, Section VIII, Division 1</i>	ASME B31.4-2001
<i>Boiler and Pressure Vessel Code, Section IX, “Welding Qualifications”</i>	<i>EPCOT Mechanical Code</i> , Chapter 16
D.O.T. 3A/3AA for CNG Cylinders E-7277	49 CFR-173.34, Oct. 1, 1997
<i>Manual of Steel Construction Machinery’s Handbook</i> , 25th Edition	EPCOT Standard 1009-1
<i>National Design Standards for Wood Construction</i>	EPCOT Standard 1010-1
<i>National Electrical Code</i>	NFPA 70-2011
<i>Overhead and Gantry Cranes</i>	ASME B30.2-2016
<i>Overhead Hoists (Underhung)</i>	ASME B30.16-2012
<i>Passenger Ropeways—Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors</i>	ANSI B77.1-2006
“Pediatric Growth Development Chart 1983” by U.S. Department of Health, Education and Welfare	
<i>Recommended Practice USA Human Physical Dimensions</i>	SAE J833
<i>Safety Code for Conveyors, Cableways and Related Equipment</i>	EPCOT Standard 5-1
<i>Safety Code for Elevators, Dumbwaiters and Moving Walks</i>	EPCOT Standard 5-1
<i>Safety Code for Jacks</i>	ANSI/ASME B30.1
<i>Safety Standard for Manlifts</i>	EPCOT Standard 5-1
<i>Safety Standard for Mechanical Power Transmission Apparatus</i>	EPCOT Standard 5-1
<i>Safety Standard for Powered Industrial Trucks</i>	ANSI/ASTM B56.1
<i>Standard Handbook for Mechanical Engineers</i> , 10th Edition	

5-13.201.3 Testing. Tests appropriate to be performed by the manufacturer may be found in Subsection 5-13.501.

5-13.201.4 Passenger weights.

- (a) For vehicles carrying seven or more passengers, the weight assigned to an adult passenger, for design purposes, shall be 170 pounds or 12 pounds per inch of hip width at the seat, whichever is greater. Reference SAE Recommended Practice, USA Human Physical Dimensions SAE J833 using the Medium Man for passenger weight.

- (b) For individual vehicles carrying six or less passengers, the weight assigned to an adult passenger, for design purposes, shall be 200 pounds or 14 pounds per inch of hip width at the seat, whichever is greater.

Exception: Alternative weights may be assigned if approved by the Building Official.

- (c) The weight assigned to a 12 year-old child passenger, for design purposes, shall be 90 pounds or 9 pounds per inch of hip width at the seat, whichever is greater. Reference Pediatric Growth Development Chart 1983, published by the U.S. Department of Health, Education and Welfare.

5-13.201.5 Passenger carrying devices.

(a) Design of passenger carrying units.

1. Passenger seating shall be designed to provide adequate support, padding and containment for the passenger’s body, during operation, consistent with the design intent of the ride or device with consideration given, but not limited to, speed and forces on passengers.
2. The interior and exterior surfaces of all passenger carrying units of amusement rides and devices shall be designed and constructed so as to be free from sharp, rough or splintered surfaces, and protruding features that might constitute a hazard.

(b) Methods of restraint.

1. Passenger restraint, where appropriate, shall be based on the design intent of the ride or device with consideration given, but not limited to, height, speed and forces on passengers.
2. Passenger restraining devices, if provided, shall be of a type that cannot be released without intention.

- (c) Passenger clearance.** Clearance shall be designed to minimize the opportunity for contact between a contained passenger and any object where said contact may reasonably be considered as likely to cause passenger injury during operation of a ride or device.

5-13.201.6 Amusement ride and device structures.

(a) Steel and aluminum structures.

1. Steel facility structures shall be designed in accordance with the *Manual of Steel Construction*, published by American Institute of Steel Construction.
2. Aluminum structures shall be designed in accordance with the specifications for aluminum structures, *Aluminum Construction Manual*.

- (b) Timber structures.** Timber structures shall be designed in accordance with *The Wood Handbook* published by the U.S. Department of Agriculture Forest Products Laboratory (USDA Agricultural Handbook 72, Revision 0).

- (c) Allowable loads or stresses as indicated by Paragraphs (a) and (b) data, shall be reduced as deemed adequate by the manufacturer, to allow for special combinations

of conditions that may include, but are not limited to, method of construction, stress concentrations, shock, dynamics, load cycles, degree of risk and environment.

(d) **Welding.** Welding of critical components shall be in accordance with the American Welding Society (AWS) and/or American Society of Mechanical Engineers (ASME) Standards and performed by appropriately certified welders.

(e) **Bolting specifications.**

1. All fasteners used on a ride in connecting components shall meet accepted engineering standards, such as SAE, ASTM, IFI, ANSI, and applicable structural codes for each application in the system and shall be grade marked or otherwise identifiable.

2. Fasteners shall properly fit their fastening holes.

(f) **Chain and wire rope.** Chain and wire rope used in ride systems shall meet existing industrial ratings considering the loads, conditions, dynamics and potential fatigue involved.

5-13.201.7 Electrical.

(a) Electrical components shall be designed, manufactured and installed in accordance with the *EPCOT Electrical Code* or equivalent.

(b) Emergency stop circuits shall be energized systems, which are fail-safe in case of power failure.

(c) Emergency stop switches shall be manually reset. Resetting of the stop switch shall not start the ride.

5-13.201.8 Hydraulic. The criteria for design and manufacture of fixed and portable amusement rides and devices shall be ANSI (NFPA/JIC) T2.24.1 or equivalent. Deviations from or changes to ANSI T2.24.1 shall be as follows:

(a) **Higher temperature operation.** Changes to ANSI T2.24-1, Section 6.7.1, shall be permitted only when components are designed and tested for higher temperature operation and adequate shielding is provided to prevent hot fluid from reaching any passenger or observer on or near the ride or device.

(b) **Access to controls.** Adjustments of control shall not require access between, over or in close proximity to moving equipment or parts.

(c) **Emergency safety device or means.** Where the possibility exists that undesirable motion will result due to an emergency or uncontrolled stop condition, a device or means shall be provided in the proportional or servo control circuit to prevent such motion.

(d) **Operation of filtration.** Filters shall be sized for a minimum of 800 hours of operation under normal system conditions.

(e) **Diagnostic pressure test points.** Pressure test points installed in the hydraulic circuit for system verification of pressure shall be accessible, and where pressure can be adjusted from the main system pressure.

(f) **System oil test.** Sample test points, close to hydraulic pumps, as well as other key locations, shall be installed for the purpose of testing the fluid for contamination.

These test points shall be made safe and reliable access points to the system while under pressure.

(g) **Position limits.** Effective means shall be provided to prevent a linear actuator, where piston and rod are the same diameter, from traveling beyond the physical limits of the actuator.

(h) **System failures.** In the event of a system failure or malfunction of the hydraulic system, the velocity or acceleration, or both, shall be controlled with respect to forces acting on the passengers.

5-13.201.9 Pneumatics.

(a) Maximum pressure shall not exceed component rating.

(b) Pneumatic storage tanks shall conform to ASME *Boiler and Pressure Vessel Code*, Section VIII, Division 1, or SAE J-10.

(c) Pneumatic accumulators shall conform to ASME *Boiler and Pressure Vessel Code*.

(d) Pneumatic tubing, hose and fittings shall conform to SAE Standards or equivalent.

(e) Loss of air pressure below design minimums in critical applications, shall cause the system to revert to the appropriate fail-safe mode.

(f) Where deemed appropriate by the manufacturer, pneumatic systems shall include components to provide lubrication, filtration, moisture extraction and pressure limiting.

(g) Where deemed appropriate by the manufacturer, provisions shall be made for dumping accumulator tanks when systems are shut down.

(h) Maximum allowable working pressures shall be marked on all compressors and their equipment.

(i) Where deemed necessary by the manufacturer, provisions for continuous monitoring of structural integrity of track and columns may be required.

(j) The pneumatic system shall include components to provide lubrication and moisture extraction where deemed appropriate by the designer.

5-13.201.10 Operator controls.

(a) Operator controls shall be designed to be located within easy reach of the operator when that operator is in a position to observe the ride while it is in operation. An operator shall be in the immediate vicinity of the operating controls at all times when the public is admitted.

Exceptions:

1. On devices or rides designed to be operated by a passenger.

2. When E-stops are accessible from the normal working position of the operator.

(b) Operator control systems shall be designed to minimize inadvertent operation.

(c) Operator controls shall be identified in the English language as to their function.

(d) An amusement ride or device propelled so as to be theoretically capable of exceeding a safe operating speed

shall be provided with a speed governor. Governors having an adjustable speed setting shall be secured so as to be inaccessible to other than those who have been assigned access by the owner/operator so that the speed cannot be changed by other than those assigned.

5-13.201.11 Brakes.

- (a) Brake design shall provide sufficient capacity to satisfy the manufacturer's recommended operation parameters.
- (b) A block system shall be designed for those rides and devices where, by the ride design, it is necessary to prevent independent passenger-carrying units from occupying the same block section or zone of the ride.
- (c) Braking systems shall be designed to be energized systems that remain activated in the event of power failure.
- (d) Inspection or test requirements for braking devices shall be assessed and information provided by the manufacturer to the owner/operator, including method and interval. This shall include daily inspections required to be performed prior to carrying guests, if applicable. Inspections shall be reasonable and such that the owner/operator can reasonably be expected to perform or cause to be performed.
- (e) Operator monitored braking systems designed to be normally activated in the absence of the operator shall be considered by the designer.

5-13.201.12 Machine guards. Machine guards shall be designed to protect employees and guests from hazards associated with, but not limited to belts, chains and pulleys.

5-13.201.13 Fencing for amusement rides and devices. Fencing is not a mandatory requirement for all rides and attractions. Other suitable means of protection, such as architectural barriers, landscaping or operator control, may be used. Fences and gates of alternative dimensions may also be utilized to supplement operator control, when approved by the Building Official.

- (a) Fencing and gates, when installed, shall comply with the following:
 1. Fencing and gates shall form a vertical protective barrier not less than 42 inches high and shall be such that a 4-inch-diameter sphere cannot pass through any opening.
 2. Fencing and gates shall be designed and constructed to prevent overturning by spectators or riders.
 3. Where used, entrance, exit and loading gates shall open away from the ride or device unless equipped with a positive latching device.
 4. Fences and gates shall be designed and constructed to restrict spectator contact with the ride or device or rider contact with the fence or gates.

5-13.201.14 Automatic and manual safety devices. Automatic and manual safety devices shall be assessed and information provided by the manufacturer to the owner/operator as to inspection or test requirements, including method and interval. This shall include daily inspections to be performed

prior to carrying guests, if applicable. Inspections shall be reasonable and such that the owner/operator can reasonably be expected to perform or cause to be performed.

5-13.201.15 Pressurized fuel cylinders. All pressurized fuel cylinders shall be governed by a comprehensive engineering specification for maintaining all required certification.

SECTION 5-13.301 OPERATION PROCEDURES

5-13.301.1 Purpose. The purpose of this Section is to delineate requirements and to establish procedures relating to the operation of amusement rides and devices.

5-13.301.2 Manufacturer's responsibility. The manufacturer of an amusement ride or device shall provide, with delivery of each ride or device, documented, recommended operating instructions in the English language. These instructions shall include, but not be limited to, the following;

- (a) Description of the ride or device operation including the function and operation of its major components.
 1. Description of the motion(s) of the ride or device during operation.
 2. Description of the recommended passenger loading procedures during operation, including recommended seating, when applicable.
- (b) Recommended safety procedures and instructions, and information about safety equipment pertaining to patrons and ride or device operators.
 1. Maximum total passenger weight and maximum number of passengers by carrier unit or ride total.
 2. Description of the passenger restraint system, its recommended use and operation.
 3. Ride or device operator safety check; recommended visual or other inspections to be performed by ride or device operators prior to and during each ride or device cycle.
 4. Instructions to the patron; recommended information that should be made available to each patron of the ride or device.
 5. Recommendations for operational restriction relating to environmental conditions, such as wind, rain, extreme heat or cold, lightning, humidity, ice, etc.
- (c) Manufacturer's recommended ride or device operating procedures, including the location of ride or device operators.
 1. Description of the recommended, daily pre-opening inspection to be performed by ride or device operator(s) that is in addition to previously performed maintenance or other inspections.
 2. Description of the recommended ride or device operator(s) positions and functions.
 3. Description of the recommended series of steps to be followed in a definite order to complete the operation of the ride or device.

- (d) Manufacturer's recommended emergency procedures.
1. Recommended evacuation procedures for the ride or device.
 2. Description of any emergency equipment that is provided with the ride or device, and its uses.
 3. Description of any emergency procedure made necessary by an interruption of power, and restart procedures, including the use of emergency power equipment, if provided with the ride or device.

5-13.301.3 Owner/operator's responsibility. The owner/operator of an amusement ride or device shall read and become familiar with the contents of the manufacturer's recommended operating instructions and specifications, when received as provided in this Section. In conjunction with the manufacturer, and based on these instructions and specifications, the owner/operator shall prepare an Operating Guideline. This procedure shall be made available to each operator of the amusement ride or device. The procedure (on a ride-by-ride basis) shall include, but not be limited to:

- (a) Specific ride or device operation policies and procedures with pertinent information from the manufacturer's instructions.
 1. Description of the ride or device operations.
 2. Duties of the specific assigned position of the ride or device operator.
 3. General safety procedures.
 4. Additional recommendations of the owner/operator.
- (b) Specific emergency procedures to be used in the event of an abnormal condition or an interruption of service.
- (c) The owner/operator shall provide training for each amusement ride or device operator. This training shall include, but not be limited to, the following, where applicable:
 1. Instructions on ride or device operating procedures.
 2. Instructions on specific duties of the assigned position.
 3. Instructions on general safety procedures.
 4. Instructions on emergency procedures.
 5. Demonstration of the physical ride or device operation.
 6. Supervised observation of the ride or device operator's physical operation of the ride or device.
 7. Additional instructions deemed necessary by the owner/operator.
- (d) The operator of each amusement ride or device shall conduct a daily pre-opening inspection of each ride or device prior to carrying passengers. This inspection shall include, but not be limited to, the following:
 1. Visual check of all passenger-carrying devices, including restraint devices and latches.
 2. Visual inspection of entrances, exits, stairways and ramps.
 3. Test of all communications equipment necessary for the operation of the ride or device.
 4. The ride or device shall be appropriately operated, without passengers, to determine that it is functioning properly.

SECTION 5-13.401 MAINTENANCE PROCEDURES

5-13.401.1 Purpose. The purpose of this Section is to delineate requirements for the maintenance of amusement rides and devices.

5-13.401.2 Manufacturer's responsibility. The manufacturer of an amusement ride or device shall provide, with delivery of each ride or device, documented maintenance instructions in the English language. These instructions shall include, but not be limited to, the following:

- (a) Description of the ride or device operation including the function and operation of its major components.
- (b) Description of the designed motion(s) of the ride or device during operation.
- (c) Description of the recommended procedures for installation, setup, disassembly and transportation of an amusement ride or device, if appropriate.
- (d) Recommended lubrication procedures for the amusement ride or device.
 1. Recommended types and specifications of lubricant.
 2. Recommended frequency of lubrication.
 3. A lubrication drawing, chart or instruction showing the location of lubrication points.
 4. Recommended special method of lubrication, where applicable.
- (e) Description of the recommended daily, pre-opening maintenance inspections to be performed and identification of special care areas and recommended procedures for inspection and maintenance of these areas.
- (f) Description, including frequency, of recommended maintenance inspections and testing, other than daily pre-opening inspection.
 1. Recommended wear limits or tolerances where deemed necessary by the manufacturer.
 2. Recommended operational tests, along with minimum intervals for these tests to be performed, that will allow the owner/operator of the ride or device to determine whether a given ride or device is operating within recommended prescribed operational limits.
 3. Where applicable, recommended nondestructive testing along with appropriate acceptance criteria, including suggested frequency and identification of the parts or areas to be tested.

4. Tests recommended pursuant to this Section shall meet the following criteria:

- (aa) The tests shall have been performed satisfactorily by the manufacturer prior to the installation of the amusement ride or device.
- (bb) The test shall be one that the amusement ride or device, or element, can reasonably be expected to pass during the expected life of the amusement ride or device, or element, assuming recommended maintenance and operating procedures have been followed.
- (cc) The test shall be one that is reasonable, and that the owner/operator can reasonably be expected to be competent to perform or cause to be performed.
- (dd) Together, these tests shall provide a thorough evaluation of systems and components.
- (ee) Recommended specifications for the use, or re-use, of original and replacement fasteners, including torque requirements, where applicable. If appropriate, precautionary information shall be provided relating to the continued use of fasteners that have been loosened or retorqued.
- (ff) Age control and/or other special handling requirements for those components effected, such as O-rings, rubber parts, filters, etc.
- (gg) Schematics of electrical power, lighting, controls, and other systems, including location charts and manufacturer's troubleshooting guide, where applicable.
 1. Description of recommended maintenance procedures for electrical components.
 2. The name of the component manufacturer and appropriate identification number, specifications or both, shall be provided for electrical components used within the amusement ride or device.
 3. Each electrical component used within the amusement ride or device shall be assigned an individual identification number, symbol or code to facilitate its location and identity on the electrical schematics.
- (hh) Schematics of hydraulic and pneumatic systems, including recommended pressures, location of components, component, line and fitting identification, type

of fluid, location chart and manufacturer's troubleshooting guide.

- (ii) Description of recommended maintenance procedures for hydraulic and pneumatic systems and components.
- (jj) List of parts used in the assembly of the ride or device, giving component specification, location and orientation in the assembly, cross referenced to the schematics, or drawings providing equivalent information.
- (kk) Description of recommended assembly and disassembly techniques and procedures, pertaining to specific components, as deemed necessary by the manufacturer.
- (ll) Recommended restrictions and special procedures, lubricants, materials or equipment that may be necessary because of environmental conditions.
- (mm) Other recommendations known to the manufacturer and specific to certain serial numbered rides or devices.
- (nn) Maintenance bulletins or similar documents, originated by the manufacturer of the amusement ride or device after the initial instructions have been provided as described in this Section, shall be supplied to the known owner/operator of the amusement ride or device.
- (oo) Replacement parts for amusement rides and devices shall be obtained from the manufacturer of the amusement ride or device, or manufactured to meet the original specifications and drawings, meeting or exceeding the same quality and function of the original part(s), as provided for in ASTM F853.

5-13.401.3 Owner/operator responsibility.

- (a) The owner/operator of an amusement ride or device shall read and become familiar with the contents of the manufacturer's maintenance instructions and specifications when received, as provided in this Section. Based on the manufacturer's recommendations, each owner/operator shall implement a program of maintenance, testing and inspections providing for the duties and responsibilities necessary in the care of each amusement ride or device. This program of maintenance shall include a checklist to be made available to each person performing the regularly scheduled maintenance on each ride or device. This maintenance checklist (on a ride-by-ride basis) shall include, but not be limited to:
 1. Description of preventive maintenance assignments to be performed, including interval.
 2. Description of inspections to be performed, including interval.

3. Special safety instructions, where applicable.
 4. Any additional recommendations of the owner/operator.
- (b) The owner/operator of the amusement ride or device shall provide training for each person performing the regularly scheduled maintenance on the ride or device, pertaining to their assigned duties. This training shall include, but not be limited to, the following:
1. Instruction on inspection and preventive maintenance procedures, including identification of special care areas.
 2. Instruction on the specific duties of the assigned position.
 3. Instruction on general safety procedures.
 4. Demonstration of the physical performance of the assigned regularly scheduled duties and inspections.
 5. Supervised observation of the maintenance person's physical performance of their assigned, regularly scheduled duties and inspections.
 6. Additional instructions deemed necessary by the owner/operator.
- (c) Prior to carrying passengers, the owner/operator shall conduct or cause to be conducted a daily documented and signed pre-opening inspection, based on provided instructions, to ensure the proper operation of the ride or device. The inspection program shall include, but not be limited to, the following:
1. Inspection of all passenger-carrying devices, including restraint devices and latches.
 2. Visual inspection of entrances, exits, stairways and ramps.
 3. Functional test of all communication equipment necessary for the operation of the ride.
 4. Inspection or test of all automatic and manual safety devices, if applicable.
 5. Inspection or test of the brakes, including service brakes, emergency brakes, parking brakes and back stops, if applicable.
 6. Visual inspection of all fencing, guarding and barricades, if applicable.
 7. Visual inspection of the ride structure.
 8. The ride or device shall be appropriately operated, without passengers, to determine that it is functioning properly.
- (d) An amusement ride or device, or the specifically affected elements, shall be appropriately inspected and operated, without passengers, to determine that it is functioning properly following an unscheduled cessation of operation caused by:
1. Malfunction or significant adjustment;
 2. Mechanical, electrical or operational modification or;
 3. Environmental conditions that affected the operation or any combination of these listed elements.
- (e) Fastening holes exhibiting wear beyond specific limits shall be replaced or repaired in accordance with the manufacturer's recommendations.
 - (f) Speed governing controls that become unsecured or require adjustment shall be resecured before operation of the ride or device is resumed.
 - (g) The owner/operator shall maintain adequate records and as-built drawings to depict the current configuration of the ride or device.

SECTION 5-13.501 TESTING PERFORMANCE

5-13.501.1 Scope and use.

- (a) This Section covers the basic tests that shall be conducted on amusement rides and devices during prototype development, installation or erection, following major modifications, and during normal operation to determine that the performance of a given ride or device meets the manufacturer's specified design criteria.
- (b) This Standard is intended for the use of manufacturers, owners/operators, and those persons or agencies involved in the installation and operational testing of amusement rides and devices.

5-13.501.2 Development testing by the manufacturer.

Where applicable, as determined by the manufacturer, the following test procedures shall be developed and performed on a prototype amusement ride or device in order that the appropriateness for use, of not only the parts, but the entire system of a newly designed ride or device, may be determined.

- (a) Procedures to verify maximum safe design loads:
 1. Procedures to verify such design characteristics as relevant deflections, loads and forces that are placed on both the equipment and the passengers during operation of the ride or device.
 2. A procedure to determine operational limits and restart criteria due to environmental conditions.
 3. Procedures to allow the manufacturer to determine such factors as component variability and certification requirements of critical components.
 4. Any other procedures necessary to demonstrate a ride or device's appropriateness for its intended use.

5-13.501.3 Installation testing. This Subsection covers those tests relevant not only to installation, but also includes post-modification and major modifications. The original manufacturer or supplier of an amusement ride or device shall also provide, where applicable, the following standard testing guides:

- (a) **Materials testing.** Acceptable test procedures for the certification of all major structural components shall be provided. Where possible, this testing should be referenced to commonly accepted industry standards.

- (b) **Erection/modification acceptance testing.** Test procedures or criteria for the acceptance of such construction operations as welding and fastening shall be provided. Reference, where possible, should be made to currently accepted industry standards for this purpose.
- (c) **Performance acceptance testing.** Tests shall be developed and performed in order to ensure that the newly erected ride or device conforms to the original design criteria.

5-13.501.4 Operational testing.

- (a) The manufacturer of a ride or device shall develop specific operational tests along with minimum intervals for these tests to be performed that will allow the owner/operator of a ride or device to determine whether that ride or device is operating within prescribed operational limits.
- (b) All operational tests shall meet the following criteria:
 1. All tests shall have been satisfactorily performed by the manufacturer.
 2. The tests shall be such that the ride, device or element can reasonably be expected to pass during its expected design life, assuming recommended maintenance and operative procedures have been followed.
 3. All tests shall be reasonable and such that the owner/operator can reasonably be expected to be competent to perform or cause to be performed.
 4. Any operational test, including load testing performed on an amusement ride or device, shall be completely nondestructive in nature. Overload testing exceeding the previously stated limits shall be deemed inappropriate.
 5. Any installation or operational testing conducted on an amusement ride or device shall be accomplished within the rated limits of the information provided by the manufacturer.

5-13.501.5 Nondestructive testing (NDT). This Subsection pertains to the nondestructive testing of amusement ride and device components as recommended by the manufacturer. These tests shall be performed by a qualified NDT inspector in accordance with Practice E 543 or ASNT Recommended Practice SNT-TC-1A, or both. It is not intended to preclude any other schedule of NDT, inspection or testing.

- (a) NDT is the development and application of technical methods, such as radiographic, magnetic particle, ultrasonic, liquid penetrant, electromagnetic, neutron radiographic, acoustic emission, visual and leak testing, to examine materials or components in ways that do not impair the future usefulness and serviceability in order to detect, locate, measure and evaluate discontinuities, defects and other imperfections; to assess integrity, properties and composition; and to measure geometrical characters.
- (b) NDT shall be used to verify the integrity of components which due to their design, location, or installation,

or combination thereof, cannot be adequately evaluated by other means.

- (c) A schedule for testing on a given ride or device component shall be defined in terms of hours, days or other units of operation. The initial design shall be developed to expect a period between tests to be no more frequent than annually.
- (d) The manufacturer shall recommend components to be tested along with appropriate acceptance criteria. The manufacturer may recommend the test method, but shall not specify how the testing is to be conducted, except where certain procedures might adversely affect other components on the ride or device. Any changes or additions to these recommendations shall be communicated to all known owner/operators of the ride or device, and inspection agencies via manufacturer's bulletins. Tests shall meet the requirements of Subsections 5-13.501.4(b)1 through 5-13.501.4(b)3.
- (e) The manufacturer shall include in an appropriate section of the ride or device manual the list and location of components to be tested, recommending specific areas to test and the schedule by which they shall be tested in accordance with Paragraph (d).
- (f) Components found to have relevant indications that do not meet the acceptance criteria shall be replaced or reconditioned in accordance with Practice F 853.
- (g) Components found free of relevant indications that meet the acceptance criteria or have been reconditioned, shall be further tested at regular schedule in accordance with Paragraph (c).
- (h) Within a reasonable time following a request by an owner/operator or inspection agency, the manufacturer of an amusement ride or device whose manual does not contain testing recommendations shall either provide a component listing or statement that no NDT is recommended on the ride in accordance with the criteria outline of Paragraph (b). When a manufacturer's list or statement is not available, it may be compiled by a registered professional engineer or engineering agency, or by any qualified by training and experience to compile such a list or statement based upon the ride or device's specifications and history and using accepted engineering practices.
- (i) The owner/operator shall be responsible for implementing a program of testing based on the recommendations of this Section.

SECTION 5-13.601 PHYSICAL INFORMATION TO BE PROVIDED

5-13.601.1 Scope. This Section covers the minimum requirements for information that shall be provided to the owner/operator by the manufacturer of an amusement ride or device, prior to initiating operation of that ride or device with passengers.

5-13.601.2 Purpose. It is intended to provide the minimum information necessary for the proper identification, placement, erection and operation of each amusement ride or device.

5-13.601.3 Information requirements.

- (a) The information listed in this Subsection shall be either included or indicated as not applicable for all amusement rides and devices by the manufacturer.
- (b) **Serial numbers.** A manufacturer's issued unique identifying number or code affixed to the ride or device, or individual passenger carrying unit, as applicable, in a permanent fashion.
 - 1. **Nomenclature.** A manufacturer's issued unique identifying nomenclature for that specific ride or device, in English, including location of manufacturer by city, state and country. This shall be provided in name plate form, if applicable.
- (c) **Ride model number.** A manufacturer's issued unique identifying number or code assigned to each manufactured type of ride having the same structural design or components.
- (d) **Date of manufacture.** The date (month and year) determined by the manufacturer that the given ride or device met the required construction specifications.
- (e) **Trailing information.** Sufficient information shall be provided with each portable ride or device, or element, if applicable, to enable handling and transportation without damage.
- (f) **Static information.** The following information shall be provided for the amusement ride or device when it is in a nonoperational state with no passengers: height, width, length (or diameter) and weight.
- (g) **Dynamic information.** The following information shall be provided for the amusement ride or device when it is in an operational state: height, width, length (or diameter) and weight.
- (h) **Ride speed.** Minimum and/or maximum acceptable speed or rate of acceleration, deceleration or jerk, of the ride or device expressed in units appropriate for that ride or device. For example: revolutions per minute, time duration for travel over a specified or known distance, feet per second, feet per second per second, etc., in conventional U.S. units of measurements.
- (i) **Direction of travel.** When the proper direction of travel is essential to the design operation of the ride, the manufacturer shall designate the direction of travel, including reference point, for this designation.
- (j) **Power requirements.**
 - 1. **Electrical.** Total electrical power required to operate the ride or device designated in hertz, watts, volts and amperes, including minimum and maximum voltage limits, as well as emergency requirements, if applicable.
 - 2. **Mechanical.** Minimum horsepower necessary to operate the ride or device properly.

(k) Load distribution per footing.

- 1. Maximum static loading of each footing of an amusement ride or device; and
- 2. Maximum dynamic loading of each footing of an amusement ride or device.

(l) Passenger capacity.

- 1. Maximum total passenger weight, per passenger position and per ride.
- 2. Maximum total number of adult or child passengers, per passenger position and per ride.

(m) Ride duration. The actual time the ride is in operation or a passenger is exposed to the elements of the ride functions, including passenger restrictions to maximum exposure time shall be included.

(n) Recommended balance of passenger loading or unloading. When passenger distribution is essential to the proper operation of the ride or device, the appropriate loading and unloading procedure, with respect to weight distribution, shall be provided.

(o) Recommended passenger restrictions. Where applicable, any recommended passenger limitations such as, but not limited to, height, weight, passenger placement or any other appropriate restrictions.

(p) Environmental restrictions. Recommendations for operational restrictions relating to environmental conditions such as, but not limited to, wind, rain, extreme heat or cold, and other weather-related factors, such as lightning, humidity, ice, etc.

(q) Fastener schedule. A manufacturer's issued schedule for the correct grade, torque, placement and re-use of all fasteners used in the assembly or erection, or both, of the ride or device.

SECTION 5-13.701 INSPECTION

5-13.701.1 Scope. This Section defines inspections of amusement rides and devices to be provided during prototype development, manufacturing, installation or erection, following major modification or overhaul, and during operation and maintenance periods.

5-13.701.2 Periodic inspections.

- (a) The owner shall cause periodic inspections to be made of any device regulated by this Standard.
- (b) The Building Official may require inspections to be made as considered necessary to assure safe operation of the device or equipment.
- (c) The Department of Building and Safety shall make appropriate inspections during the installation, modification and testing of all amusement rides and devices, and no amusement ride or device shall be issued a Certificate of Occupancy until final approval by the Building Official.

5-13.701.3 Quality assurance program. Manufacturer's responsibility:

- (a) The manufacturer of an amusement ride or device shall have a written quality assurance program for use in conjunction with the design, manufacture, construction, modification or reconditioning of the amusement ride or device.
- (b) Quality assurance documents, that is, material certifications, test reports and inspection reports, shall be retained for the useful life of the amusement ride or device.
- (c) The manufacturer of an amusement ride or device shall provide the owner/operator with a written inspection procedure to be delivered with the ride or device. The document shall outline those inspections as contained in the maintenance and operation sections of this Standard.
 - 1. Any changes in the previously prescribed procedure, deemed essential by the manufacturer to be made after delivery, shall be communicated to all known owner/operators.
- (d) All inspections recommended shall meet the following criteria:
 - 1. Inspections shall be such that they shall have been satisfactorily performed by the manufacturer.
 - 2. Inspections shall be ones in which the ride or device, or element, can reasonably be expected to pass during the expected design life of the ride, device or element, assuming that recommended maintenance procedures have been followed.
 - 3. Inspections shall be reasonable and such that the owner/operator can reasonably be expected to be competent to perform or cause to be performed.
- (e) Upon notification from an owner/operator of an incident involving a critical component, the manufacturer of an amusement ride or device shall promptly evaluate this information and disseminate his findings to that owner/operator and, in addition, shall make any pertinent recommendations to all other known owner/operators of rides or devices of the same nomenclature, or sharing comparable features that might contribute to or be effected by those factors indicated in the incident.
 - 1. Owner/operator responsibilities:
 - (aa) Owner/operators of amusement rides or devices shall have an inspection program consistent with the inspections outlined in the maintenance and operations sections of this Standard; *Standard Practice for Operation Procedures*, ASTM F770; and *Standard Practice for Maintenance Procedures*, ASTM F853.
 - (bb) Inspection documents deemed appropriate by the owner/operator shall be maintained according to the procedures

outlined in the maintenance and operations sections of this Standard.

- (cc) The owner/operator of an amusement ride or device shall promptly notify the manufacturer and the Department of Building and Safety of an incident, failure or malfunction, which, in his judgment, seriously affects the continued proper operation of the ride or device and is information of which the manufacturer and the Department of Building and Safety should be aware.

SECTION 5-13.801 MANUFACTURER'S QUALITY ASSURANCE PROGRAM

5-13.801.1 Scope. This Section defines the minimum requirements necessary for establishment of a written Quality Assurance Program for an amusement ride and device manufacturer.

5-13.801.2 Drawing control procedure. A procedure shall be in effect to assure that appropriate drawings, revisions and related documents are used for each project.

5-13.801.3 Material control procedure. A procedure shall be in effect to assure that all materials, processes and components, including raw materials, are in accordance with the engineering specifications.

- (a) This procedure shall provide the purchasing agent with all the information required to order appropriate material.
- (b) A receiving procedure shall be in effect so that incoming material is checked against the purchasing specifications.
- (c) A procedure shall be in effect so that material in stock can be properly identified for future use.
- (d) Documentation on any material, process or components certified shall be maintained for reference.

5-13.801.4 Inspection.

- (a) A procedure shall be in effect so that appropriate inspections are made on manufactured parts and subassemblies to ensure conformance to engineering specifications.
- (b) A procedure shall be in effect so that appropriate inspections are made on purchased components.
- (c) A procedure shall be in effect so that completed units are inspected prior to delivery.
- (d) Nonconforming components shall be identified and evaluated for disposition as follows:
 - 1. Reworked components shall be re-inspected in accordance with this practice prior to use.
 - 2. A component not suitable for use shall be altered or disposed of to avoid accidental use.
- (e) In some cases, a component may be determined to be "acceptable as is" or "as modified" after further evaluation.

tion. In such cases, appropriate review, acceptance and documentation shall be a requirement.

5-13.801.5 Welding. Welding of critical components shall be in accordance with AWS, ASME or other equivalent standards and be performed by appropriately certified welders.

- (a) A procedure shall be in effect to identify critical components for the manufacturing shop.
- (b) A procedure shall be in effect to maintain documentation on certification of welders.

EPCOT STANDARD 6-1

**FIRE TESTS AND FIRE-RESISTIVE RATING OF
BUILDING CONSTRUCTION**

PART 1
TESTING FOR FIRE RESISTANCE

6-1.101 Testing criteria.

- (a) Materials and assemblies of materials and systems used in building construction as set forth in this Code as adopted by the District shall be tested in accordance with the procedures specified in ASTM E119, *Standard Method of Fire Test of Building Construction and Materials*.
- (b) Terms relating to fire tests of building construction and materials have the meanings specified in ASTM E176, *Standard Terminology Relating to Fire Standards*.

PART 2
**PERFORMANCE REQUIREMENTS FOR BUILDING
COMPONENTS UNDER EXPOSURE TO FIRE**

6-1.201 Performance criteria. The kind and minimum thickness of fire protection and rated time periods of fire resistance of building components and assemblies shall be as set forth in tests made by a recognized independent laboratory in accordance with Part 1, or shall be determined by the Building Official based upon calculations set forth in Section 311.

EPCOT STANDARD 7-7

FIRE-RETARDANT ROOF COVERINGS

SECTION 7-7.101 ADMINISTRATIVE REQUIREMENTS

7-7.101.1 Scope.

- (a) Roof coverings hereafter constructed, applied, altered or repaired shall comply with the requirements of this Code and Standard.
- (b) Not more than 25 percent of the roof covering of any building or structure shall be replaced in any 12-month period, unless the entire roof covering is made to conform to the requirements of this Code and Standard.
- (c) Roof coating systems shall be designed to extend the useful life expectancy of existing roof assemblies, and stop or prevent moisture intrusion into existing roof assemblies, including all components of the existing roof assemblies, such as pitch pans, flashing, through-roof penetrations, and attachments and parapet wall surfaces.

7-7.101.2 Permits. A permit shall be required for construction, application, alteration or repair of roofs in accordance with the requirements of Chapter 3. Application for permit shall be accepted only from persons or firms qualified to perform the work.

7-7.101.3 Inspections. Inspections shall be made as specified in Subsection 306.2, and in accordance with the following requirements:

- (a) On new roof construction, where the sheathing is exposed from below and, for architectural appearance, the roofing nails are not driven through the sheathing, the permit holder shall notify the Building Official before the tin capping is completed and an inspection shall be made before the roof is mopped or covered.
- (b) When replacing roof coverings on existing buildings, the permit holder shall notify the Building Official before capping is completed and an inspection shall be made before the roof is mopped or covered.
- (c) When applying tile roofing, the permit holder shall notify the Building Official before the roof covering is completed and an inspection shall be made during the process of laying the tile.
- (d) When applying coating systems over an existing roof, the permit holder shall notify the Building Official at completion of the system installation for inspection.

7-7.101.4 Fire classification of roof covering. Roof assemblies shall be divided into the classes defined below. Class A, B and C roof assemblies and roof coverings required to be listed by this Section shall be tested in accordance with ASTM E108 or UL 790. In addition, fire-retardant-treated wood roof coverings shall be tested in accordance with ASTM D2898.

- (a) **Class A roof assemblies.** Class A roof assemblies are those that are effective against severe fire test expo-

sure. Class A roof assemblies and roof coverings shall be listed and identified as Class A by an approved testing agency.

Exception: Brick, masonry, slate, clay or concrete roof tile, exposed concrete roof deck, ferrous or copper shingles or sheets are considered to meet Class A roof covering provisions without testing.

- (b) **Class B roof assemblies.** Class B roof assemblies are those that are effective against moderate fire test exposure. Class B roof assemblies and roof coverings shall be listed and identified as Class B by an approved testing agency.

Exception: Metal sheets and shingles are considered to meet Class B roof covering provisions without testing.

- (c) **Class C roof assemblies.** Class C roof assemblies are those that are effective against light fire test exposure. Class C roof assemblies and roof coverings shall be listed and identified as Class C by an approved testing agency.

- (d) **Nonclassified roofing.** Nonclassified roofing is approved material that is not listed as a Class A, B or C roof covering.

- (e) **Fire-retardant-treated wood shingles and shakes.**

1. **Fire testing.** When testing wood shingles and shakes in accordance with ASTM E108 (including the rain test) and ASTM D2898, the fire tests shall include the intermittent flame test, spread of flame test and burning brand test; additionally, at the conclusion of the rain test, test panels shall be subjected to the intermittent flame test, burning brand test and flying brand test.

2. **Treatment.** Fire-retardant-treated wood shakes and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPA C1. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall also be labeled to identify the classification of the material in accordance with the testing required in Paragraph 1 (Class B or C), the treating company and the quality control agency.

7-7.101.5 Criteria.

- (a) Design of roof decks and supporting structural members shall be as specified in Chapters 7 and 9.
- (b) Materials used for roof coverings shall comply with the Standards listed in Table 7-7.1.

**TABLE 7-7.1
REFERENCED STANDARDS FOR ROOF COVERINGS**

Standard	Author and Designation
Test for Wind-Uplift Resistance of Roof Assemblies	UL 580-06
Built-Up Roofs: Mineral aggregate—Specification	ASTM D1863-06
Asphalt for use in built-up roof covering	ASTM D312-00
Asphalt base sheet for use in built-up roof covering	ASTM D2626-04
Asphalt base emulsions for use as protective coatings for built-up roofs	ASTM D2939-03
Bituminous and other organic materials for roofing, waterproofing and related uses	ASTM D1079-10
Standard test methods for fire tests of roof coverings	ASTM E108-07a
Composition roofing: Composition roofing—Fire tests	UL 790-04
Composition roofing—Specifications	UL 55A-04
Shingles: Slate shingles—Specification	ASTM C406-06e01
Wood shingles and handsplit shakes—Grading—Packing	CSSB-97
Standard test methods for accelerated weathering of fire-retardant-treated wood for fire testing	ASTM D2898-04
Wire: Brass Wire—Specification	ASTM B134-08
Aluminum alloy bars, rods and wire—Specification	ASTM B209-06
Wrought copper and copper alloy—Specification	ASTM B250/250 M-07

SECTION 7-7.201 IDENTIFICATION

7-7.201.1 All material.

- (a) All roofing material shall be delivered in the original package bearing the manufacturer's label.
- (b) The following requirements shall apply to specific materials and shall supplement, but shall not supersede, the requirements in the Standards of references listed in Table 7-7.1.
 1. **Built-up roofing.** Each package of felt, cement and base-ply combination or cap sheets shall bear the label of an approved testing laboratory having a service for inspection of material and finished products during manufacture.
 2. **Slate shingles.** Slate shingles shall bear the label of an approved inspection bureau or agency certifying compliance with ASTM C406. (See Table 7-7.1.) Ribbed or otherwise faulty slate shingles shall not be used.
 3. **Composition shingles.** Packages of composition shingles shall bear the label of an approved testing laboratory having a service for inspection of

material and finished products for Class A, B or C roofing.

4. **Prepared roofing.** Each package of prepared roofing shall bear the label of an approved testing laboratory having a service for inspection of material and finished products during manufacturing for Class A, B or C roofing.
5. **Wood shingles.** Each bundle of wood shingles for roofs shall bear the label of an approved inspection bureau or agency certifying compliance with the U.S. Bureau of Standards CS-31.
6. **Handsplit wood shakes.** Each bundle of wood shakes for roofs shall be of Red Cedar or Redwood and shall bear the label of an approved inspection bureau or agency certifying compliance with the *Standard Grading and Packing Rules* of the Cedar Shake and Shingle Bureau.

SECTION 7-7.301 FASTENINGS

7-7.301.1 Criteria. Fastenings for specific types of roof coverings shall be required as listed in Table 7-7.1, and shall comply with the following requirements:

- (a) **Composition roofs.** Nails for composition roofs shall be not smaller than 12 gage, with heads not less than a $\frac{3}{8}$ -inch diameter for shingle application, and $\frac{7}{16}$ -inch diameter for built-up roofs, and shall be long enough to penetrate the sheathing $\frac{3}{4}$ inch or through the thickness of the sheathing, whichever is less. Smaller size nail-heads may be used when metal discs are used with them. Exposed nails and shingle nails shall be corrosion resistant.
- (b) **Wood shingles.** Nails for wood shingles shall be corrosion resistant, not less than 14 $\frac{1}{2}$ gage and shall be long enough to penetrate the sheathing $\frac{3}{4}$ inch or through the thickness of the sheathing.
- (c) **Wood shakes.** Nails for wood shakes shall be the same as required for wood shingles.
- (d) **Cement shingles.** Nails for cement shingles shall be corrosion resistant, not less than 11 gage and shall be long enough to penetrate the sheathing $\frac{3}{4}$ inch or through the thickness of the sheathing.
- (e) **Slate shingles.** Nails for slate shingles and clay or concrete tile shall be corrosion resistant, not less than 11 gage and shall be long enough to penetrate the sheathing $\frac{3}{4}$ inch or through the thickness of the sheathing. Approved tiles of clay or concrete designed to be held in place by lugs engaging battens may be installed when approved by the Building Official.
- (f) **Tile (clay, concrete or slate).** Attaching wire for slate shingles and clay or concrete tile shall be not less than 14 gage complying with the requirements of Table 7-7.1. Nails for clay or concrete tile shall be as required for slate shingles.

SECTION 7-7.401 APPLICATION OF MATERIALS

7-7.401.1 Cement shingles and sheets.

- (a) Cement roofing shall be applied in an approved manner. Cement roofing shall have an underlay of not less than 15-pound felt, applied as required for a base sheet. The underlay may be omitted where the cement shingles or sheets are applied over an existing roof covering.
- (b) Cement roofing shall not be installed on a roof having a slope of less than 3 inches in 12 inches, except as approved by the Building Official.
- (c) Corrugated cement roofing not less than $\frac{5}{16}$ inch thick may be used where 24-gage galvanized sheet corrugated steel is permitted.
- (d) Roof valley flashing shall be the same as required for wood shakes.

7-7.401.2 Built-up roofs.

- (a) Built-up roofing shall be applied only to solid surface roofs.
- (b) Base sheets shall be cemented, spot-mopped or strip-mopped to a nonnailable deck as required for the type of deck, using not less than 20 pounds of hot asphalt for solid mopping, 10 pounds for spot or strip-mopping, or not less than 2 gallons of cold bituminous compound in accordance with the manufacturer's published specifications or 30 pounds of hot coal tar pitch per roofing square.
- (c) Successive layers shall be cemented to the base sheets using not less cementing material than as specified for solidly cemented base sheets.
- (d) Base sheets shall be nailed to nailable decks, using not less than one nail per $1\frac{1}{2}$ square foot. Nails shall be as required in the manufacturer's specifications for the type of deck.
- (e) Mineral aggregate surfaced roofs shall be surfaced with not less than 50 pounds of hot asphalt or other cementing material in which is embedded not less than 300 pounds of gravel or other approved surfacing material, or 250 pounds of gravel slag per roofing square. Mineral aggregate shall conform to the requirements of Table 7-7.2.
- (f) Cap sheets shall be cemented to the base sheets using not less cementing material than as specified for solidly cemented base sheets.
- (g) For high melt types, hot asphalt shall be applied at a temperature of not less than 375°F, nor more than 450°F, and shall not be heated to a temperature above 475°F. Low melt types shall not be applied at a temperature of less than 350°F, nor more than 400°F.
- (h) Coal tar pitch shall not be heated to a temperature above 375°F.

TABLE 7-7.2
SIEVE ANALYSIS OF AGGREGATES APPROVED
FOR USE IN MINERAL-SURFACED ROOFING

Sieve Size	PERCENTAGE OF AGGREGATE PASSING SIEVE EMBEDMENT COAT	PER ROOFING SQUARE
	60-Pound	50-Pound
$\frac{5}{8}$ inch	100	100
$\frac{1}{2}$ inch	90 – 100	100
$\frac{3}{8}$ inch	25 – 60	90 – 100
$\frac{1}{4}$ inch	0 – 10	30 – 70
No. 4	0 – 2	0 – 10
No. 8	—	0 – 4
No. 10	—	0 – 1
No. 20	0 – 0.5	0 – 0.5

7-7.401.3 Composition shingles.

- (a) Composition shingles shall be applied only to solidly sheathed roofs, except when applied over existing wood shingle roofs as approved by the Building Official.
- (b) Composition shingles shall be fastened according to the manufacturer's printed instructions, and as required in Subsection 7-7.301.1(a).
- (c) Composition shingles shall not be installed on a roof having a slope of less than 4 inches in 12 inches, except as approved by the Building Official.
- (d) Composition shingle roofs shall have an underlay of not less than 15-pound felt, applied as required for a base sheet. The underlay may be omitted over existing roofs, or where the roof slope is more than 7 inches in 12 inches or where shingles are laid not less than three thicknesses at any point.
- (e) Roof valley flashing shall be the same as required for wood shingles, or shall be of laced composition shingles, applied in an approved manner, with an underlay of not less than 30-pound felt extending 10 inches from the centerline each way or, shall be two layers of 90-pound mineral surfaced cap sheet cemented together with the bottom layer not less than 12 inches wide laid face down and the top layer not less than 24 inches wide laid face up.

7-7.401.4 Metal roofing.

- (a) Metal roofing exposed to the weather shall be corrosion resistant.
- (b) Flat sheets or shingles of metal shall be applied only to solidly sheathed roofs and shall be applied as approved by the Building Official and in accordance with the manufacturer's specifications.
- (c) Corrugated or ribbed steel shall not be less than 30 gage galvanized sheet.

STANDARD 7-7

- (d) Flat steel sheets shall not be less than 30 gage galvanized sheet.
- (e) Flat nonferrous sheets and shingles shall be not less than 28 B & S gage.
- (f) Other ferrous sections or shapes shall be galvanized sheets not less than 28 gage. Other nonferrous sections or shapes shall be not less than 25 B & S gage.
- (g) Corrugated sheets or other shaped sheet sections shall be designed to support the required live load between supporting members.
- (h) Ferrous sheets or sections shall comply with Section 1009.
- (i) Metal shingles shall not be installed on a roof having a slope of less than 3 inches in 12 inches, except as approved by the Building Official.
- (j) Metal shingles shall be applied as required for a base sheet over an underlay of not less than 30-pound felt.

7-7.401.5 Slate shingles.

- (a) Slate shingles shall be applied in an approved manner, and shall be securely fastened with corrosion-resistant nails or corrosion-resistant nails and wire. Fastenings shall comply with Subsection 7-7.301.1(e) and Table 7-7.1.
- (b) Slate shingle roofs shall have an underlay of not less than two layers of 15-pound felt or one layer of 30-pound felt, applied as required for a base sheet.
- (c) Roof valley flashing shall be the same as required for wood shakes.

7-7.401.6 Tile or clay and concrete.

- (a) All roof tile shall be securely fastened with corrosion-resistant nails or nails and wire, or other approved method. Fastenings shall comply with Subsection 7-7.301.1(f) and Table 7-7.1.
- (b) Tile shall not be installed on a roof having a slope of less than 3 inches in 12 inches, except as approved by the Building Official.
- (c) Tile with projecting anchor lugs at the bottom of the tiles shall be held in position by means of 1-inch by 2-inch wood strip, treated to resist moisture deterioration, nailed to the roof sheathing over the underlay or by other approved method.
- (d) Tile roofs shall have an underlay of not less than two layers of 15-pound felt or one layer of 30-pound felt, applied as required for a base sheet.
- (e) Roof valley flashing shall be the same as required for wood shakes.

7-7.401.7 Wood shingles.

- (a) Shingles may be applied to roofs with solid or spaced sheathing. The spaced sheathing shall be spaced not more than 4 inches clear, nor more than the width of the sheathing board. Spaced sheathing shall be not less than 1 inch by 3 inches nominal dimensions.
- (b) Shingles shall be laid with a side lap of not less than 1½ inches between joints in adjacent courses and ½ inch in alternate courses. Spacing between shingles shall be not

less than ¼ inch, nor more than ⅜ inch. Each wood shingle shall be fastened to the sheathing with two nails only and in accordance with the requirements of Subsection 7-7.301.1(b) and Table 7-7.1.

- (c) Shingles shall not be installed on a roof having a slope of less than 4 inches in 12 inches unless they are installed over an underlay of not less than 15-pound felt, applied as required for a base sheet, except as approved by the Building Official.
- (d) Roof valley flashing shall be corrosion-resistant galvanized sheet metal not less than 28 gage and shall extend at least 8 inches from the centerline each way and shall have a splash diverter rib not less than ¾ inch high at the flow line, formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches.
- (e) Weather exposure shall not exceed the maximum set forth in Table 7-7.3. Hip and ridge weather exposures shall not exceed those permitted for the field of the roof.

7-7.401.8 Handsplit wood shakes.

- (a) Wood shakes shall conform to the requirements of the Cedar Shake and Shingle Bureau, and shall be tapered and nontapered pieces of Red Cedar or Redwood of random widths, ranging from 4 inches to 14 inches, and shall be one of the following three types:
 1. Handsplit and resawn; tapered and having one sawed and one split face, 18 inches, 24 inches or 32 inches long.
 2. Taper-split; tapered and having both split faces 24 inches long, or shall be accompanied by descriptive certificate identifiable as to shipment.
 3. Straight split; nontapered and with both faces split; 18 inches or 24 inches long.
- (b) Minimum butt thickness shall be ½ inch.
- (c) Shakes may be applied to roofs with solid or spaced sheathing. Spaced sheathing shall be spaced not more than 4 inches clear width, nor more than the width of the sheathing board. Spaced sheathing shall be not less than 1-inch by 4-inch nominal size.
- (d) Shakes shall be laid in straight or staggered courses. Shakes shall be laid with a side lap of not less than 1½ inches between joints in adjacent courses. Edges shall be parallel within 1 inch. Spacing between shakes shall be not more than ½ inch.
- (e) Each wood shake shall be fastened to the sheathing with two nails only. Nails shall be as required for wood shingles in Subsection 7-7.301.1(b) and Table 7-7.1. The starter course at the eaves shall be doubled and the bottom or first layer may be either 15-inch or 18-inch wood shakes or wood shingles. For the final course at the ridge, either 15-inch or 18-inch shakes may be used.
- (f) Shakes shall be laid with not less than 18-inch-wide strips of not less than 30-pound felt, applied as required for a base sheet, and when approved by the Building Official.

- (g) Roof valley flashing shall be corrosion-resistant galvanized sheet metal not less than 28 gage and shall extend not less than 11 inches from the centerline each way. A splash diverter rib not less than 1 inch high at the flow line shall be provided, formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches.
- (h) Weather exposures shall not exceed those set forth in Table 7-7.3. Hip and ridge weather exposures shall not exceed those permitted for the field of the roof.

**TABLE 7-7.3
WEATHER EXPOSURE AND ROOF PITCH**

	EXPOSURES		ROOF PITCH	
	Length	Grade	3:12 ^a to less than 4:12 pitch	4:12 ^a pitch & steeper
Shingles	16 inch	No. 1	3 ³ / ₄ "	5"
		No. 2	3 ¹ / ₂ "	4"
		No. 3	3"	3 ¹ / ₂ "
	18 inch	No. 1	4 ¹ / ₄ "	5 ¹ / ₂ "
		No. 2	4"	4 ¹ / ₂ "
		No. 3	3 ¹ / ₂ "	4"
	24 inch	No. 1	5 ³ / ₄ "	7 ¹ / ₂ "
		No. 2	5 ¹ / ₂ "	6 ¹ / ₂ "
		No. 3	5"	5 ¹ / ₂ "
Shakes	Length		Exposure and Pitch	
	18 inch 24 inch		8 for 4:12 ^a and steeper 10" for 4:12 ^a and steeper pitch ^b	

a. Minimum roof slope.

b. Maximum exposure for 24-inch by ³/₈-inch handsplit shakes is 7¹/₂ inches.

EPCOT STANDARD 7-8

APPLICATION OF VENEER

SECTION 7-8.101 ADMINISTRATIVE REQUIREMENTS

7-8.101.1 Scope.

- (a) This Standard specifies methods of application of veneer in or on buildings hereafter constructed, erected, altered or repaired in the District, in accordance with this Code.
- (b) The term “veneer” shall have the meanings specified in Subsection 710.5.
- (c) This Standard supplements, but does not supersede, the requirements of this Code. Where there is a conflict between this Code and Standard, the requirements of this Code shall apply.

SECTION 7-8.201 VENEER OF MASONRY UNITS

7-8.201.1 Design. Design of veneer constructed of masonry units shall conform to the requirements of Chapters 7 and 10, and to the requirements of this Standard.

7-8.201.2 Materials. Masonry units, mortar, grout and attachments shall conform to the requirements of Section 1006.

7-8.201.3 Anchorage.

- (a) Masonry veneer shall be attached to the supporting wall with corrosion-resistant metal ties capable of resisting a horizontal force equal to twice the weight of the veneer.
- (b) Veneer ties shall be not less than 6 U.S. gage steel wire. Ties shall be spaced not more than 24 inches apart horizontally, nor more than 12 inches apart vertically. Corrugated sheet metal ties of not less than 22 U.S. gage steel wire may be used, with the same spacing as for steel wire ties, when approved by the Building Official.
- (c) Where veneer is applied to wood framing, ties shall be fastened through the sheathing into the studs.

7-8.201.4 Setting.

- (a) Masonry veneer shall be placed 1 inch clear of the backing; and when backing is of masonry, this space shall be solidly grouted.
- (b) When veneer is placed on wood framing, a weather-proof covering of asphalt-saturated felt or equivalent weighing not less than 15 pounds per square (100 square feet) shall be applied over solid sheathing. The 1-inch space between the sheathing and veneer need not be grouted.

7-8.201.5 Support. The weight of masonry veneer shall be supported on footings or other noncombustible structural supports, spaced not more than 12 feet vertically above a point 20 feet above the adjacent ground elevation. Veneer above openings shall be supported on lintels of noncombustible material.

Exceptions:

1. The weight of the masonry veneer attached to wood frame walls above the second floor shall be supported entirely on footings, and when placed above openings it shall be carried to the footings on non-combustible construction.
2. Flagstone and similar veneer shall be installed as specified for masonry, except when an alternative design is approved by the Building Official.

SECTION 7-8.301 VENEER OF NONSTRUCTURAL UNITS

7-8.301.1 Installation. Nonstructural materials used as veneer for walls shall comply with the requirements of Chapter 7 and this Standard.

7-8.301.2 Anchorage. Nonstructural material used as veneer shall be anchored to the supporting wall by corrosion-resistant metal ties of not less than 9 U.S. gage steel wire and shall be spaced not more than 12 inches apart horizontally and vertically.

Exception: Approved units of flat tile or terra cotta not more than 1 inch thick, with scored surfaces, may be cemented to masonry or concrete walls. Such units may be cemented to exterior grade plaster with a specially mixed Portland cement mortar having a bond to withstand a shearing stress of 50 pounds per square inch (psi), when approved by the Building Official. The mortar shall be mixed in accordance with Section 1006.

7-8.301.3 Terra cotta (ceramic) veneer.

- (a) Buildings may have a veneer of slabs of terra cotta not more than 72 square inches in superficial area.
- (b) Terra cotta veneer shall not be considered as part of the thickness of the wall.
- (c) Walls to which terra cotta veneer is applied shall be rigid and free from oil. Immediately before installation, the backing wall shall be cleaned by wire brushing to assure adhesion of the veneer.
- (d) Terra cotta veneer may be attached to a backing wall, either with metal anchors or by adhesion only, without anchors.
- (e) If anchored, the terra cotta veneer shall be not less than 1¹/₄ inches thick; shall have key webs on the back thereof, and shall be tied to the backing wall with substantial corrosion-resistant metal anchors, not less than 6 U.S. gage steel wire in horizontal bed joints on about 12-inch centers and not more than 18-inch centers. Veneer ties shall support twice the full weight of the veneer in tension. The facing shall be set with back of terra cotta spaced not less than 1¹/₂ inches from the face of the backing wall and the space shall be filled

solidly with grout of Portland cement mortar and top gravel in proportion of not less than 1 to 6. Just before setting, the backing wall and the ceramic facing shall be drenched with clean water and shall be damp when grout is poured.

- (f) If not anchored, the terra cotta veneer shall be not more than 1 inch thick with units not more than 30 inches in any dimension, and with not more than 600 square inches of superficial area. The veneer shall have corrugations or vertical scoring on the back. Immediately before setting, each piece of terra cotta shall be soaked in clean water for at least 1 hour, and the surface of the backing wall shall be saturated with water applied through a hose nozzle at a pressure of not less than 25 psi. A brush coat of neat Portland cement and water shall then be applied both to the backing and to the back side of the terra cotta veneer. Mortar shall average $\frac{3}{4}$ -inch thickness.
- (g) Proportions of the mortar used for terra cotta veneer shall be as follows:

High calcium slaked lime putty, screened and aged at least 20 days, containing not more than 4 percent magnesium oxide	$\frac{1}{2}$ cubic foot
Clear, sharp siliceous sand	4 cubic feet
Ammonium stearate paste or approved equal	1 quart
Approved Portland cement	1 cubic foot

Half of the mortar shall be applied to the piece of terra cotta and half to the backing immediately before the setting. Pieces disturbed after having been tapped into place shall be removed, after which additional mortar shall be applied and the piece reset. A unit shearing strength between backing and facing of not less than 50 psi shall be developed.

7-8.301.4 Marble veneer. Marble veneer shall be anchored to the backing by ties capable of resisting a horizontal force equal to twice the weight of the marble veneer without dependence on the use of plaster of paris or other adhesives, and as approved by the Building Official.

7-8.301.5 Ferro enamel panels. Ferro enamel panels and similar veneer shall be fastened to the wall with corrosion-resistant metal anchors, and in accordance with the manufacturer's recommendations and as approved by the Building Official.

SECTION 7-8.401 GLASS VENEER

7-8.401.1 Design. Glass veneer shall be designed in accordance with Section 902, and shall be installed in accordance with Chapter 7 and the following requirements.

7-8.401.2 Dimensions. Glass veneer units shall be not less than $\frac{11}{32}$ inch thick. No unit shall be more than 10 square feet in area when 15 feet or less above the grade directly below,

nor more than 6 square feet when more than 15 feet above the grade directly below.

7-8.401.3 Attachment.

- (a) Glass veneer units shall be attached to the backing with approved mastic cement and corrosion-resistant ties, and shall be supported on shelf angles in accordance with the provisions of this Subsection.
- When more than 6 feet above grade, veneer shall be supported by shelf angles. Ties shall be used in both horizontal and vertical joints.
 - Below a point 6 feet above grade, glass veneer shall rest on shelf angles. Veneer shall not be supported on construction that is not an integral part of the wall; and over sidewalks, veneer shall be supported on a shelf angle not less than $\frac{1}{4}$ inch above grade.
 - All edges of glass veneer shall be ground.
- (b) The mastic shall cover not less than one-half the area of the unit after the unit has been set in place and shall be not less than $\frac{1}{4}$ inch, nor more than $\frac{1}{2}$ inch thick. The following requirements for the use of mastics shall apply:
- The mastic shall be insoluble in water and shall not lose its adhesive properties when dry.
 - Absorbent surfaces shall be sealed by a bonding coat before the mastic is applied. The bonding coat shall be cohesive with the mastic.
 - Glass veneer surfaces to which mastic is applied shall be clean and uncoated.
 - Space between edges of glass veneer shall be filled uniformly with an approved jointing compound.
- (c) Shelf angles shall be of corrosion-resistant material capable of supporting four times the weight of the supported veneer. The shelf angles shall be spaced vertically in alternating horizontal joints, but not more than 3 feet apart. Shelf angles shall be secured to the wall at intervals not more than 2 feet, with corrosion-resistant bolts not less than $\frac{1}{4}$ -inch diameter. Bolts shall be set in masonry and secured by lead shields.
- (d) Ties shall be of corrosion-resistant metal manufactured for the purpose of holding glass veneer sheets to masonry surfaces. There shall be not less than one approved tie for each 2 square feet of veneer surface.
- (e) Exterior glass veneer shall be applied only on masonry, concrete or stucco surfaces.

7-8.401.4 Expansion joints. Glass veneer units shall be separated from each other and from adjoining materials by an expansion joint at least $\frac{1}{16}$ inch thick. There shall be at least a $\frac{1}{64}$ -inch clearance between bolts and adjacent glass.

SECTION 7-8.501 PLASTIC VENEER

7-8.501.1 Criteria. Plastic veneer shall be designed in accordance with Section 902, and shall be installed in accordance

with Chapter 7 and Section 1008, and with the following requirements:

- (a) **Height.** The approved veneer shall not be attached to an exterior wall above the first story, or 50 feet above the adjacent grade, whichever is greater.
- (b) **Area.** Sections of plastic veneer shall not be more than 250 square feet in area.
- (c) **Separation.** Sections of plastic veneer shall be separated by not less than 4 feet vertically and 2 feet horizontally.

EPCOT STANDARD 7-18

CRITERIA FOR ACCEPTANCE OF FOAM PLASTICS

SECTION 7-18.101 ADMINISTRATIVE REQUIREMENTS

7-18.101.1 Scope.

- (a) The purpose of this Standard is to set forth the conditions under which a foam plastic can be recognized by the Building Official as complying with Section 717.
- (b) The intent is to also provide acceptable diversified tests to justify structural and nonstructural assemblies without complying thermal barriers as specified in Section 717.

SECTION 7-18.201 APPROVED FOAM PLASTICS

7-18.201.1 Maximum flame spread. The maximum flame spread shall not exceed a rating of 75 when tested in accordance with EPCOT Standard 6-3.

- (a) Subsequent sections in this acceptance criteria may require lower flame spread ratings.
- (b) Except as specifically allowed in Section 717, a foam plastic cannot exceed the maximum thickness and density tested based on test specimens with no backing material.

7-18.201.2 Maximum smoke density. The maximum smoke density shall not exceed a rating of 450 when tested in accordance with EPCOT Standard 6-3. Recognition shall be limited based on Subsection 7-18.201.1(b).

7-18.201.3 Products of combustion. Products of combustion shall be no more toxic than those of untreated wood when burned under similar conditions.

- (a) Laboratory analysis shall be gas chromatography and mass spectrometry.
- (b) Biological tests are mandatory to augment laboratory analysis.
- (c) Comparative samples of foam plastic and untreated wood shall be based on equal volumes of foam plastic at the prescribed maximum density and Douglas Fir or Southern Pine.

7-18.201.4 For purposes of this acceptance criteria. Foam plastic is considered a combustible material.

Exceptions:

1. Subsection 717.2(a).
2. Special considerations based on justifying data.

7-18.201.5 Recognition of fire-resistive construction. The use of foam plastic shall be based on tests conducted in accordance with EPCOT Standard 6-1. Density and thickness of foam plastics in tests set the maximum conditions of recognition.

7-18.201.6 Recognition of foam plastic. Any test under this acceptance criteria is limited to the specific manufacturer and chemical formulation used. Generic descriptions in test reports must be augmented with manufacturer's name and stock number or other precise foam identification. Any consideration contrary to this requires the specific approval of the Building Official.

7-18.201.7 Conditions of use. These conditions are controlled by four basic considerations of this Code, which must be established.

- (a) Combustible or noncombustible construction, the latter being defined in Chapter 2. EPCOT Standard 6-2 shall be the Standard, or as an alternative, establishing equivalency to products presently recognized as non-combustible.
- (b) Fire-resistive or nonrated construction. Recognition of any vertical or horizontal assembly as fire resistive requires testing in compliance with EPCOT Standard 6-1.
- (c) Bearing or nonbearing wall assemblies as defined in Chapter 2.
- (d) Exterior or interior locations.

SECTION 7-18.301 COMPLIANCE WITHOUT TESTING

7-18.301.1 Horizontal or vertical system.

- (a) A horizontal or vertical system containing foam plastic that can be justified analytically for structural compliance with this Code utilizing allowable stresses and loads specified therein can be recognized without testing under the following conditions:
 1. A thermal barrier is used that complies with Section 717.
 2. Attachment of the thermal barrier is presently justified by tests or can be installed in compliance with specific sections of this Code based on the material involved. One-half-inch Type X gypsum wallboard installed in compliance with EPCOT Standard 1007-4 would be a specific example.
 3. Items 1 and 2 would not be a consideration for masonry or concrete walls with cavities filled with foam plastic.
 4. Testing relative to Items 1, 2 and 3 may still be necessary.
- (b) Special applications set forth in Subsections 717.2(d) and 717.2(e) will also be applicable.

**SECTION 7-18.401
TESTS UNDER SUBSECTION 717.2**

7-18.401.1 Finish rating.

- (a) Finish rating is the shorter time span for 250°F average or 325°F maximum temperature rise above ambient on the unexposed face of a thermal barrier exposed to furnace temperatures set forth in Part 2 (Time-Temperature Curve) of EPCOT Standard 6-1.
1. The temperature rise shall be measured at the interface of the thermal barrier and foam plastic or framing member.
 2. Test specimens shall have a minimum area of 9 square feet with minimum dimensions of 3 feet.
 3. Small-scale furnaces must be properly calibrated to provide results compatible with full-scale complying with ASTM E119. This requires Building Official approval.
- (b) Thermal barriers must remain in place during the finish rating tests for a 15-minute period.
1. Bearing walls, roofs, floors and ceilings with thermal barriers must be tested by EPCOT Standard 6-1 for the 15-minute period. This involves testing with superimposed loads as set forth in Part 2 (Loading of Tests of Bearing Walls and Partitions) and Part 25 (Loading of Tests of Floors and Roofs) of the referenced Standard.
 2. Thermal barriers applied continuously with no joints and directly to foam plastics on nonbearing walls, floors or roofs may be justified by small-scale tests described in Subsection 7-18.301. Building Official approval prior to commencing tests is necessary.

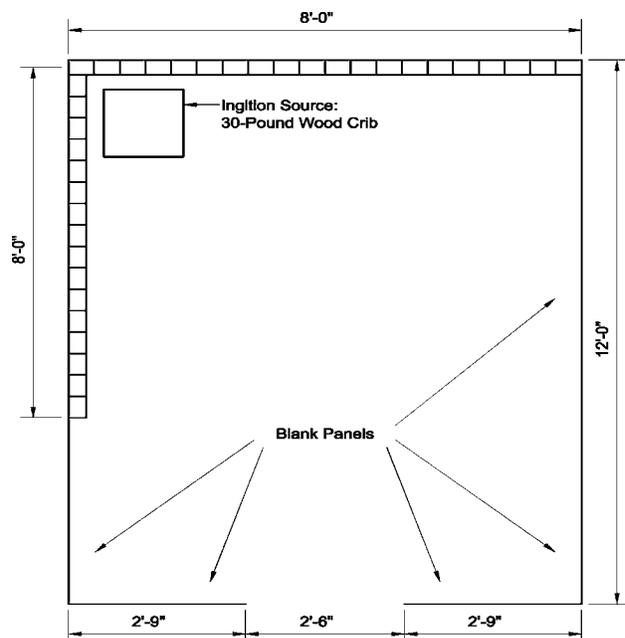
**SECTION 7-18.501
ACCEPTED DIVERSIFIED TESTS
UNDER SUBSECTION 717.2**

7-18.501.1 Factory mutual.

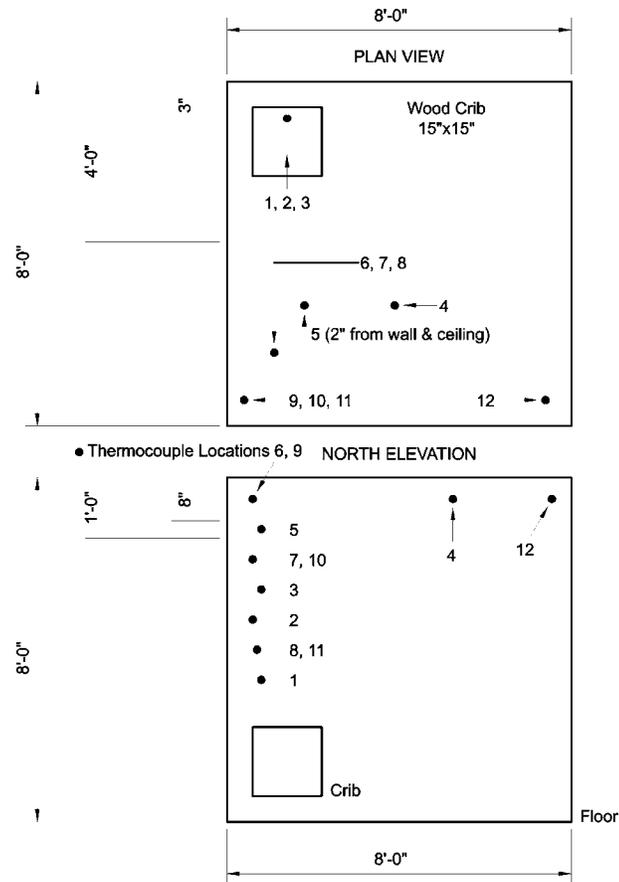
- (a) A Factory Mutual, full-scale corner test (750-pound crib) for nonbearing wall panels shall be an acceptable test criteria.
- (b) Room test for nonbearing walls and ceiling shall be as set forth herein.
1. **Test specimen and set-up.**
 - (aa) Eight-foot ceiling height.
 - (bb) Two-foot wall sections totaling 8 feet in length for each wall forming a corner of a room 8 feet wide and 12 feet long fully enclosed with walls and ceiling, except for a 2-foot, 6-inch by 7-foot, 0-inch doorway. (See Figure No. 1.)

2. Sandwich panels.

- (aa) Sandwich panels for walls with structural foam plastic cores shall be installed in the manner intended for actual use. This includes connections along all joints and perimeter.
- (bb) The remaining walls for the 8-foot by 12-foot room shall be framed as necessary using a listed assembly. The 8-foot room dimension opposite the fire source shall contain a 30-inch-wide by 84-inch doorway centered on the 8-foot dimension.
- (cc) The basic ceiling, where sandwich panels are not involved, shall consist of a listed assembly attached to framing and/or decking. Sandwich panels shall be installed in a manner paralleling field installation and with joint sealed. When testing under Section V-C of the Full-Scale Corner Test, floor and roof panels shall comprise the entire ceiling area.
- (dd) Where the test involved other than structural wall panels, the foam shall be applied to the millboard listed assembly in the wall test area and/or 8-foot by 8-foot ceiling test area and covered with protective material as required.
- (ee) In considering Paragraphs (a), (b) and (c), the intent is to have the test assembly duplicate the manner of field installation.



**FIGURE NO. 1
(Door 2'-6" Wide by 7'-0" High)
ROOM TEST CONFIGURATION
[See Subsection 7-18.501.1(b)]**



**FIGURE NO. 2
ROOM TEST**

Notes:

1. All thermocouples spaced 1 inch from adjacent surfaces except as otherwise noted.
2. Thermocouple 4 located 4 feet from the crib corner measured along the diagonal.
3. The room test shall be conducted within a fully enclosed building.
4. See Figure No. 2 for thermocouple locations.
5. A wood crib ignition source shall be constructed of 1½-inch by 1½-inch sticks of White Fir cut to 15-inch lengths. The crib shall have a dry wood weight of 30 pounds and be 15 inches square in plan. One 8-penny nail shall be driven at each intersection of two sticks. After fabrication, the crib shall be conditioned to a maximum constant moisture content of 8 percent.
6. A brick piece, nominally 4 inches by 4 inches, is placed on end at each corner of the crib to provide a 3-inch space between the floor and lower surface of the crib. One pound of shredded, fluffed wood excelsior is distributed around the bricks with the excelsior extending from the wall surfaces and covering an area approximately 21 inches by 21 inches. To start the test, the wood excelsior is soaked with 4 ounces of absolute ethyl alcohol except for an area approximately 6 inches by 6 inches diametrically from the intersection of the walls. The crib is then placed on the bricks 1 inch from the respective wall surfaces. For floors and roofs under Section V-C of the Full-Scale Corner Test, the crib shall be located at the center of the room. At the start of the test clock, a match is placed in the excelsior at the extreme corner diametrically from the wall intersection. See Note 7.
7. Conditions of acceptance. Combustion of the foam plastic shall not extend to the outer extremities of the test area.

(c) As an option, where loading is feasible, the room test may be used to justify bearing walls, floors and roof with the prior permission of the Building Official. The manner of loading must be described in detail and must result in maximum stress conditions. Under this proposal, an additional condition of acceptance is that the system must support its design loads without collapse during the test.

(d) Tests under EPCOT Standard 6-1 for bearing wall, floor and roof assemblies require that after 15 minutes

of testing, the system continue to support the maximum allowable load without collapse.

1. Upon ignition, flames typically progress slowly through the dry excelsior for approximately 10 seconds until the soaked alcohol portion is reached, whereupon flames flash through the entire excelsior, providing uniform application of ignition flame beneath the entire crib.

(e) Ignition temperature tests in compliance with EPCOT Standard 1008-1 are required to augment other diversified tests.

**SECTION 7-18.601
MISCELLANEOUS**

7-18.601.1 Tests.

- (a) All tests must be conducted by an approved testing agency. Tests may be conducted by the proponent provided a qualified independent consultant specifically approved by the Building Official certifies that preparation of test specimens, testing and reporting of test results comply with the test program approved by the Building Official.
- (b) Test reports must include the following:
 - 1. Preparation of test specimens.
 - 2. Description of the room test set-up with details.
 - 3. Test observations commencing with crib ignition and ending with a final description of panels after all combustion ceases.
 - 4. Statement on passing or failing Subsections 7-18.501.1(b) and 7-18.501.1(c).
 - 5. Photographic records of the test.
- (c) All room tests must be approved by the Building Official prior to conducting the tests.
- (d) **Special conditions.**
 - 1. Foamed plastic roofing as described in Subsection 717.2 must be separated from the interior of the building by a complying thermal barrier or be successfully tested under Subsection 7-18.501.1.
 - 2. Recognition of specific products or systems may be based on the end use, quantity, location and similar considerations where tests described in Subsection 7-18.501.1 are not applicable or practical.

EPCOT STANDARD 1004-1

REINFORCED GYPSUM CONCRETE

SECTION 1004-1.101 ADMINISTRATIVE REQUIREMENTS

1004-1.101.1 Scope. This Standard specifies methods for the use of reinforced gypsum concrete in buildings hereafter constructed, erected, altered or repaired in accordance with Chapters 9 and 10, and the EPCOT Standards listed in Appendix A for Section 1004.

1004-1.101.2 Testing. Testing shall be performed in accordance with the requirements of Subsection 1004.3 and the specifications listed in Appendix A for Section 1004.

SECTION 1004-1.201 DESIGN AND CONSTRUCTION

1004-1.201.1 Cast-in-place gypsum concrete.

- (a) Cast-in-place reinforced gypsum concrete shall consist of a mixture of gypsum with wood chips, shavings or fiber, or other approved aggregate, premixed by the manufacturer with only water added at the job, and shall conform to the requirements of ASTM C317 (see EPCOT Standard 1004-4). Class A gypsum concrete shall contain a maximum of 12 percent by weight of wood chips, shavings or fiber.
- (b) Cast-in-place reinforced gypsum concrete shall attain the minimum mechanical properties shown in Table 1004-1.1.

**TABLE 1004-1.1
MINIMUM MECHANICAL PROPERTIES
CAST-IN-PLACE REINFORCED GYPSUM CONCRETE**

CLASS	ULTIMATE COMPRESSIVE STRENGTH-f _g (psi)	MODULUS OF ELASTICITY-E (psi)	MODULUS OF RIGIDITY-G (psi)
A	500	200,000	0.36E
B	1,000	600,000	0.40E

- (c) The maximum unit working stresses in reinforced gypsum concrete shall not exceed those set forth in Table 1004-1.2.

**TABLE 1004-1.2
UNIT WORKING STRESSES^a
CAST-IN-PLACE REINFORCED GYPSUM CONCRETE**

TYPE OF STRESS	FACTOR x(f _g)	CLASS A (psi)	CLASS B (psi)
Compression—Flexural	0.25	125	250
Compression—Axial	0.25	100	200
Bearing	0.20	100	200
Shear	0.02	10	20
Bond—Deformed bars	0.03	15	30
Plain bars	0.02	10	20
E _g = n	—	150	50

- a. Reinforcing in accordance with Paragraph (h) shall be considered to fulfill the requirements of this Table for bond and shear.

- (d) Bolt and dowel values shall not exceed those set forth in Table 1004-1.3.

**TABLE 1004-1.3
PERMITTED SHEAR ON ANCHOR BOLTS AND DOWELS
REINFORCED GYPSUM CONCRETE**

DEAMETER	MINIMUM EMBEDMENT (inches)	MAXIMUM SHEAR (pounds)
Bolt		
³ / ₈ inch 0	4	325
¹ / ₂ inch 0	5	450
⁵ / ₈ inch 0	5	650
Dowel ^a		
³ / ₈ inch 0	6	325
¹ / ₂ inch 0	6	450

- a. Deformed bars conforming to ASTM A615, A616 or A617. (See EPCOT Standards 1003-12, 1003-13 and 1003-14.)

- (e) The maximum diaphragm shears in cast-in-place reinforced gypsum concrete shall not exceed those set forth in Table 1004-1.4 or those calculated for Formula 1 of this Standard. Tabulated diaphragm shear values in Table 1004-1.4 include the one-third increase permitted for wind forces.
- (f) Cast-in-place reinforced gypsum shall be a minimum of 2 inches thick not including formboard, except that when the slab is not being used as diaphragm, the thickness of concrete may be 1½ inches if the overall thickness, including formboards, is not less than 2 inches. In computing diaphragm shears, a maximum thickness of 2½ inches of slab, excluding formboard, shall be used except as specifically approved by the Building Official. When the slab is designed to act as a diaphragm, minimum thickness of concrete over the subpurlins shall be 5⁄8 inch.
- (g) Subpurlins shall be designed to provide a mechanical lock or key, equivalent to a bulb tee, with the gypsum concrete, and shall be connected to the roof framing by welding or bolting to the supporting members. Bulb tees and subpurlins shall conform to the requirements of ASTM A242 (see EPCOT Standard 1009-20) and ASTM A449 (see EPCOT Standard 1009-23).
- (h) Reinforcing fabric shall be welded steel wire conforming to the requirements of ASTM A185 (see EPCOT Standard 1003-17) or 2-inch hexagonal woven mesh from steel wire conforming to ASTM A82 (see EPCOT Standard 1003-16). The woven wire mesh shall have an additional 16-gage wire perpendicular to the subpurlins at 3 inches on center. Principal reinforcing shall have a minimum cross-sectional area of 0.026 square inches per foot of width and secondary reinforcing shall have a minimum cross-sectional area of 0.0075 square inches

per foot of width. The maximum of spacing of reinforcing bars or wires shall be 8 inches on center. All mesh shall be lapped one mesh or 4 inches, whichever is greater, on edges, and one mesh or 8 inches, whichever is greater on ends.

- (i) Maximum ratio of span to depth for cast-in-place gypsum concrete diaphragm shall be 3:1, where used for lateral support of masonry on concrete walls, and 4:1, where used for lateral support of wood or light steel walls.

1004-1.201.2 Precast gypsum concrete.

- (a) Precast reinforced gypsum concrete shall conform to ASTM C317 and shall contain not more than 3 percent of wood chips, shavings or fiber measured as a percentage by weight of dry mix.
- (b) Precast gypsum concrete units shall be reinforced and, unless marked to ensure their being placed right side up, the reinforcement shall be placed symmetrically relative to the top and bottom.

TABLE 1004-1.4
MAXIMUM DIAPHRAGM SHEAR
REINFORCED GYPSUM CONCRETE^a
(pounds per lineal foot)

CLASS	CONCRETE THICKNESS ^b (inches)	4 in x 8 in MESH No.12 x No.14	6 in x 6 in MESH No.10 x No.10	HEXAGONAL ^c WOVEN MESH
A	2	600	700	760
	2½	640	740	800
B	2	920	1,020	1,080
	2½	1,040	1,140	1,200

a. Values as computed by Formula 1.

$$\text{Formula 1: } Q = 0.16f_g t C_1 + 100(k_1 d_1 + k_2 d_2)$$

Where:

- Q = Maximum shear on diaphragm, in pounds per lineal foot.
- f_g = Compressive strength of overdry gypsum concrete, in pounds per square inch.
- t = Thickness of gypsum concrete between subpurlins, not including formboard.
- C_1 = 1.0 for Class A or 1.5 for Class B gypsum concrete.
- k_1 = Number of wires per foot passing over and perpendicular to subpurlins.
- d_1 = Diameter of mesh wires passing over and perpendicular to subpurlins.
- k_2 = Number of wires per foot parallel to subpurlins or 0.7 of number of wires composing hexagonal mesh.
- d_2 = Diameter, in inches, of mesh wires parallel to subpurlins or wires composing hexagonal mesh.

b. Not including formboard.

c. Two-inch hexagonal woven wire mesh of 19-gage wire with additional longitudinal 16-gage wires spaced 3 inches on center.

EPCOT STANDARD 1006-2

ENGINEERED BRICK MASONRY

SECTION 1006-2.101 ADMINISTRATIVE REQUIREMENTS

1006-2.101.1 Criteria. This Standard specifies methods for the use of plain and reinforced brick masonry in buildings hereafter constructed, erected, altered or repaired in accordance with the design requirements of Chapters 9 and 10, and the Standards listed in Appendix A for Section 1006.

1006-2.101.2 Definitions. For use in this Code and Standard, the following terms shall have the meanings indicated in this Subsection:

- (a) **Architectural terra cotta.** Plain or ornamental (molded or extruded) hard-burned building units, usually larger than brick, consisting of mixtures of plastic clays, fusible minerals and grog, and having a glazed or unglazed ceramic finish.
- (b) **Ashlar facing.** Facing of a faced or veneered wall composed of solid rectangular units, usually larger than brick, having sawed, dressed or squared beds and mortar joints.
- (c) **Ashlar masonry.** Masonry composed of rectangular units usually larger than brick and securely bonded, having dressed or square heads and mortar joints.
- (d) **Bonder (header).** Masonry unit such as a header that ties two or more wythes (q.v.) of the wall together by overlapping.
- (e) **Brick.** Solid masonry unit shaped approximately as a rectangular prism, usually not more than 4 inches by 4 inches by 12 inches. A brick may be of burned clay or shale, fire clay or mixtures thereof, lime and sand, cement and aggregates or other approved materials.
- (f) **Column.** Upright compression member whose width does not exceed four times its thickness and the height of which exceeds three times its least lateral dimension.
- (g) **Concrete.** Mixture of Portland cement, aggregates and water.
- (h) **Cross-sectional area.** Net cross-sectional area of a masonry unit shall be taken as the gross cross-sectional area minus the area of cores or cellular spaces. Gross cross-sectional area of scored units shall be measured to the outside of the scoring, but the cross-sectional area of the grooves shall not be deducted from the gross cross-sectional area to obtain the net cross-sectional area.
- (i) **Deformed bar.** Reinforcing bar conforming to ASTM A615, A616 and A617 (see EPCOT Standards 1003-12, 1003-13 and 1003-14). Bars not conforming to these specifications are classified as plain bars.
- (j) **Grout.** Mixture of cementitious material and aggregate to which sufficient water is added to produce pouring consistency without segregation of the constituents.
- (k) **Grouted masonry.** Masonry in which the interior cells are filled by pouring grout therein as the work progresses.
- (l) **Header.** See “Bonder.”
- (m) **Hollow masonry unit.** 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. (See “Cross-sectional area.”)
- (n) **Leaf (leaves).** See “Wythe.”
- (o) **Masonry.** Built-up construction or combination of building units of materials, such as clay, shale, concrete, glass, gypsum or stone, set in mortar.
- (p) **Masonry unit.** Brick, tile or block conforming to the requirements of Section 1006-2.201.
 - 1. **Masonry of hollow units.** Masonry consisting of wholly or partly of hollow masonry units laid contiguously in mortar.
 - 2. **Solid masonry.** Masonry consisting wholly of solid masonry units laid contiguously in mortar.
- (q) **Mortar.** Plastic mixture of cementitious materials, fine aggregates and water used to bond masonry or other structural units.
- (r) **Pier.** Isolated column of masonry. A bearing wall not bonded at the sides into associated masonry shall be considered as a pier when its horizontal dimension measured at right angles to the thickness does not exceed four times its thickness.
- (s) **Reinforced grouted masonry.** Solid unit masonry construction in which interior joints of masonry are filled by pouring grout therein and in which reinforcement is embedded.
- (t) **Reinforced hollow masonry.** Hollow unit masonry construction in which certain cells are continuously filled with concrete or grout and in which reinforcement is embedded.
- (u) **Reinforced masonry.** Unit masonry in which reinforcement is embedded as required by this Standard and in such a manner that the two materials act together in resisting forces.
- (v) **Reinforcement.** Structural steel shapes, steel bars, rods, wire fabric or expanded metal embedded or encased in masonry so that the reinforcement works with the masonry in resisting forces.

- (w) **Reinforcement, effective area.** Area obtained by multiplying the right cross-sectional area of the metal reinforcement by the cosine of the angle between its direction and the direction for which the effectiveness of the reinforcement is to be determined.
- (x) **Rubble, coursed rubble.** Masonry composed of roughly shaped stones fitting approximately on level beds, well bonded and brought to continuous level beds or courses at vertical intervals.
1. **Random rubble.** Masonry composed of roughly shaped stones, well bonded and brought to discontinuous but approximately level beds or courses at irregular intervals.
 2. **Rough or ordinary rubble.** Masonry composed of nonshaped or field stones laid without regularity of coursing.
- (y) **Solid masonry unit.** Masonry unit whose net cross-sectional area in every plane parallel to the bearing surface of 75 percent or more of its gross cross-sectional area measured in the same plane. (See “Cross-sectional area.”)
- (z) **Stretcher.** Unit laid with length horizontal and parallel to the face of the wall or other masonry member.
- (aa) **Unit masonry.** Built-up construction or combination of masonry units set in mortar or grout.
- (bb) **Veneer.** Nonstructural facing of brick, concrete, stone, tile or other approved material attached to a backing or ornamentation, protection or insulation, but not bonded to exert a common reaction under load.
- (cc) **Wall.** (For definitions of walls other than masonry walls, see Chapter 2):
1. **Cavity wall.** Wall built of masonry units, arranged to provide an airspace within the wall (with or without insulating material), in which the inner and outer wythes of the wall are tied together with metal ties.
 2. **Composite wall.** Walls in which masonry facing and backing are of different materials bonded to exert a common reaction under load.
 3. **Hollow wall.** Wall of masonry arranged to provide an airspace within the wall between the inner and outer wythes of the wall.
 4. **Masonry-bonded hollow wall.** Walls of hollow masonry units in which the inner and outer wythes of the wall are bonded together with masonry units.
 5. **Partly reinforced masonry wall.** Walls designed as plain masonry, except that reinforcement is provided in some parts of the wall to resist flexural tensile stresses.
- (dd) **Wythe (leaf).** Each continuous vertical section of a wall one masonry unit thick and tied to its adjacent vertical section or sections (front and back) by bonders (headers), metal ties or grout.

1006-2.101.3 Testing. Testing and grading of masonry units shall be in accordance with Section 1006, and with the appropriate testing Standard as listed in Appendix A for Section 1006 and as set forth in Table 1006-2.1.

**TABLE 1006-2.1
TESTING AND GRADING MASONRY UNITS**

UNIT TESTED	TESTING STANDARDS	EPCOT No.	GRADE
Nonloadbearing	ASTM C129	1006-9	Special duty ^b (Not to be used under condition of Note b)
Building brick (clay shale, sand-lime)	ASTM C67	1006-24	MW or SW ^a SW ^b
Structural clay tile and hollow clay or shale masonry Load bearing	ASTM C67	1006-24	LBX (Standard or special duty) ^a
Concrete brick	ASTM C140	1006-25	U-I, U-II, P-I ^a , P-II U-I, U-II ^b
Concrete masonry Load-bearing	ASTM C140	1006-25	U-I, U-II ^a P-I, P-II
Nonloadbearing	ASTM C140	1006-25	Type I
Gypsum tile or block partition tile	ASTM C471M ASTM C473		

a. Subject to action of weather and soil, but not to frost action when permeated with water.

b. Subject to temperature below freezing while exposed to weather or soil.

SECTION 1006-2.201 MATERIALS

1006-2.201.1 Standards of quality. Materials used in masonry construction shall comply with the requirements of Section 1006 and with the requirements of the appropriate Standards as listed in Appendix A for the specific material.

1006-2.201.2 Mortar and grout.

- (a) **Mortar.** Mortar, other than gypsum mortar, shall conform to the requirements of ASTM C270 (see EPCOT Standard 1006-23), omitting Type K mortar, and shall be classified in accordance with and comply with the requirements of Table 1006-2.2.
1. Where the classification has not been established by a test for compressive strength, when approved by the Building Official, mortar mixed to the type specified in Table 1006-2.3 is assumed to meet the proper requirements.
 2. The type of mortar used in masonry construction shall comply with the requirements of Table 1006-2.4 for the kind of masonry specified and its use.
 3. Mortar shall be rettempered with water to compensate for any loss from evaporation and to keep its plasticity. Rettempering shall be accomplished by adding water into a basin made with mortar and the mortar reworked with a trowel or other suitable

tool. Harsh nonplastic mortar shall not be retempered or used. Mortar unused after 2 hours from initial mixing shall be removed from the work.

(b) **Grout.** Grout used in masonry construction shall conform to the following requirements:

1. Fine grout shall be Type M, S or N mortar to which water is added to produce a consistency for pouring without segregation of the constituents.
2. Coarse grout shall be the same as fine grout, except that from one to two parts of gravel to one part of cement by volume shall be added in addition to the fine aggregate. In no case shall the sum of the volumes of the fine aggregate and gravel exceed four times the sum of the volumes of the cement and the hydrated lime or lime putty.
3. Type M grout shall be used with Type M mortar. Type M or S grout shall be used with Type S mortar. Type M, S or N grout shall be used with Type N mortar. The minimum compressive strength of the grout shall be 2,000 pounds per square inch (psi).
4. Coarse grout may be used in grout spaces in brick masonry 2 inches or more in horizontal dimension and in grout spaces in filled-cell construction 4 inches or more in both horizontal and vertical directions.

**TABLE 1006-2.2
COMPRESSIVE STRENGTH FOR MORTAR TYPES**

TYPE	AVERAGE COMPRESSIVE STRENGTH AT 28 DAYS (psi)
M	2,500
S	1,800
N	750
O	350

**TABLE 1006-2.3
MORTAR PROPORTIONS**

MORTAR TYPE	PORTLAND CEMENT	MASONRY CEMENT TYPE II (ASTM C91)	HYDRATED LIME OR LIME PUTTY	PROPORTIONS BY VOLUME AGGREGATE (Measured in a damp and loose condition)
M	1	1	—	2 ¹ / ₄ to 3 times
	1	—	1 ¹ / ₄₃ ^a	The sum of the volumes of the cement and lime used
S	1/2	1	—	
	1	—	1/4 to 1/2 ^a	
N	—	1	—	
	1	—	1/2 to 1 1/4 ^a	
O	—	1	—	
	1	—	1/4 to 2 1/4 ^a	

a. 1:10 part maximum when used for grout.

**TABLE 1006-2.4
REQUIREMENTS FOR THE USE OF MORTAR**

KIND OF MASONRY AND USE	TYPE OF MORTAR REQUIRED
Masonry in contact with earth	M or S ^a
Masonry not in contact with earth Piers of solid masonry Piers of hollow units Walls of solid masonry Walls of hollow units	M, S or N M or S M, S or N M, S or N
Cavity walls and masonry-bonded hollow walls where assumed design wind pressure: 1. Exceeds 20 psi 2. Does not exceed 20 psi	M or S M, S or N
Glass block	S or N
Nonbearing partitions or fire protection	M, S, N, O or gypsum
Gypsum partition tile or block	Gypsum
Firebrick	Refractory air-setting
Linings of existing masonry, either above or below grade	M or S

a. Type N mortar may be used where masonry in contact with earth will not be exposed to frost action.

SECTION 1006-2.301 UNREINFORCED MASONRY

1006-2.301.1 Working stresses.

- (a) Stresses shall be calculated on net rather than nominal dimensions, except as permitted in other sections of this Code. Working stresses in unreinforced masonry shall not exceed the values set forth in Table 1006-2.5.
- (b) Working stresses in bearing directly under concentrated loads, on solid masonry or grouted masonry of hollow units, may be 50 percent higher than shown for compression in Table 1006-2.5 when the clear distance between the application of two adjacent concentrated loads is not less than the sum of the widths of bearing.
- (c) When calculating wall stresses, concentrated loads may be distributed over a maximum length of wall, not more than the center-to-center distance between loads. If concentrated loads are not distributed through a structural element, the length of wall considered shall not be more than the width of bearing plus four times the wall thickness. Concentrated loads shall not be considered as distributed by metal ties not distributed across vertical joints.
- (d) In composite walls or other structural members composed of different kinds of grades of masonry units or mortars, the maximum stress for the weakest combination of units and mortars of which the member is composed shall be used.

1006-2.301.2 Lateral support.

- (a) **Ratio of height or length to thickness.** The ratio of unsupported height or length to nominal thickness (one or the other, but not necessarily both) for solid masonry bearing and shear walls of buildings shall not exceed

20 when of solid units, and shall not exceed 18 for walls of hollow masonry units or hollow walls. In computing the ratio for cavity walls, the value for thickness shall be the sum of the nominal thicknesses of the inner and outer wythes. In walls composed of different kinds or classes of units or mortars, the ratio of height or length to thickness shall not exceed the ratio permitted for the weakest combination of units and mortars of which the member is composed.

- (b) **Method of support.** Lateral support may be obtained from cross walls, piers or buttresses when the limiting distance is measured vertically. Sufficient bonding or anchorage shall be provided between the walls and the supports to resist the assumed wind or other horizontal force acting either inward or outward. Piers, buttresses and cross walls relied upon for lateral support shall have sufficient strength and stability to transfer the horizontal force acting in either direction to adjacent structural members or to the ground. When walls are dependent upon floors or roofs for lateral support, provision shall be made to transfer lateral forces to the ground.
- (c) **Piers.** The unsupported height of piers shall not exceed 10 times their least dimension, provided that when structural clay or tile or hollow concrete units are used for isolated piers to support beams or girders, their

unsupported height shall be not more than four times their least dimension, except when the cellular spaces are filled solidly with concrete or grout.

1006-2.301.3 Thickness of masonry walls.

- (a) **Criteria.** The thickness of masonry walls shall conform to the requirements of Subsection 1006-2.301.1 for maximum stresses and to Subsection 1006-2.301.2 for lateral support. Where walls of masonry of hollow units or masonry-bonded hollow walls are decreased in thickness, a course or courses of solid masonry shall be interposed between the wall below and the thinner wall above, or special units or construction shall be used that will transmit the loads from the shells above to those below.
- (b) **Nonbearing and nonshear walls.** The distance between lateral supports of nonbearing partitions of masonry shall be not more than 36 times the thickness of the partition, including the plaster. Gypsum partition tile or block shall not be used in bearing walls, shear walls or where subject to continual dampness. Gypsum partition tile shall not be used for partitions to receive Portland cement plaster, ceramic tile, marble, structural glass wainscotting or other noncompatible materials unless self-furring metal lath is placed over the gypsum tile.

**TABLE 1006-2.5
WORKING STRESSES IN UNREINFORCED UNIT MASONRY**

MATERIAL SPECIAL INSPECTION REQUIRED	TYPE M MORTAR COMPRESSION ^a	Type S MORTAR COMPRESSION ^a	TYPE M OR TYPE S MORTAR				COMPRESSION ^a	TYPE N MORTAR SHEAR OR TENSION IN FLEXURE ^{b, c}	
			Shear or Tension in Flexure ^{b, c}		Tension in Flexure ^d			YES	NO
	NO	NO	YES	NO	YES	NO	NO		
Solid brick masonry (psi)									
4,500 and over	250	225	20	10	40	20	200	15	7.5
2,500 to 4,500	175	160	20	10	40	20	140	15	7.5
1,500 to 2,500	125	115	20	10	40	20	100	15	7.5
Solid concrete and masonry									
Grade A	175	160	12	6	24	12	140	12	6
Grade B	125	115	12	6	24	12	100	12	6
Grouted masonry (psi)									
4,500 and over	350	275	25	12.5	50	25	n.p.	n.p.	n.p.
2,500 to 4,500	275	215	25	12.5	50	25	n.p.	n.p.	n.p.
1,500 to 2,500	225	175	25	12.5	50	25	n.p.	n.p.	n.p.
Hollow unit masonry	85	75	12 ^e	6 ^e	24 ^e	12 ^e	70	10 ^e	5 ^e
Cavity wall masonry									
Solid units ^e									
Grade A or 2,500 psi	140	130	12	6	30	15	110	10	5
Grade B or 1,500 to 2,500	100	90	12	6	30	15	80	10	5
Hollow units ^e	70	60	12	6	30	15	50	10	5
Stone masonry									
Cast stone	400	360	8	4	n.p.	n.p.	320	8	4
Natural stone	140	120	8	4	n.p.	n.p.	100	8	4
Gypsum masonry	20	20	n.p.	n.p.	n.p.	n.p.	20	n.p.	n.p.

n.p.—not permitted.

- a. Maximum axial or flexural compressive stresses, in pounds per square inch of gross cross-sectional area (except as noted).
- b. Value of tension based on tension across a bed joint, i.e., vertically in standard masonry work.
- c. No tension permitted in stack bond across head joints.
- d. Values are for tension in masonry in the direction of running bond, i.e., horizontally between supports.
- e. Net area in contact with mortar or net cross-sectional area.

1006-2.301.4 Bond.

- (a) **Reinforcement.** Bond of masonry units in a single wythe shall be provided by lapping units in alternate vertical courses. Where masonry units are laid in stack bond, steel bar or wire reinforcement, or other approved joint reinforcement shall be embedded in the horizontal mortar beds at vertical intervals of not more than 16 inches. The longitudinal bars or wires of such reinforcement shall be not less than 9 gage and at least one longitudinal bar or wire shall be provided for each 6 inches of wall thickness or fraction thereof. Reinforcement shall be placed in mortar joints. The minimum mortar joint thickness shall be as required for reinforced masonry.
- (b) **Walls of solid units.** The facing and backing of solid masonry bearing and nonbearing walls shall be in accordance with the following provisions:
1. The facing and backing shall be bonded so that not less than 4 percent of the wall surface of each face is composed of bonders extending not less than 4 inches into the backing. The distance between adjacent full-length headers shall be not more than 24 inches either vertically or horizontally. In walls in which a single bonder does not extend through the wall, bonders from the opposite sides shall overlap at least 4 inches or bonders from opposite sides shall be covered with another bonder course overlapping the bonder below by at least 4 inches.
 2. The facing and backing shall be bonded with corrosion-resistant metal ties conforming to the requirements of Paragraph (f) for cavity walls. Walls so bonded shall conform to the requirements for maximum stresses, lateral support, thickness (excluding cavity), height and mortar requirements for cavity walls. Where space between metal-tied wythes is solidly filled with mortar, the requirements for maximum stresses and other provisions regulating masonry-bonded walls shall apply.
- (c) **Walls of hollow units.** Walls of hollow masonry units shall comply with the following requirements:
1. Where two or more hollow units are used to make up the thickness of a wall, the stretcher courses shall be bonded at vertical intervals of not more than 34 inches by lapping at least 4 inches over the unit below, or by lapping at vertical intervals of not more than 17 inches with units at least 50 percent thicker than the units below; or by bonding with corrosion-resistant metal ties conforming to the requirements of Paragraph (f).
 2. Walls bonded with metal ties shall conform to the requirements for maximum stresses, lateral support, thickness (excluding cavity), height and mortar for cavity walls. Where the space between metal-tied wythes is solidly filled with mortar, requirements for masonry-bonded walls shall apply.
3. Hollow masonry units shall have full mortar coverage of the ends and edges of the face shells in horizontal and vertical joints.
- (d) **Stone walls.** Stone walls shall comply with the following requirements:
1. In ashlar masonry, bond stones uniformly distributed shall be provided to the extent of not less than 10 percent of the area of exposed faces.
 2. Rubble stone masonry 24 inches or less thick shall have bond stones with a maximum spacing of 3 feet vertically and 3 feet horizontally, and if the masonry is over 24 inches thick, there shall be one bond stone for each 6 square feet of wall surface on both sides.
- (e) **Faced walls (composite walls).** Faced walls shall comply with the following requirements:
1. Net thickness of materials used for masonry facing shall be not less than 2 inches and not less than one-eighth the height of the unit. Masonry facing shall be bonded to the backing as required in Paragraph (b).
 2. The percentage of bond stones for ashlar masonry shall be computed from the exposed face area of the wall. At least 10 percent of the face area shall consist of bond stones extending 4 inches or more into the backing and the bond stones shall be evenly distributed.
 3. Every bonding stone, and except when alternate courses are full bond courses, every stone, shall be securely anchored to the backing with corrosion-resistant metal anchors with a cross section of not less than $\frac{3}{16}$ inch by 1 inch, or its equivalent in cross-sectional area. There shall be at least one anchor to each stone and not less than two for each stone more than 2 feet long and 3 square feet in face area; facing stones of larger size shall have at least one anchor to each 4 square feet of the face area of the unit as applied, but not less than two anchors.
- (f) **Hollow walls (cavity and masonry bonded).** Hollow walls of masonry shall comply with the following requirements:
1. Facing and backing of cavity walls shall be bonded with $\frac{3}{16}$ -inch-minimum diameter steel rods or metal ties of equivalent stiffness embedded in horizontal joints.
 2. Ties in alternate course shall be staggered, the maximum vertical distance between ties shall be 18 inches and the maximum horizontal distance shall be 36 inches.
 3. Rods bent to rectangular shape shall be used with hollow masonry units laid with cells vertical; in other walls, the ends of ties shall be bent to a 90-degree angle to provide hooks not less than 2 inches long. Additional bonding ties shall be provided at openings, spaced not more than 3 feet

around the perimeter and within 12 inches of the opening.

4. Ties shall be of corrosion-resistant metal or coated with a corrosion-resistant metal or other approved protective coating. Masonry-bonded hollow walls shall be bonded as required in Paragraph (b)1.

(g) **Bonding of intersecting walls.** Masonry walls shall be securely anchored or bonded at points where they intersect and where they abut or adjoin the structural frame of a building, except when other provisions are made for lateral support of the walls. Anchored or bonded intersecting walls shall conform to the following requirements:

1. When two walls meet or intersect and the courses are built up together, the intersections shall be bonded by laying in a true bond at least 50 percent of the units intersecting.
2. When the courses of meeting and intersecting walls are carried up separately, the intersecting walls shall be regularly toothed or blocked with 8-inch-maximum offsets and the joints shall be provided with metal anchors having a minimum section of $\frac{1}{4}$ inch by $1\frac{1}{2}$ inches with ends bent up at least 2 inches, or with $\frac{1}{2}$ -inch round by 4-inch cross pins to form anchorage. Such anchors shall be at least 2 feet long, spaced not more than 4 feet.

1006-2.301.5 Grouted masonry.

(a) **Definition.** Grouted masonry is that form of construction made with brick or solid concrete brick units in which interior joints of masonry are filled by pouring grout therein as the work progresses. Grouted hollow unit masonry is made with hollow masonry units in which the cells are continuously filled with concrete or grout. At the time of laying, all masonry units shall be clean and free of deleterious substances. Type M or S mortar containing lime or lime putty shall be used.

(b) **Low-lift grouted construction.** Low-lift grouted masonry construction shall conform to the following requirements:

1. All units in the two outer tiers shall be laid with full shoved head and bed mortar joints. Masonry headers shall not project into the grout space.
2. All longitudinal vertical joints shall be grouted and shall be not less than $\frac{3}{4}$ inch thick. In members three or more tiers thick, interior bricks shall be embedded into the grout so that at least $\frac{3}{4}$ inch of grout surrounds the sides and ends of each unit. All grout shall be puddled with a grout stick immediately after pouring.
3. One exterior tier may be carried up 16 inches before grouting, but the other exterior tier shall be laid up and grouted in lifts not more than six times the width of the grout space, with a maximum of 8 inches.

4. If the work is stopped for 1 hour or longer, the horizontal construction joints shall be formed by stopping all tiers at the same level and with the grout 1 inch below the top.

(c) **High-lift grout construction.** High-lift grouted masonry shall conform to the following requirements:

1. All units in the two tiers shall be laid with full head and bed mortar joints.
2. The two tiers shall be bonded together with wall ties. Ties shall be not less than 9-gage wire in the form of rectangles 4 inches wide and 2 inches long less than the overall wall thickness. Kinks, water drips or deformations shall not be permitted in the ties. One tier of the wall shall be built up not more than 16 inches ahead of the other tier. Ties shall be laid not more than 24 inches on center horizontally and 16 inches on center vertically for running bond, and not more than 24 inches on center horizontally and 12 inches on center vertically for stack bond. Every fourth tie vertically shall coincide with the vertical reinforcement of the wall, and shall be used as a centering element.
3. Cleanouts shall be provided for each pour by leaving out every other unit in the bottom tier of the section being poured. During the work, a high-pressure jet stream of water or air shall be used to remove mortar fins and any other foreign matter from the grout space. The cleanout shall be sealed after inspection and before grouting.
4. The grout space (longitudinal vertical joint) shall be not less than 3 inches wide and not less than the thickness required by the placement of steel with the required clearances and shall be poured solidly with grout. If the grout space contains no horizontal steel, it may be reduced to 2 inches. Masonry walls shall cure at least three days to gain strength before pouring grout.
5. Vertical grout barriers or dams shall be built of solid masonry across the grout space the entire height of the wall to control the flow of the grout horizontally. Grout barriers shall be not more than 25 feet apart.
6. Grout shall contain an approved shrinkage compensating admixture, shall be a plastic mix suitable for pumping without segregation of the constituents and shall be mixed thoroughly. Grout shall be placed by pumping or by an approved alternative method and shall be placed before an initial set occurs and not more than $1\frac{1}{2}$ hours after water has been added.
7. Grouting shall be done in a continuous pour, in lifts not more than 4 feet. The grouting shall be consolidated by puddling or mechanical vibrating during placing and reconsolidated after excess moisture has been absorbed, but before plasticity is lost. The grouting of a section of a wall

between control barriers shall be completed in one day with no interruptions longer than 1 hour.

8. Special engineering inspection shall be provided immediately prior to and during grouting. This inspection shall qualify the work for use of higher stresses in accordance with Table 1006-2.5.

- (d) **Grouted hollow unit masonry.** Grouting in hollow unit masonry shall be done in accordance with the requirements of Subsection 1006-2.401.4.

1006-2.301.6 Glass block masonry.

- (a) **Limitations.** Masonry of glass blocks may be used in nonload-bearing, nonfire-resistive exterior or interior walls and in openings that otherwise might be windows, and may be isolated or in continuous bands when the glass block panels are not less than 3¹/₂ inches thick at the mortar joints and the mortared surfaces of the blocks are treated in an approved manner for mortar bonding. Glass block panels for exterior walls shall have not more than 144 square feet of unsupported wall surface, nor be more than 25 feet long and 20 feet high between supports. For interior walls, glass block panels shall have not more than 250 square feet of unsupported wall surface, nor be more than 25 feet in one direction between supports.
- (b) **Mortar.** Glass block shall be laid in Type N or S mortar. Vertical and horizontal mortar joints shall be not less than 1/4 inch thick and not more than 3/8 inch thick and shall be completely filled.
- (c) **Exterior glass block panels.** Installation of exterior glass block panels shall comply with the following requirements:
1. Panels shall be held in place in the wall opening to resist external and internal wind pressure.
 2. Panels shall be set in recesses at the jambs and for panels more than 10 feet in horizontal dimension between supports, at head and base, as well. Recesses shall have a bearing surface at least 1 inch wide along the panel edge.
 3. When approved by the Building Official, anchorage may be provided by perforated strips of non-corrodible material when:
 - (aa) Panel is not more than 100 square feet in area, nor 10 feet in horizontal or vertical dimension.
 - (bb) Panel is not located above the fourth floor and is less than 52 feet above grade level.
 4. Reinforcement shall be provided in horizontal mortar joints, extending from end to end of the joints, but not across expansion joints. Where joints cannot be avoided, they may be spliced by lapping the reinforcement not less than 6 inches.
 5. Reinforcement shall be spaced not more than 2 feet vertically.
 6. Reinforcement shall be placed in the mortar joint immediately above and below openings in a

panel and shall consist of two parallel longitudinal galvanized steel wires, 9 gage or larger, spaced 2 inches and having welded thereto cross wires, 14 gage or larger, at intervals not more than 8 inches or an equivalent.

7. Exterior glass block panels shall have 1/2-inch expansion joints at sides and top. Expansion joints shall be free of mortar and shall be filled with resilient material.

SECTION 1006-2.401 REINFORCED MASONRY

1006-2.401.1 Criteria.

- (a) **Construction.** Reinforced masonry construction shall comply with the requirements of Section 1006 and ACI 530.
- (b) **Mortar and grout.**
1. Mortar used in reinforced masonry construction shall comply with Section 1006-2.201 and with the requirements of ACI 530, except that mortar proportions shall comply with the requirements set forth in Table 1006-2.3 for Type M or S mortar mixed with Portland cement.
 2. Grout shall be mixed in accordance with the requirements of ACI 530, except that proportions shall comply with the requirements of Subsection 1006-2.801.2(b).

1006-2.401.2 Fine grout shall be used in lieu of MG grout and coarse grout shall be used in lieu of PG grout.

1006-2.401.3 Strength of masonry. Determination of compressive strength of masonry shall be in accordance with EPCOT Standard 1006-1.

1006-2.401.4 Reinforced grouted masonry. Reinforced grouted masonry shall comply with the requirements of EPCOT Standard 1006-1.

1006-2.401.5 Reinforced hollow masonry. Reinforced hollow unit masonry shall comply with the following requirements:

- (a) Type M or S mortar shall be used.
- (b) All reinforced hollow unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled. Walls and cross webs forming such cells shall be full-bedded in mortar to prevent leakage of grout. All head (or end) joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells. Bond shall be provided by lapping units in successive vertical courses or by equivalent mechanical anchorage.
- (c) Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than 2 inches by 3 inches.
- (d) All cells containing reinforcement shall be filled solidly with grout.

- (e) All grout shall be consolidated at the time of pouring by puddling or vibrating and then reconsolidated by again puddling before plasticity is lost.
- (f) Low-lift grouted construction shall comply with the following requirements:
 1. In any one day, the height of pour shall not exceed 4 feet.
 2. When grouting is stopped for 1 hour or longer, horizontal construction joints shall be formed by stopping the grout 1 inch below the top of the uppermost unit.
- (g) High-lift grouted construction shall comply with the following requirements:
 1. Grouting shall be done in a continuous pour, in lifts not more than 4 feet.
 2. Grouting shall have no interruptions of more than 1 hour between lifts.
 3. Cleanout openings shall be provided at the bottom of all cells and pours to be filled with grout; openings shall be sealed after inspection and before grouting.
 4. Special engineering inspection prior to and during grouting shall be provided and shall qualify the work for use of higher stresses.

1006-2.401.6 Reinforced masonry columns and walls. Reinforced masonry columns and walls shall conform to the following requirements:

- (a) Design and construction of reinforced masonry columns and walls shall conform to the requirements of this Standard and EPCOT Standard 1006-1.

SECTION 1006-2.501 MISCELLANEOUS MASONRY REQUIREMENTS

1006-2.501.1 Anchoring walls.

- (a) Masonry walls that meet or intersect walls, floors or structural frames shall be securely bonded or anchored thereto where they provide the lateral support of the walls.
- (b) The ends of structural members bearing on masonry walls or piers shall be securely fastened to the walls or piers by an approved method.
- (c) When lateral support for walls is to be provided by anchorage to floor or roof joists that are parallel to the walls, the anchors shall be spaced at intervals not more than 6 feet and shall engage not less than three joists; these joists shall be bridged solidly at the anchors.
- (d) Other methods of anchoring masonry walls may be approved by the Building Official when engineering calculations are submitted in their support.

1006-2.501.2 Chases and recesses. Chases and recesses in masonry walls shall be designed and constructed so as not to reduce the required strength or fire resistance of the wall.

1006-2.501.3 Pipes and conduits embedded in masonry. No pipe or conduit shall be embedded in structural masonry

that is necessary for structural stability or required fire protection, except under the following conditions:

- (a) Rigid electric conduits may be embedded in structural masonry when their location has been detailed on the approved plans.
- (b) Pipes and conduits may pass vertically or horizontally through masonry by means of a sleeve at least large enough to pass any hub or coupling on the pipeline. Such sleeves shall be placed not closer than 3 diameters center-to-center; they shall not impair the strength of construction.
- (c) Placement of pipes or conduits in unfilled cores of low unit masonry shall not be considered as embedment.

1006-2.501.4 Arches and lintels. Members supporting masonry shall be of noncombustible materials. Steel or reinforced masonry lintels shall be of sufficient stiffness to carry the superimposed load without deflection of more than $1/360$ of the clear span.

1006-2.501.5 Corbeling.

- (a) Except for chimneys, the maximum corbeled horizontal projection beyond the face of the wall shall be not more than one-half of the wall thickness and the maximum projection of one unit shall not be more than one-half the depth, nor one-third the width of the unit, measured at right angles to the face of the wall that is offset.
- (b) No chimney shall be corbeled from a wall more than 6 inches, nor shall a chimney be corbeled from a wall that is less than 12 inches thick, unless the chimney projects the same distance on each side of the wall. In the second story of two-story dwellings, corbeling of chimneys on the exterior of the enclosing walls may equal the wall thickness. Corbeling shall be not more than a 1-inch projection for each course of brick projected.

1006-2.501.6 Cornices. Centers of gravity of stone cornices shall be inside of the outer wall face. Terra cotta cornices and metal cornices shall be supported structurally.

1006-2.501.7 Masonry chimneys.

- (a) Masonry chimneys shall be designed, anchored, supported and reinforced as required in this Standard and in accordance with the requirements of Chapter 9 of the *EPCOT Mechanical Code*. No chimney shall support a structural load other than its own weight, unless the chimney is designed to act as a supporting member. Every masonry chimney shall have walls of masonry units, brick, stone, reinforced concrete or equivalent solid thickness of hollow masonry and shall be lined with liners as required in the *EPCOT Mechanical Code*.
- (b) Wood members used in chimney construction shall meet the requirements of the *EPCOT Mechanical Code* for clearances.

1006-2.501.8 Drainage of hollow walls. In cavity walls, the cavity shall be kept clear of mortar droppings during construction. Approved flashing shall be installed in hollow walls and drainage shall be provided to keep dampness from the backing.

1006-2.501.9 Masonry veneer. Veneer of masonry units shall comply with the requirements of Section 710 and EPCOT Standard 7-8 for application. Design of masonry veneer shall comply with the requirements of Section 902.

1006-501.10 Anchor bolts. Bolts fully embedded in masonry shall have values not to exceed those set forth in Table 1006-2.6.

**TABLE 1006-2.6
MAXIMUM SHEAR ON BOLTS FOR MASONRY**

DIAMETER (inches)	EMBEDMENT (inches)	SOLID MASONRY (shear, pounds)	GROUTED MASONRY (shear, pounds)
$\frac{1}{2}$	4	350	550
$\frac{5}{8}$	4	500	750
$\frac{3}{4}$	5	750	1,100
$\frac{7}{8}$	6	1,000	1,500
1	7	1,250	1,850 ^a
$1\frac{1}{8}$	8	1,500	2,250 ^a

a. Permitted only with not less than 2,500 pound units.

EPCOT STANDARD 1009-5

STEEL

SECTION 1009-5.101 ADMINISTRATIVE REQUIREMENTS

1009-5.101.1 Scope. This Standard specifies methods for the use of structural steel, light gage cold-formed structural steel members, and open-web and long-span steel joists for buildings hereafter constructed, erected, altered or repaired in accordance with the requirements of Chapters 9 and 10, and this Standard. The EPCOT Standards listed in Appendix A for Section 1009 also shall apply.

1009-5.101.2 Testing. Tests shall be conducted in accordance with the requirements of Subsection 1004.3 and with the requirements of the testing specifications listed in Appendix A for Section 1009, as amended by this Standard.

SECTION 1009-5.201 STRUCTURAL STEEL

1009-5.201.1 Quality and design. The quality and design of structural steel shall comply with the requirements of American Institute of Steel Construction (AISC) (see EPCOT Standard 1009-1 or 1009-40) as modified by this Section.

1009-5.201.2 Material. Structural steel material shall conform to AISC (see EPCOT Standard 1009-1 or 1009-40) with the following modifications:

- (a) Structural steel shapes and plates shall be identified and marked as specified in ASTM A36 for the grade ordered. Mill test reports and certificates may be accepted by the Building Official as satisfactory identification.
- (b) The fabricator shall maintain procedures and records of the mill-identified material, so that the mill test reports and certificates can be considered as identification acceptable to the Building Official.
- (c) Steel that is not properly identified as to grade shall be tested by an approved independent agency for conformity to the specified grade.
- (d) The Building Official may waive testing or identification of steel designed for working stresses not more than 50 percent of those permitted for ASTM A36.

1009-5.201.3 Arc and gas cutting. Cutting of structural steel shall comply with the requirements of AISC with the following modifications:

- (a) Structural steel exposed to the weather shall receive at least one additional coat of paint or equivalent protective coating after erection.
- (b) Members having a corrosion-resistant metallic or other equivalent approved coating are not required to be shop and field painted.
- (c) Where structural members are exposed to the fumes from industrial plants, to fresh water, saltwater spray or other corrosive agents, such members shall be pro-

ected with a corrosion-resistant metallic finish or an equivalent approved coating.

- (d) Corrosion-resistant steel, with or without painting or coating, may be approved where sufficient test data or other factual data are submitted to and approved by the Building Official, establishing satisfactory performance under the specific exposure conditions or use.

SECTION 1009-5.301 LIGHT GAGE STEEL

1009-5.301.1 Quality and design. The quality and design of light gage cold-formed steel structural members shall comply with the requirements of the applicable Standards listed in Appendix A for Section 1009, and with the provisions of the American Iron and Steel Institute (AISI) (see EPCOT Standard 1009-2) as modified by this Section.

- (a) Gage, as referred to in this Section, shall be the thickness of the base material, without coating, according to U.S. standard gage; or when galvanized, the material shall be 2½ ounces per square foot heavier or 0.0037 inches thicker than U.S. standard gage, regardless of weight or thickness of galvanizing.
- (b) Structural sheet sections shall have a minimum thickness of 22 gage for floors and 30 gage for roofs and walls. Light gage steel studs shall have the following minimum thicknesses:
 1. **Bearing walls.** Eighteen gage and, except where specifically designed as columns, shall be spaced not more than 24 inches on centers.
 2. **Nonbearing partitions.** Exterior and exposed locations—18 gage; interior locations shall be designed for the load and deflection requirements of Chapter 9.
- (c) Light gage steel joists, rafters, purlins, girts and stringers shall have a minimum thickness of 18 gage.

1009-5.301.2 Material. The material used for light gage cold-formed steel structural members shall comply with the requirements of AISI with the following modifications:

- (a) Steel shall be identified as to grade by mill certificates or tests by an approved independent agency and as approved by the Building Official.
- (b) Light gage steel with a specified yield point higher than 33,000 pounds per square inch (psi) shall be marked with the ASTM designation. Members with a yield point higher than 33,000 psi obtained through additional treatment shall be marked with the resulting yield point.
- (c) Identification shall be on each bundle or lift of fabricated items with paint, decal, tag or other means approved by the Building Official. The fabricators' identification system shall be established on record

with the Building Official prior to fabrication. If the steel is not marked as required, or cannot be identified readily to the satisfaction of the Building Official, he may require tests to determine conformance to the applicable specification. The fabricator shall furnish to the Building Official an affidavit certifying that the material supplied complies with the applicable specification.

- (d) If the design stresses do not exceed 50 percent of the maximum stresses permitted for material with a yield point of 25,000 psi, identification and testing may be waived on approval of the Building Official.

1009-5.301.3 Protection against corrosion. Light gage cold-formed steel structural members and assembled panels, except those fabricated of approved corrosion-resistant steel or other approved coating, shall be protected against corrosion with a suitable shop coat of paint or other approved protection. Where directly exposed to the weather, members shall receive one additional coat of protection after erection.

SECTION 1009-5.401 OPEN-WEB AND LONG-SPAN STEEL JOISTS

1009-5.401.1 Quality and design. The quality, design and manufacture of open-web and long-span steel joists shall comply with the requirements of Section 1009, with the appropriate EPCOT Standards listed in Appendix A, and with SJI-AISC (see EPCOT Standard 1009-3) with the following modifications:

- (a) Anchorage and end-bearing steel joists shall conform to SJI-AISC, except that end bearing shall be designed for the maximum stresses for the material being used, as set forth in the applicable Sections of this Code.
- (b) All open-web and long-span steel joists and accessories shall be given one coat of protective paint before the joists and accessories leave the shop. The shop paint shall comply with the requirements of SSPC15 (see EPCOT Standard 1009-38).

1009-5.401.2 Materials. The materials used in the manufacture of open-web or long-span steel joists shall comply with the requirements of SJI-AISC with the following modifications:

- (a) Each bundle or lift of open-web and long-span steel joists shall be identified as to type, size and manufacturer by an approved method, at the time of fabrication. The identification shall be maintained until the material is installed in the structure.
- (b) When mill test reports or other data required by SJI-AISC cannot be verified by the Building Official, test results obtained by an approved independent agency showing compliance with the specification may be required.

SECTION 1009-5.501 WELDING

1009-5.501.1 Quality and design. The quality and design of welded connections in building construction shall conform to the requirements of AWS (see EPCOT Standard 1009-5) and

to the applicable EPCOT Standards listed in Appendix A for Section 1009.

EPCOT STANDARD 1010-9

WOOD

SECTION 1010-9.101 ADMINISTRATIVE REQUIREMENTS

1010-9.101.1 Criteria.

- (a) The quality and design of solid sawn wood members, structural glued-laminated wood members and plywood or nonveneer structural panel assemblies and their fastenings shall conform to the requirements of this Section, and to the basic standards of the industry listed in EPCOT Standards 1010-1 through 1010-36, as amended by this Standard. Other Standards listed in Appendix A for Section 1010 also are adopted as part of this Code. For heavy timber standard, see Section 1010-9.801.
- (b) Classification and grading of all species of lumber shall conform to the requirements of EPCOT Standard 1010-1 for the individual species.

1010-9.101.2 Limitations of use.

- (a) Wood members shall not be used to support the dead load of masonry or concrete, except that nonstructural masonry or concrete floor surfacing not more than 4 inches thick may be supported by wood members and structures may rest on wood piles constructed in accordance with the requirements of Subsection 908.4 and pressure treated in accordance with the requirements of EPCOT Standard 9-5.
- (b) Wood members shall not be used to resist horizontal forces in buildings more than one story when constructed with masonry or concrete, except that wood floor and roof members may be used in horizontal trusses and diaphragms to resist horizontal forces imposed by wind. Wood members shall not be used to transmit lateral forces by rotation of the truss or diaphragm in masonry or concrete buildings. Lateral earth pressures shall not be resisted by wood members in buildings.
- (c) The Building Official may deny permission for use of wood members where permissible grade characteristics or defects are present in a combination that will affect the strength of the member for the use intended.

1010-9.101.3 Identification.

- (a) Where structures are designed for use of stress-grade lumber or where structural glued-laminated timber or plywood is used structurally, the maximum unit stresses for the species and grade shall be shown on the plans filed with the Building Official.
- (b) Structural glued-laminated timber shall be manufactured and identified as required in ANSI/AITC A190.1. (See EPCOT Standard 1010-18.)
- (c) All stress-grade lumber shall be identified by grade mark or Certificate of Inspection issued by an approved agency as conforming to the requirements of EPCOT Standards 1010-11 through 1010-17 for the species used.

- (d) Plywood and other structural-use panels used structurally, including siding, roof sheathing and wall sheathing, subflooring, diaphragms and build-up members, shall be identified and grade marked by an approved agency indicating compliance with the requirements of EPCOT Standards 1010-19 and 1010-32, respectively.
- (e) All lumber, sawn timber, plywood and poles supporting permanent structures are required to be pressure treated as described in the standards listed in Appendix A and shall bear a product identification mark. Quality control inspection agencies for pressure-treated wood shall be certified as to competency of performance by an approved accrediting organization.

All pressure-treated lumber 6 inches or less in thickness and all pressure-treated plywood shall be marked with an indelible ink stamp at the treating facility. The stamp shall contain, as a minimum, the following information:

1. The treating company and plant location.
2. The American Wood Preservers Association (AWPA) standards to which the product is treated.
3. The quality mark of an approved inspection agency, which maintains continued supervision, testing and inspection over the quality of the product as described in AWPA standards.
4. The preservative used.
5. The year of the treatment.
6. The amount of retention of the chemical per cubic foot of wood.
7. The quality standard of the inspection agency.
8. Dry or kiln dried after treatment (KDAT), if applicable.
9. The purpose for which the wood has been treated (ground contact, above ground or foundation).

Exception: When the pressure-treated material will be used where all four sides are in full view and will not be covered by paint or other opaque finish, a Certificate of Treatment may be accepted in lieu of a permanent ink stamp. The certificate shall contain the same information as the stamp.

Pressure-treated wood more than 6 inches in width and more than 6 inches thick shall be marked with an indelible ink stamp or tagged at the treating facility.

- (f) Lumber and plywood required to be fire retardant shall be identified by the seal of an approved independent inspection agency, certifying compliance with AWPA C20 and C27 (see EPCOT Standard 1010-21).

- (g) Wood-based fiberboard and particleboard shall be identified by the manufacturer as meeting the appropriate EPCOT Standard as listed in Appendix A.

SECTION 1010-9.201 MAXIMUM STRESSES

1010-9.201.1 Limits. Stresses shall not exceed the maximum unit stresses for the respective types, species and grades of lumber as follows (as modified by this Standard):

**TABLE 1010-9.1
UNIT STRESSES BY SPECIES**

TYPE AND SPECIES OF LUMBER	DESIGNATION	EPCOT NO.
Solid sawn lumber	See Appendix A	1010-1
Glued-laminated Douglas Fir (Coast Region)	See Appendix A	1010-4
WWPA grades of Douglas Fir and larch	See Appendix A	1010-4
Southern Pine	See Appendix A	1010-4
California Redwood	See Appendix A	1010-4
Softwood	See Appendix A	1010-11 through 1010-17

- (a) **Bending stresses.** The maximum units bending stress, as specified in Appendix A of EPCOT Standard 1010-1, shall apply to members loaded with the wide face of the lamination perpendicular to the load. When the wide face of the lamination is parallel to the direction of the load and the member is composed of not less than three laminations, 115 percent of the bending stress as specified in EPCOT Standard 1010-1 may be used.
- (b) **Grades.** Studs, joists, rafters, foundation plates or sills planking 2 inches or more thick; beams, stringers, posts, structural sheathing and other load-bearing members shall be of at least minimum grades specified in EPCOT Standard 1010-1.
- (c) **Poles or piles.** “The maximum unit stresses for normal loading of round poles or piles used as structural members shall be as specified in EPCOT Standard 9-4 (except that the modulus of elasticity shall be the same for sawn lumber). Poles shall conform to the requirements of EPCOT Standard 1010-22. Piles shall conform to the requirements of EPCOT Standard 9-5.
- (d) The stress values for fire-retardant-treated lumber, including fastener values, shall be determined by an approved method that considers the effects of high heat and high humidity. The testing shall be verified by an approved agency.

Values for light metal plate connectors shall be recommended by each truss plate manufacturer and approved by the Building Official.

Values for glued-laminated timber, including fastener design loads, shall be recommended by the treater and approved by the Building Official.

In addition to the requirements specified in Section 1010-9.901, fire-retardant-treated wood having structural applications shall be tested in accordance with

EPCOT Standard 1010-35 and identified by an approved agency.

1010-9.201.2 Adjustment of maximum stresses. The maximum unit stresses specified in Subsection 1010-9.201.1 and the values for mechanical fastenings, as established in this Standard, shall be subject to adjustment as shown in EPCOT Standard 1010-1.

1010-9.201.3 Compression and tensile members. Columns, posts, struts and other members in compression parallel to grain, consisting of solid wood, structurally glued-laminated lumber or spaced columns shall be designed in accordance with EPCOT Standard 1010-1, and the unit axial tensile stress shall be calculated, using the net area and shall not exceed 67 percent of the maximum bending tensile stress.

1010-9.201.4 Notching and boring. Girders, beams or joists shall not be notched or bored in the middle third of the span. Notches shall not exceed 25 percent of the width of any wood member. Bored holes shall not exceed 40 percent of the width of any wood member and, in no case, shall the edges of the hole be nearer than $\frac{5}{8}$ inch to the edge of the wood member.

1010-9.201.5 Lateral stability of beams. Lateral stability shall be subject to requirements of Section 3.3.3 of EPCOT Standard 1010-1.

SECTION 1010-9.301 CONNECTIONS

1010-9.301.1 Design and installation. Timber connectors, bolts, lagscrews, nails, spikes, drift-bolts and wood screws shall be designed and installed in accordance with EPCOT Standard 1010-1. In nailed joints, the nails shall be spaced center-to-center a distance not less than the required penetration. Edge and end distance shall be not less than one-half the required penetration. Where necessary to prevent splitting, holes for nails shall be pre-drilled.

1010-9.301.2 Mechanical fastenings. Joist hangers, framing anchors, ties and other mechanical fastenings not specifically covered by this Section may be used provided that the values are approved by the Building Official.

1010-9.301.3 Fasteners in preservative-treated and fire-retardant-treated wood. Fasteners for preservative-treated and fire-retardant-treated wood shall be in accordance with ASTM A153.

1010-9.301.3.1 Fasteners for preservative-treated wood. Fasteners for preservative-treated wood shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. The coating weights for zinc-coated fasteners shall be in accordance with ASTM A153.

Exception: Fasteners other than nails and timber rivets shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B695, Class 55 minimum.

1010-9.301.3.2 Fastenings for wood foundations. Fastenings for wood foundations shall be as required in AF&PA Technical Report No. 7.

1010-9.301.3.3 Fasteners for fire-retardant-treated wood used in exterior applications or wet or damp locations. Fas-

teners for fire-retardant-treated wood used in exterior applications or wet or damp locations shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Fasteners other than nails, timber rivets, wood screws and lag screws shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B695, Class 55 minimum.

1010-9.301.3.4 Fasteners for fire-retardant-treated wood used in interior applications. Fasteners for fire-retardant-treated wood used in interior locations shall be in accordance with the manufacturer's recommendations. In the absence of manufacturer's recommendations, Section 1010-9.301.3.3 shall apply.

SECTION 1010-9.401 STRUCTURAL GLUED-LAMINATED LUMBER

1010-9.401.1 Design. Design of structural glued-laminated lumber shall comply with Subsection 1010-9.201.1, except as modified by this Section.

1010-9.401.2 Maximum stresses. The maximum unit stresses in structural glued-laminated lumber shall be in accordance with the requirements of the Standards listed in the first paragraph of this Section, and with the following modifications:

- (a) **Taper.** No taper shall be cut on the tension face of simple beams. On other members subject to bending, a slope not to exceed 1:24 may be used on the tension side when measured from the tangent to the laminations of the section considered. Steeper slopes may be used on the tension face, with approval of the Building Official, on arches and at sections increased in size beyond design requirements for architectural projections.
- (b) **Radial stress.** The maximum radial stress in curved sections shall be computed as set forth in Part V of Standard 1010-1.
- (c) **Fabrication.** Structural glued-laminated lumber shall be fabricated as specified in ANSI/AITC A190.1 (see EPCOT Standard 1010-18). End joints in laminations shall conform to ANSI/AITC A190.1, except that all test values must exceed twice the highest maximum bending or tension value for normal conditions or loading used in design.

SECTION 1010-9.501 DIAPHRAGMS AND SHEAR WALLS

1010-9.501.1 General requirements.

- (a) **Deflection.** Wood diaphragms and shear walls may be used to resist lateral forces when the deflection in the plane of the diaphragm, as determined by calculations, tests or analogies drawn therefrom, does not exceed the maximum deflection to which the diaphragm and any supported elements will maintain their structural integrity under assumed load conditions, that is, they would continue to support assumed loads without danger to building or occupants.
- (b) **Horizontal diaphragms.** For buildings having masonry or concrete walls, the use of horizontal dia-

phragms of diagonal sheathing or unblocked plywood, where permitted, shall be limited to one-story buildings or to the roofs of buildings more than one story.

- (c) **Connections.** Ties, connections and anchorages capable of resisting the design forces shall be provided between the diaphragms and the resisting elements. Openings that materially affect the strength of the diaphragm shall be fully detailed on the plans, and shall have their edges adequately reinforced to transfer shearing stresses. Boundary members at edges of diaphragms shall be designed to resist the direct tensile or compressive chord stress.
- (d) **Size and shape.** The size and shape of diaphragms shall be limited as set forth in Table 1010-9.2. In buildings with masonry or concrete walls, straight or diagonal sheathing may not be used for shear walls. In buildings of wood construction where rotation is provided for, transverse shear resisting elements normal to the longitudinal element shall be provided at spacings not more than 1½ times the width for diagonally sheathed diaphragms or two times the width for plywood diaphragms. Construction in which rotation of roof diaphragms is permitted shall be limited in accordance with Subsection 1010.2.

1010-9.501.2 Wood sheathed diaphragms.

- (a) **Sheathing boards.** Diaphragms constructed of 1-inch or 2-inch nominal boards shall have boards laid at right angles to rafters, joists or studs when designed as straight sheathing, or shall have boards laid at an angle of 45 degrees to rafters, joists or studs when designed as diagonal sheathing. Boards shall be 6 inches wide or wider and shall be nailed to each rafter, joist, stud, plate or peripheral blocking as required in Paragraph (b). For 1-inch sheathing, end joints in adjacent boards shall be separated by at least two joints, rafter or stud spaces. For 2-inch sheathing, end joints shall be separated by at least one joist, rafter or stud space.
- (b) **Nailing.** Sheathing boards shall be nailed to each intermediate-bearing member with not less than two 8d nails for each 1-inch by 6-inch board. At the diaphragm boundaries, three 8d and four 16d nails shall be provided at 1-inch and 2-inch boards. Equivalent nailing shall be used for boards wider than 6 inches.
- (c) **Sheathed diaphragms.** Straight sheathed diaphragms may be used to resist shears, caused by wind, or 50 pounds per lineal foot for 1-inch boards and 40 pounds per lineal foot for 2-inch boards. Diagonal sheathed diaphragms may be used to resist shears caused by wind of 300 pounds per lineal foot for 1-inch boards and 400 pounds per lineal foot for 2-inch boards. When double 1-inch diagonal sheathing laid 90 degrees to one another is used, the sheathing may resist wind shear up to 500 pounds per lineal foot.
- (d) **Supports.** Rafters or joists supporting sheathed diaphragms shall not exceed 24 inches on center for 1-inch sheathing and 5 feet for 2-inch sheathing. Walls or partitions carrying lateral loads shall be framed of studs not less than 2 inches by 4 inches spaced 16 inches on center.

TABLE 1010-9.2
MAXIMUM DIMENSION RATIO FOR
HORIZONTAL AND VERTICAL DIAPHRAGMS

MATERIALS	RATIO OF HORIZONTAL MAXIMUM LENGTH TO WIDTH	RATIO OF VERTICAL MAXIMUM HEIGHT TO WIDTH
Metal lath and cement or gypsum plaster	Not permitted	2:1
Fiberboard sheathing	Not permitted	1½:1
1-inch diagonal sheathing	3:1	2:1
1-inch straight sheathing	2:1	2:1
Double 1-inch diagonal sheathing	4:1	3½:1
2-inch diagonal sheathing	3:1	2:1
2-inch straight sheathing	2:1	2:1
Plywood sheathing—unblocked	4:1	Not permitted
Plywood sheathing—blocked	4:1	3½:1

1010-9.501.3 Plywood and particleboard diaphragms.

- (a) **Stresses.** Horizontal and vertical diaphragms sheathed with plywood or particleboard may be used to resist horizontal forces not exceeding those set forth in Table 1010-9.3A for plywood and Table 1010-9.3B for particleboard horizontal diaphragms, and Table 1010.9.4A for plywood and Table 1010-9.4B for particleboard shear walls. Plywood diaphragms may be calculated by principles of mechanics by using values of nail strength and plywood shear values as specified in APA-Engineered Wood Association *Design and Construction Guide—Diaphragm*.

The maximum span permitted for plywood used in horizontal diaphragms shall be as set forth in Table 1010-9.5 and, when used as a combination subfloor underlayment, shall be as set forth in Table 1010-9.6.

(b) **Material.**

1. Plywood used for horizontal or vertical diaphragms shall conform to the requirements of PSI 1 (see EPCOT Standard 1010-19).
2. Particleboard used for horizontal or vertical diaphragms shall conform to the requirements of ANSI/A208.1 (see EPCOT Standard 1010-28).

- (c) **Framing members.** Framing members shall be at least 2-inch nominal dimension to which plywood is attached and such members shall be limited to a maximum of 16 inches on center for vertical diaphragms. Panel edges shall bear on the framing members and butt along their center lines. Nails shall be placed not less than ⅜ inch from the panel edge, nor more than 12 inches apart along intermediate supports and 6 inches along panel edge bearings, and shall be firmly driven into the framing members. No unblocked panels less than 12 inches wide shall be used.

1010-9.501.4 Other shear walls.

- (a) **Stresses.** Other wood stud shear walls designed in accordance with the requirements of this Subsection may be used to resist horizontal forces in wood frame

buildings when the values shown in Table 1010-9.7 are not exceeded.

- (b) **Increase in stresses.** The increase in maximum stress for duration of load is included in the values shown in Table 1010-9.7.
- (c) **Lateral loads.** Walls and partitions resisting lateral loads shall be frames of studs not less than 2 inches by 4 inches nominal and shall be spaced not more than 16 inches on center.
- (d) **Plastered walls and partitions.** Plastered walls and partitions designed to resist horizontal loads shall conform to the requirements of Section 1007.
- (e) **Fiberboard sheathing.** Wood stud walls sheathed with fiberboard sheathing complying with ASTM D2277 (see EPCOT Standard 1010-24) may be used to resist lateral loads not exceeding those shown in Table 1010-9.7. Sheathing shall be applied with 8-foot-minimum vertical dimension and nailed with 11-gage galvanized roofing nails with 7/17-inch diameter heads and 1-inch nominal penetration into studs. If the wall exceeds the vertical dimension of the sheathing panel, the horizontal joint shall be blocked with 2-inch nominal blocking. Nails shall be spaced 3 inches on center at all panel edges and 6 inches on center at intermediate supports, and shall be ⅜ inch minimum from the edge of the panels.
- (f) **Braces.** When used in combination with any of the shear walls set forth in Table 1010-9.7 and straight sheathing, a 1-inch by 4-inch brace let into the studs may be used to resist an additional horizontal force not exceeding 1,000 pounds when the total value of the shear wall or partition does not exceed 600 pounds per foot. Each brace shall be nailed to each stud and to the top and bottom plates with two 8d nails.
- (g) **Gypsum.** Gypsum lath and plaster, gypsum sheathing board and gypsum wallboard when applied on wood studs in accordance with this Section, may be used as shear walls to resist horizontal forces not to exceed those set forth in Table 1010-9.7. End joints of adjacent panels of gypsum lath, gypsum sheathing board or gypsum wallboard sheets shall not occur over the same stud. Gypsum lath and 2-foot-wide panels of gypsum sheathing shall be applied with the long dimension perpendicular or parallel to the studs.
- (h) **Composite walls.** The shear values set forth in Table 1010-9.7 for a wall made up of a combination of materials shall be considered as the sum of the values of the individual materials, except as follows:
1. The sum of the values shall not exceed 600 pounds per foot.
 2. The values for gypsum lath, sheathing board and wallboard shall not be cumulative with the values for any other material applied to the same wall. The values may be doubled when identical materials are applied to both sides of the wall in accordance with the requirements of this Subsection.
 3. The values set forth in Table 1010-9.4 for plywood shear walls shall not be cumulative with the values for any other material.

**TABLE 1010-9.3A
MAXIMUM SHEAR FOR WIND FORCES FOR HORIZONTAL PLYWOOD DIAPHRAGMS^a
(pounds per foot)**

PANEL GRADE	COMMON NAIL SIZE	MINIMUM NAIL PENETRATION IN FRAMING (inches)	MINIMUM NOMINAL PLYWOOD THICKNESS (inches)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBER (inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
					Nail Spacing at Diaphragms and Continuous Panel Edges Parallel to Load ^b				Nails Spaced 6 inches Maximum at Supported Edges ^b	
					6	4	2 ¹ / ₂ ^c	2	Load Perpendicular to Unblocked Edges and Continuous Panel Joints	All Other Plywood Configurations
					Nail Spacing at Plywood Panel Edges					
6	6	4	3							
Structural I	6d	1 ¹ / ₄	5 ⁵ / ₁₆	2	188	250	375	420	167	125
				3	210	280	420	475	187	140
	8d	1 ¹ / ₂	3 ³ / ₈	2	270	360	530 ^c	600 ^c	240	180
				3	300	400	600	675	267	200
	10d	1 ⁵ / ₈	1 ¹ / ₂	2	318	425	640 ^c	730 ^c	283	212
				3	360	480	720	820	320	240
C-D, C-C and other grades covered in RCID Standard 1010-8	6d	1 ¹ / ₄	5 ⁵ / ₁₆	2	170	225	335	380	150	110
				3	190	250	380	430	170	125
			3 ³ / ₈	2	185	250	375	420	165	125
				3	210	280	420	475	185	140
	8d	1 ¹ / ₂	3 ³ / ₈	2	240	320	480 ^c	545	215	160
				3	270	360	540	610	240	180
PS-1-83	10d	1 ⁵ / ₈	1 ¹ / ₂	2	270	360	530 ^c	600 ^c	240	180
				3	300	400	600	675	265	200
			5 ⁵ / ₈	2	290	385	575 ^c	655	255	190
				3	325	430	650	735	290	215
			3 ³ / ₄	2	320	425	640 ^c	730 ^c	285	215
				3	360	480	720	820	240	240
4	645	870	935							
4	750	980	1075							

a. Values are for short-time wind loads and shall be reduced 25 percent of normal loading.

b. Nails shall be spread 12 inches on center along intermediate framing members.

c. Where nail spacing is less than 3 inches for 8d and 10d nails, the supporting member shall be at least 2¹/₂ inches (net) thick and the edge distance for the supporting member shall be 3³/₄ inch for nailing.

TABLE 1010-9.3B
ALLOWABLE SHEAR, IN POUNDS PER FOOT, FOR HORIZONTAL OR VERTICAL DIAPHRAGMS
WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE^{a, d}

PANEL GRADE	COMMON NAIL SIZE	MINIMUM NAIL PENETRATION IN FRAMING (inches)	MINIMUM NOMINAL PANEL THICKNESS (inches)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBER (inches)	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
					Nail Spacing at Diaphragms and Continuous Panel Edges Parallel to Load (Cases 3 & 4) and at all Panel Edges (Cases 5 & 6)				Nails Spaced 6 inches Maximum at Supported Edges ^b	
					6	4	2 1/4 ^c	2 ^e	Case 1 (no unblocked edges or continuous joints parallel to load)	All Other Configurations (Cases 2, 3, 4, 5 & 6)
					Nail Spacing (inches) at other Panel Edges (Cases 1, 2, 3 & 4)					
6	6	4	3	6	6	4	3			
Type 2-M-W	6	5/16	3/8	2	170	225	335	380	150	110
				3	190	250	380	430	170	125
		1 1/4	3/8	2	185	150	375	420	165	125
				3	210	280	420	475	185	140
	8	1 1/2	3/8	2	240	320	480	545	215	160
				3	270	360	540	610	240	180
		7/16	3/8	2	255	340	505	575	255	170
				3	285	380	570	645	290	190
2-M-3	10 ^e	1/2	5/8	2	290	385	575	655	285	190
				3	325	430	650	735	320	215
		1 5/8	5/8	2	320	425	640	730	285	215
				3	360	480	720	820	240	240
	10 ^e	1 5/8	3/4	2	320	425	640	730	285	215
				3	360	480	720	820	320	240

- a. Allowable shear values for nails in framing members of other species set forth in the AF&PA *National Design Specification* shall be calculated for all grades by multiplying the values by the following factors: Group III, 0.82 and Group IV, 0.65.
- b. Space nails 12 inches on center along intermediate framing members.
- c. Framing at panel edges shall be 3 inches nominal or wider and nails shall be staggered where nails are spaced 2 inches or 2 1/2 inches on center.
- d. These values are for short-term loads due to wind or earthquake and must be reduced 25 percent for normal loading.
- e. Framing at adjoining panel edges shall be 3 inches nominal or wider and nails shall be staggered where 10d nails having penetration into framing of more than 1 5/8 inches are spaced 3 or less on center.

TABLE 1010-9.4A
MAXIMUM SHEAR FOR WIND FORCES FOR PLYWOOD SHEAR WALLS^a
(pounds per foot)

PANEL GRADE	MINIMUM NOMINAL PLYWOOD THICKNESS (inches)	MINIMUM NAIL PENETRATION IN FRAMING (inches)	NAIL SIZE ^d	PANELS APPLIED DIRECT TO FRAMING				NAIL SIZE ^d	PANELS APPLIED OVER 1/2 inch GYPSUM BOARD			
				Nail Spacing at Plywood Edges					Nail Spacing at Plywood Edges (inches) ^b			
				6	4	2 1/2	2		6	4	2 1/2	2
Structural I	5/16	1 1/4	6	200	300	450	510	8	200	300	450	510
	3/8	1 1/2	8	230 ^d	360 ^d	530 ^d	610 ^d	10	280	430	640 ^e	730 ^e
	1/2	1 5/8	10	340	510	770 ^e	870 ^e					
Structural II C-D, C-C and other grades covered in PS-1-83 RCID Standard 1010-8	5/16	1 1/4	6	180	270	400	450	8	180	270	400	450
	3/8	1 1/2	8	220 ^d	320 ^d	470 ^d	530 ^d	10	160	380	570 ^e	640 ^e
	1/2	1 5/8	10	310	460	690 ^e	770 ^e					
Panel plywood siding in grades covered in PS-1-83 RCID Standard 1010-8	5/16 ^c	1 1/4	6 ^b	140	210	320	360	8 ^b	140	210	320	360
	3/8	1 1/2	8 ^b	130 ^d	200 ^d	300 ^d	340 ^d	10 ^b	160	240	360	410

- a. Panel edges shall be backed with 2-inch nominal or wider framing. Plywood may be installed either horizontally or vertically. Nails shall be spaced 12 inches on center along intermediate framing members. Values are for short-time wind loads and shall be reduced 25 percent for normal loading.
- b. Galvanized casing nails.
- c. 3/8-inch or 303-160.C, is minimum recommended when applied direct to framing as exterior siding.
- d. Shears may be increased 20 percent provided (1) studs are spaced a minimum of 16 inches on center, (2) plywood is applied with face grain across studs or (3) plywood is 1/2 inch or greater in thickness.
- e. Reduce tabulated shears 10 percent when boundary members provide less than 3-inch nominal nailing surface.

TABLE 1010-9.4B
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES IN POUNDS PER FOOT FOR
PARTICLEBOARD SHEAR WALLS WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE^{a, f}

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inches)	MINIMUM NAIL PENETRATION IN FRAMING (inches)	PANELS APPLIED DIRECT TO FRAMING				PANELS APPLIED OVER 1/2 INCH GYPSUM BOARD					
			NAIL SIZE (Common or Galvanized box)	Nail Spacing at Panel Edges (inches) ^b				NAIL SIZE (Common or Galvanized box)	Nail Spacing at Plywood Edges (inches) ^b			
				6	4	3	2		6	4	3	2 ^e
TYPE 2-M-W	5/16	1 1/4	6d	180	270	350	450	8d	180	270	350	450
	3/8			200	300	390	510		200	300	390	510
	3/8	1 1/2	8	220 ^c	320 ^c	410 ^c	530 ^c	10d	260	380	490 ^c	640
	7/16			240 ^c	350 ^c	450 ^c	585 ^c					
	1/2	1 5/8	10d ^d	260	380	490	640					
	1/2			310	460	600	770					
	5/8			340	510	655	870					

- a. For framing of other species, find species group of lumber in AF&PA *National Design Specification*. Find shear value from this Table for nail size. Multiply this value by 0.82 for Lumber Group III or 0.65 for Lumber Group IV.
- b. All panel edges backed with 2-inch nominal or wider framing. Install panels either horizontally or vertically. Space nails 6 inches on center along intermediate framing members for 3/8 inch and 7/16 inch in panels installed on studs spaced 24 inches on center. For other conditions and panel thickness, space nails 12 inches on center on intermediate supports.
- c. The allowable shear values may be increased to the values shown for 1/2-inch-thick sheathing with the same nailing, provided the studs are spaced a maximum of 16 inches on center.
- d. Framing at adjoining panel edges shall be 3-inch nominal or wider and nails shall be staggered where 10d nails having penetration into framing of more than 1 5/8 inches are spaced 3 inches or less on center.
- e. Framing at panel edges shall be 3-inch nominal or wider. Nails shall be staggered where nails are spaced 2 inches on center.
- f. These values are for short-term loads due to wind or earthquake and must be reduced 25 percent for normal loading.

TABLE 1010-9.5
MAXIMUM SPANS FOR PLYWOOD FLOOR AND ROOF SHEATHING
(Plywood Continuous over Two or More Spans and Face Grain Perpendicular to Supports)^a

PANEL IDENTIFICATION INDEX ^d	MAXIMUM SPAN (inches)		ROOF ^b LOAD (psf)		FLOOR MAXIMUM SPAN ^c (inches)
	Edges Blocked ^e	Edges Unblocked	Total	Live	
12/0, 5/16	12	—	155	150	0
16/0, 5/16, 3/8	16	—	95	75	0
20/0, 5/16, 3/8	20	—	75	65	0
24/0, 3/8	24	20	65	50	0
30/12, 5/8	30	26	70	50	12 ^f
32/16, 1/2, 5/8	32 ^g	28	55	40	16 ^h
36/16, 3/4	36	30	55	50	16 ^h
42/20, 5/8, 3/4, 7/8	42	32	40 ⁱ	35 ⁱ	20 ^j
48/24, 3/4, 7/8	48	36	40 ⁱ	35 ⁱ	24

- a. Values apply for C-C, C-D Structural I and II grades only. Spans limited to values shown because of possible effect on concentrated loads.
- b. Uniform load deflection limitations: 1/180 of span under live load plus dead load: 1/240 under live load only.
- c. Edges shall have tongue-and-groove joints to be supported with blocking unless 1/4-inch minimum thickness underlayment installed or finish floor is 25/32-inch wood strip. Uniform load is 165 pounds per square foot (psf), based on deflection of 1/360 of span.
- d. Identification index appears on panels in grades listed in Note a.
- e. Edges may be blocked with timber or other approved edge support.
- f. May be 16 inches if 25/32-inch wood strip flooring is installed at right angles to joists.
- g. 1/2-inch Structural I, if continuous over two or more spans, may be laid with face grain parallel to supports when panel edges block or other approved support provided, when spacing of supports is not more than 24 inches on center and live load is not more than 20 psf. For other grades, a thickness of 5/8 inch is required.
- h. May be 24 inches if 25/32-inch wood strip flooring is installed at right angles to joists.
- i. For roof live load of 40 psf, or total load of 55 psf, decrease spans 13 percent or use panel with next higher identification index.
- j. May be 24 inches where a minimum of 1 1/2 inches of approved cellular or lightweight concrete is placed over the subfloor and the plywood sheathing is manufactured with exterior glue.

**TABLE 1010-9.5A
ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANEL SHEATHING AND
SINGLE-FLOOR GRADES CONTINUOUS OVER TWO OR MORE SPANS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS^{a, b}**

SHEATHING GRADES		ROOF ^c				FLOOR ^d
Panel span rating roof/floor span	Panel thickness (inches)	Maximum span (inches)		Load ^e (psf)		Maximum span (inches)
		With edge support ^f	Without edge support	Total load	Live load	
12/0	$\frac{5}{16}$	12	12	40	30	0
16/0	$\frac{5}{16}, \frac{3}{8}$	16	16	40	30	0
20/0	$\frac{5}{16}, \frac{3}{8}$	20	20	40	30	0
24/0	$\frac{3}{8}, \frac{7}{16}, \frac{1}{2}$	24	20 ^g	40	30	0
24/16	$\frac{7}{16}, \frac{1}{2}$	24	24	50	40	16
32/16	$\frac{15}{32}, \frac{1}{2}, \frac{5}{8}$	32	28	40	30	16 ^h
40/20	$\frac{19}{32}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}$	40	32	40	30	20 ^{h, i}
48/24	$\frac{23}{32}, \frac{3}{4}, \frac{7}{8}$	48	36	45	35	24
54/32	$\frac{7}{8}, 1$	54	40	45	35	32
60/32	$\frac{7}{8}, 1\frac{1}{8}$	60	48	45	35	32
SINGLE-FLOOR GRADES		ROOF ^c				FLOOR ^d
Panel span rating	Panel thickness (inches)	Maximum span (inches)		Load ^e (psf)		Maximum span (inches)
		With edge support ^f	Without edge support	Total load	Live load	
16 o.c.	$\frac{1}{2}, \frac{19}{32}, \frac{5}{8}$	24	24	50	40	16 ^h
20 o.c.	$\frac{19}{32}, \frac{5}{8}, \frac{3}{4}$	32	32	40	30	20 ^{h, i}
24 o.c.	$\frac{23}{32}, \frac{3}{4}$	48	36	35	25	24
32 o.c.	$\frac{7}{8}, 1$	48	40	50	40	32
48 o.c.	$1\frac{3}{32}, 1\frac{1}{8}$	60	48	50	40	48

- a. Applies to panels 24 inches or wider.
- b. Floor and roof sheathing conforming to this Table shall be deemed to meet the design criteria of this Code.
- c. Uniform load deflection limitations $\frac{1}{180}$ of span under live load plus dead load, $\frac{1}{240}$ under live load only.
- d. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking unless $\frac{1}{4}$ -inch minimum thickness underlayment or $1\frac{1}{2}$ inches of approved cellular or lightweight concrete is placed over the subfloor, or finish is $\frac{3}{4}$ -inch wood strip. Allowable uniform load based on deflection of $\frac{1}{360}$ of span is 100 psf, except the span rating of 48 inches on center is based on a total load of 65 psf.
- e. Allowable load at maximum span.
- f. Tongue-and-groove edges, panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center), lumber blocking or other. Only lumber blocking shall satisfy blocked diaphragm requirements.
- g. For $\frac{1}{2}$ -inch panel, maximum span shall be 24 inches.
- h. Span is permitted to be 24 inches on center where $\frac{3}{4}$ -inch wood strip flooring is installed at right angles to joist.
- i. Span is permitted to be 24 inches on center for floors where $1\frac{1}{2}$ inches of cellular or lightweight concrete is applied over the panels.

TABLE 1010-9.5B
ALLOWABLE SPAN FOR WOOD STRUCTURAL PANEL COMBINATION SUBFLOOR-UNDERLAYMENT (SINGLE FLOOR)^{a, b}
(Panels Continuous Over Two or More Spans and Strength Axis Perpendicular to Supports)

IDENTIFICATION	MAXIMUM SPACING OF JOISTS (inches)				
	16	20	24	32	48
Species group ^c	Thickness (inches)				
1	1/2	5/8	3/4	—	—
2, 3	5/8	3/4	7/8	—	—
4	3/4	7/8	1	—	—
Single floor span rating ^d	16 o.c.	20 o.c.	24 o.c.	32 o.c.	48 o.c.

- a. Spans limited to value shown because of possible effects of concentrated loads. Allowable uniform loads based on deflection of $1/360$ of span is 100 psf, except allowable total uniform load for $1\frac{1}{8}$ -inch wood structural panels over joists spaced 48 inches on center is 65 psf. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless $1/4$ -inch minimum thickness underlayment or $1\frac{1}{2}$ inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is $3/4$ -inch wood strip.
- b. Floor panels conforming to this Table shall be deemed to meet the design criteria of this Code.
- c. Applicable to all grades of sanded exterior-type plywood. See EPCOT Standard 1010-19 for PS1 plywood species groups.
- d. Applicable to underlayment grade, C-C (plugged) plywood, and single-floor grade wood structural panels.

TABLE 1010-9.6
MAXIMUM SPANS FOR PLYWOOD COMBINATION SUBFLOOR UNDERLAYMENT^a
(Plywood Continuous Over Two or More Spans and Face Grain Perpendicular to Supports)

SPECIES GROUPS ^b	MAXIMUM SPACING FOR JOISTS FOR VARIOUS THICKNESS OF PLYWOOD SUBFLOOR (inches)		
	Joist Spacing		
	16	20	24
	Plywood Thickness		
1	1/2	5/8	3/4
2, 3	5/8	3/4	7/8
4	3/4	7/8	1

- a. Applicable to underlayment grade, C-C (plugged) and all grades of sanded exterior-type plywood. Spans limited to values shown because of possible effect on concentrated loads. Maximum uniform load based on deflection of $1/360$ of span is 100 psf. Plywood edges shall have approved tongue-and-groove joints, or shall be supported with blocking, unless $1/4$ -inch minimum thickness underlayment is installed, or finish floor is $25/32$ -inch wood strips. If wood strips are perpendicular to supports, thicknesses shown for 16-inch and 20-inch spans may be used for 24-inch spans.
- b. See EPCOT Standard 1010-19 for plywood species used.

TABLE 1010-9.7
MAXIMUM SHEAR FOR WOOD FRAMED SHEAR WALLS
 (For Plywood Shear Wall Values, see Table 1010-9.4)

THICKNESS OF SHEATHING MATERIAL (one side only) ^a	MAXIMUM SHEAR (plf)	NAILING REQUIREMENTS EACH BEARING ^b
Metal lath and Portland cement plaster	200	See Section 1007
Fiberboard 7/16 inch 25/32 inch	125 175	See Paragraph e of this Subsection See Paragraph e of this Subsection
Gypsum lath and plaster 3/8-inch gypsum lath and 1/3-inch plaster (no blocking)	100	1 1/8 inch by 13 gage 19/64 inch head plaster board blued nails at 5 inches on center ^c
Gypsum sheathing board 1/2 inch × 2 feet × 8 feet panels (no blocking) 1/2 inch × 4 feet × 8 feet panels; blocked ^d	75 175	1 3/4 inches × 11 gage, 7/16 inch head, diamond point, galvanized at 4 inches on center ^c
Gypsum wallboard 1/2 inch unblocked 1/2 inch unblocked 1/2 inch blocked ^d 1/2 inch blocked ^d 5/8 inch blocked ^d Two layers, 5/8 inch blocked	100 125 125 150 200 300	5d cover nails 7 inches on center 5d cover nails 4 inches on center 5d cover nails 7 inches on center 5d cover nails 4 inches on center 6d cover nails 4 inches on center Base: 6d cover nails 9 inches on center Face: 8d cover nails 7 inches on center ^c

plf = pounds per lineal foot

- a. Values may be doubled when identical sheathing materials are applied to both sides of wall.
 b. Applies to each stud, top and bottom plates, and blocking where required.
 c. Nails shall be placed not less than 3/8 inch from edges of panels.
 d. Block all horizontal joints with 2 inches × full width of studs.

SECTION 1010-9.601 WOOD FRAME CONSTRUCTION

1010-9.601.1 Alternative methods. Buildings or parts of buildings or structures constructed of wood shall conform to the requirements of this Section, unless other methods are proved to be satisfactory by engineering calculations or tests acceptable to the Building Official.

1010-9.601.2 Fastenings. The number and size of nails connecting wood members shall be not less than those set forth in Table 1010-9.8.

1010-9.601.3 Protection against decay and termites. Where protection of wood members is required by this Subsection, protection shall be provided by using naturally durable or pressure-treated wood. Wood subject to damage from both decay and termites shall be a naturally durable species resistant to termites or pressure treated.

- (a) **Durable wood.** The expression “durable wood” refers to the heartwood of the following species with the exception that an occasional piece with corner sapwood may be included if 90 percent or more of the width of each side on which it occurs is heartwood.

Decay resistant: Redwood, Cedars and Black Locust.

Termite resistant: Redwood and Eastern Red Cedar.

- (b) **Pressure-treated or preservative-treated wood.** The expression “pressure-treated or preservative-treated wood” refers to wood meeting the retention, penetration and other requirements applicable to the species, products, treatment and conditions of use in the approved standards of the AWPA and the AWPB-FDN, *Quality Control Program for Softwood Lumber, Timber and Plywood Pressure Treated with Water Borne Preservatives for Ground Contact Use in Residential and Light Commercial Foundations* of the American Wood Preservers Bureau.
- (c) **Standards.** The standards of the National Pest Control Association shall be deemed as approved in respect to pre-construction soil treatment for protection against termites.
- (d) **Termite hazard.** In territories where hazard of termite damage is known to be very heavy, the Building Official may require floor framing of termite-resistant wood, pressure-treated wood, soil treatment or other approved methods of termite protection.
- (e) **Exposed structural supports.** In geographical areas where experience has demonstrated a specific need, approved wood of natural resistance or pressure-treated wood shall be used for those portions of wood

- members that 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 may include horizontal members, such as girders, joists and decking, and vertical members, such as posts, poles and columns.
- (f) **Stumps and roots.** All stumps and roots shall be removed from the soil to a depth of at least 12 inches below the surface of the ground in areas to be occupied by a building.
- (g) **Wood embedded in ground.** Where wood is embedded in or in contact with the ground for support of permanent structures, it shall have an approved pressure preservative treatment suitable for ground contact use, except where continuously below the ground water line or continuously submerged in fresh water. Round or rectangular posts, poles and sawn timber columns supporting permanent structures, which are embedded in concrete in direct contact with earth or embedded in concrete exposed to the weather, shall be approved pressure-treated wood.
- (h) **Wood in ground contact or exposed to the weather.** Posts or columns supporting permanent structures, which are closer than 8 inches to exposed ground in enclosed crawl spaces or unexcavated areas located within the periphery of the building, shall be approved wood of natural decay resistance or pressure-treated wood. Wood posts or columns exposed to the weather or in basement or cellars and that support permanent structures shall be supported by concrete piers or metal pedestals projecting at least 1 inch above concrete of masonry floors or decks and 6 inches above exposed earth and separated therefrom by an approved impervious barrier except when approved wood of natural decay resistance or pressure-treated wood is used.
- (i) **Glued-laminated timbers.** Those portions of glued-laminated timbers that form the structural supports of a building or other structure, and are exposed to weather and not properly protected by a roof, eave or similar covering shall be pressure preservative treated or be manufactured from wood of natural resistance to decay.
- (j) **Crawl space construction.** Crawl spaces under buildings without basements shall be ventilated in accordance with this Section. Usable crawl spaces under buildings without basements shall be provided with a minimum of one access opening not less than 18 by 24 inches. Access openings shall be readily accessible and provided with a door or device that may be easily removed or operated. All wood framing and sheathing less than 8 inches from exposed earth in exterior walls that rest on treated wood, concrete or masonry foundations shall be approved naturally durable or pressure-treated wood. When the bottoms of wood structural floor elements, including joists, girders and subfloor, are less than 18 inches above the horizontal projection of the outside grade level and extend toward the outside grade beyond the plane represented by the interior face of the foundation wall studs, such elements shall be approved naturally durable or pressure-treated wood. When wood joists or the bottom of wood structural floors without joists are closer than 18 inches, or wood girders are closer than 12 inches to exposed ground located within the periphery of the building over crawl space or unexcavated areas, they shall be of approved wood of natural decay resistance or pressure-treated wood.
- (k) **Crawl space ventilation.** Crawl spaces under buildings without basements shall be ventilated by approved mechanical means or by openings in foundation walls. Openings shall be arranged to provide cross ventilation and shall be covered with corrosion-resistant wire mesh of not less than $\frac{1}{4}$ inch, nor more than $\frac{1}{2}$ inch in any dimension. Openings in foundation walls shall not be less than the following:
1. Such openings shall have a net area of not less than 1 square foot for each 150 square feet of crawl space.
 2. Where asphalt-saturated felt weighing 55 pounds per square, lapped at least 2 inches at joints, or 4 mil polyethylene lapped at least 4 inches at joints, or other approved vapor barrier is installed over the ground surface, the required net area of openings may be reduced to 10 percent of that required in Paragraph 1, and vents may have operable louvers. There shall be one ventilation opening within 3 feet of each corner.
- (l) **Wood in contact with concrete or masonry.** All wood in contact with concrete or masonry, including sills, sleepers, plates, posts, columns, beams, girders and furring, shall be treated with an approved preservative or shall be of a durable species, except that the ends of joists not less than 8 feet above the grade, when in contact with concrete or masonry, may be treated by dipping the ends in an approved preservative for a period of not less than 5 minutes.
- (m) **Moisture-permeable floors.** Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of approved wood of natural resistance or pressure-treated wood, unless separated from such floors or roofs by an approved impervious moisture barrier.
- (n) **Walls.** Clearance between wood siding and earth on the exterior of a building shall be not less than 6 inches, except where siding, sheathing and wall framing are of approved pressure-treated wood or approved wood for natural resistance to termites.
- (o) **Wood girders.** Ends of wood girders entering exterior masonry or concrete walls shall be provided with $\frac{1}{2}$ -inch airspace on tops, sides and ends, unless approved naturally durable or pressure-treated wood is used.
- (p) **Furring strips.** Wood furring strips or other wood framing members attached directly to the interior of

exterior masonry or concrete walls below grade shall be approved naturally durable or pressure-treated wood.

- (q) **Crib or retaining walls.** Wood used in retaining or crib walls shall be approved pressure-treated wood.

Exceptions:

1. It may be of untreated wood when the wall is not more than 2 feet in height and is separated from the property line or a permanent building by a minimum distance equal to the height of the wall.
 2. It may be of approved naturally durable wood when the wall is not more than 2 feet in height and is located on the property line.
 3. It may be of durable wood when the wall is not more than 4 feet in height and is separated from the property line or a permanent building by a minimum distance equal to the height of the wall.
- (r) **Planter boxes.** There shall be not less than 4 inches of solid masonry or 3 inches of concrete between planter boxes and wood stud walls. The masonry or concrete shall extend to a height of not less than 6 inches above the outer wall of the planter. Solid sheathing and 15-pound asphalt-saturated felt or equivalent shall be installed between the masonry or concrete and the wood stud.

1010-9.601.4 Firestops. Firestopping shall be provided in accordance with the requirements of Subsection 707.9.

1010-9.601.5 Members entering masonry walls. Where joists, beams or girders enter and terminate in a masonry wall, they shall be beveled 3 inches minimum, so that the top edges enter the wall not more than 1 inch. If located in a required fire-resistive wall, members shall be separated from the opposite side of the wall by at least 4 inches of solid masonry, except on street fronts. The ends of wood members entering required fire-resistive masonry or concrete walls from opposite sides shall be separated by not less than 4 inches of solid masonry.

1010-9.601.6 Horizontal framing. Horizontal framing shall comply with the following requirements:

- (a) **Sills.** Sills, 2 inches minimum in thickness, shall be bolted to the foundation or foundation wall with not less than 1/2-inch-diameter bolts embedded at least 7 inches into the masonry or concrete and spaced not more than 4 feet apart. There shall be a minimum of two bolts per piece with one bolt located within 12 inches of each end of each piece.
- (b) **Built-up beams.** Laminated built-up beams with continuous lamination not less than 2 inches nominal thickness may be used in place of solid timbers when the face of laminations is parallel to the applied load. Laminated beams 10 inches or less deep may be spiked together with not less than 16d spikes at 12 inches centers, staggered. Unless so spiked, or if the depth of beam is more than 10 inches, the laminations shall be connected with bolts not smaller than 1/2-inch diameter, spaced not more than 2 feet apart, staggered or equal. Fastenings shall be placed at a maximum of

one-fourth the depth of the member from the top and bottom edges.

- (c) **End bearing.** Except where 2-inch members are supported on a 1-inch by 4-inch ribbon strip and nailed to the adjoining stud, the ends of each joist or rafter shall have not less than 1 1/2 inches of bearing on wood or metal, nor less than 3 inches on masonry, unless engineering calculations are submitted to show that lesser amounts are required.
- (d) **Members framing from opposite sides.** Rafters, joists and beams framing from opposite sides and on top of a beam, girder or partition shall be lapped at least 3 inches or the opposite joists shall be tied together by approved method.
- (e) **Header spans.** Header joists shall be doubled, or shall be of solid lumber of equivalent cross section, when the span of the header exceeds 4 feet. The ends of header joists more than 6 feet long shall be supported by framing anchors or joist hangers, unless bearing on a beam, partition or wall. Tail joists more than 12 feet long shall be supported by framing anchors or on ledger strips not less than 2 inches by 3 inches. All headers, beams, joists and studs shall be kept at least 2 inches from the outside face of chimney or fireplace masonry.
- (f) **Bearing partitions.** Bearing partitions parallel to joists shall be supported on built-up joists, beams, girders, walls or other bearing partitions. Bearing partitions perpendicular to joists shall not be offset from supporting members, walls or partitions more than the joist depth, except when engineering calculations are submitted to justify the offset.
- (g) **Rafters and floor joists.** Rafters more than 8 inches deep and floor joists more than 4 inches deep shall be stabilized against overturning or buckling from superimposed load, as follows:
 1. At ends and at each support, by solid blocking not less than 2 inches thick and the full depth of joists, by nailing to studs when supported by ribbon boards, or by approved hangers or fastenings.
 2. Between supports, as required, so that joists will be stabilized every 8 feet and rafters every 10 feet by solid blocking 2 inches thick and full depth of the joist or rafter, or by wood cross bridging not less than 1 inch by 3 inches thick or by approved metal cross bridging.
 3. Where cross bridging is used, the lower ends of such bridging shall be driven up and nailed after the floor or subfloor has been nailed.
 4. Blocking and bridging of joists between supports may be eliminated for one-story buildings where joist depth does not exceed 12 inches and design live load is 50 pounds per square foot or less.

1010-9.601.7 Vertical framing. Vertical framing shall comply with the following requirements:

- (a) **Columns and posts.** All wood columns and posts shall be framed to true end bearings; shall extend down to supports of such design as to hold the column

or post securely in position and to protect its base from deterioration.

- (b) **Stud walls.** Studs in walls may be placed with their wide faces parallel to the wall when the studs are designed as columns. Stud walls shall have top and bottom plates.
- (c) **Exterior stud walls.** Exterior stud walls for buildings of two stories or less shall be of not less than 2-inch by 4-inch studs; for buildings of three stories, the studs shall be not less than 3 inches by 4 inches or 2 inches by 6 inches to the bottom of the second floor joists, and 2 inches by 4 inches for the two upper stories, except as otherwise provided.
- (d) **Unsupported height.** Unless designed in accordance with the requirements of Chapter 9, maximum unsupported height for stud framing shall be as follows:

MAXIMUM UNSUPPORTED HEIGHT FOR STUD FRAMING

MAXIMUM UNSUPPORTED HEIGHT (feet)	SIZE OF STUD FRAMING (inches)
8	2 × 3
11	2 × 4
14	3 × 4
17	2 × 6

- (e) Studs shall be spaced not more than 16 inches on center.

Exceptions:

1. Studs 2 inches by 4 inches and wider may be spaced 24 inches on center when supporting a roof and ceiling only.
2. When engineering calculations are submitted to justify other spacing.

For maximum spacing of studs supporting gypsum lath, metal lath or gypsum wallboard, and other covering materials, see ASTM C926 (see EPCOT Standard 1007-1).

- (f) **Bracing.** Not less than three studs shall be installed at all corners and intersections of stud walls. Stud walls shall be effectively braced in accordance with Section 1010-9.501.
- (g) **Ties.** In bearing partitions and exterior walls, the top plates shall be doubled and lapped at each intersection with walls or partitions. Joints in the upper and lower members of the top plates shall be staggered not less than 4 feet. Other methods of providing a continuous tie at the top of walls may be used when approved by the Building Official.
- (h) **Foundation studs.** Studs between the foundation and the floor above shall be not less in size than the stud- ding above, shall be a minimum length of 14 inches and shall be effectively braced. When more than 4 feet high, studs shall be of the size required for an additional story.
- (i) **Openings.** Unless designed in accordance with Chapter 9, openings in bearing exterior walls shall have

double studs on each side of openings more than 3 feet wide and triple studs shall be provided on each side of openings more than 6 feet wide. Studs shall be continuous from floor to roof or floor to floor. Headers shall be provided over each openings in exterior-bearing walls and shall be designed in accordance with the requirements of this Code. Where the opening is more than 3 feet wide, each end of the header shall be supported on not less than one stud, and where the opening is more than 6 feet wide, each end shall be supported on not less than two studs, unless designed.

- (j) **Openings for pipes.** Stud partitions in which plumbing, heating or other pipes are placed shall be framed and the joists underneath shall be spaced to give required clearance for the piping. Where a partition containing such piping is parallel to the floor joists, the joists supporting the partition shall be doubled and spaced to permit passage of the pipes, and shall be bridged. Where plumbing, heating or other pipes are placed in or partly in a partition, requiring cutting the soles or plates, a metal tie not less than 1/8 inch thick and 1 1/2 inches wide shall be fastened to the plate across and to each side of the opening, with not less than four 16d nails.
- (k) **Blocking.** All stud partitions or walls more than 8 feet high shall have blocking at mid-height or at intervals of not more than 10 feet. The blocking shall be not less than 2 inches thick and shall be the same width as the studs, fitted snugly and spiked into the studs, or other approved method shall be used to give lateral support to the studs. Blocking meeting the requirements of Subsection 707.9 shall be used.
- (l) **Water protection.** Where wood frame walls and partitions are covered on the interior with plaster, tile or other facings, and are subject to water splash, the framing shall be protected with approved water-resistant material.

SECTION 1010-9.701 LIGHT FRAMING

1010-9.701.1 Scope. The requirements of this Section are for light-frame construction in buildings housing Group R-3 and S occupancies, where the required floor live load is less than 50 psf and where the required roof live load does not exceed 20 psf. The details of this construction shall comply with the requirements of Subsections 1010-9.701.2 to 1010-9.701.8, inclusive.

1010-9.701.2 Joists and rafters. Joists and rafters selected from the American Forest & Paper Association (AF&PA) *Span Tables for Joists and Rafters* may be used in lieu of calculations, as required by other Subsections. Lumber specified by this method shall be grade marked accordingly.

1010-9.701.3 Fastenings. Fastenings for light framing shall comply with the following requirements:

- (a) **Size and number.** The number and size of nails connecting wood members shall be as specified in Table 1010-9.8.

- (b) **Subflooring.** Plywood subflooring and roof sheathing shall be nailed 6 inches on center at panel edges and boundary members, and 12 inches on center at intermediate supports.
- (c) **Mechanical fastenings.** Connections depending on joist hangers or framing anchors, ties and other mechanical fastenings may be used when approved by the Building Official.

1010-9.701.4 Floor framing. Floor framing for light-frame construction shall meet the following requirements:

- (a) **Girders.** Girders supporting first-floor joists shall be not less than 4 inches by 4 inches for spans 5 feet or less, or not less than 4 inches by 6 inches placed on edge for spans 7 feet or less. The ends of beams or girders supported on masonry or concrete shall have not less than 4 inches of bearing.
- (b) **Joists spans.** Spans for joists shall be in accordance with Paragraph (a).
- (c) **Subfloors.** Except when joist spacing is not more than 16 inches and nominal 1-inch tongue-and-grooved wood strips are applied perpendicular to the joist, one of the following subfloors shall be required.
 1. One-inch nominal, 3/4-inch minimum net sheathing applied perpendicular or diagonally to joists spaced 24 inches maximum on center. Joists shall occur over supports unless boards are end-matched wherein each board must be continuous over at least two joists.
 2. Plywood used as structural subflooring shall comply with the maximum span and identification index requirements shown in Table 1010-9.5 or combination subfloor underlayment shall have maximum spans in accordance with Table 1010-9.6.
- (d) **Plank and beam floors.** Floor systems of plank and beam construction may be designed as provided in this Standard, or in EPCOT Standard 1010-3. Joists in planking may be randomly spaced, provided that the system is applied to not less than three continuous spans; that planks are center-matched and end-matched or splined; that each plank bears on at least one support and joints are separated by at least 12 inches in adjacent pieces. One-inch-nominal strip square-edged flooring 1/2-inch tongue-and-grooved flooring shall be applied at right angles to the span of the plank. The 3/8-inch plywood shall be applied with the face grain at right angles to the span of the planks.

1010-9.701.5 Stair framing. Stair framing for light-frame construction shall be supported on floor framing or on walls or partitions. Not less than two stringers shall be provided for each set of stairs, cut to receive finish treads and risers of uniform width and height. Unless stringers are continuously supported on walls or partitions parallel to the stringer, the minimum effective depth at each notch shall be not less than 3 1/3 inches. Stringers shall be designed in accordance with the provisions of this Section, based on the net action. (See Section 806 for requirements for fire-protection of stairway construction.)

1010-9.701.6 Wall framing. The maximum un-supported height of studs shall be as specified in Subsection 1010-9.601.7(d).

1010-9.701.7 Nonbearing partitions. Framing for nonbearing partitions shall be of adequate size and spacing to support the finish applied thereto and the loads specified in Chapter 9.

1010-9.701.8 Roof and ceiling framing. Roof and ceiling framing in light-frame construction shall comply with the following requirements:

- (a) **Spans.** Spans for ceiling joists and rafters shall be in accordance with the requirements of Subsection 1010-9.701.2.
- (b) **Ridge members.** There shall be a ridge board at least 1 inch thick and not less in depth than the cut end of the rafter at all ridges. Where the slope of the roof is less than 3 in 12, the ridge member shall be designed as a vertical load-bearing member. At all valleys and hips, there shall be a double valley or a single hip rafter, each not less than 2 inches thick and not less in depth than the cut end of the rafter.
- (c) **Tie between exterior walls.** Where the ridge member is not designed as a vertical load-bearing member, rafters shall be framed directly opposite each other at the ridge and shall be nailed to adjacent ceiling joists to form a continuous tie between exterior walls. Where the ceiling joists run other than parallel to the rafters, rafters shall be tied across at or near their support by cross ties spaced not more than 48 inches on center, not less in size than 1 inch by 4 inches, or subflooring or metal straps shall be attached to the ends of the rafters to provide a continuous tie across the building.
- (d) **Purlins.** Purlins to support roof loads, that are installed to reduce the span of the rafters within permissible limits, shall be supported by struts from bearing walls or partitions. The maximum span of 2-inch by 4-inch purlins shall be 4 feet. The maximum span of 2-inch by 6-inch purlins shall be 6 feet. In no case shall the purlin be smaller than the size of the rafter supported. Struts shall not be smaller than 2 inches by 4 inches. The unbraced length of struts shall be 8 feet or less and the slope of the struts shall be not less than 45 degrees from the horizontal.
- (e) **Sheathing.** Rafters and roof joists shall be covered with sheathing conforming to the following requirements:

TYPE OF SHEATHING	MINIMUM THICKNESS (net - between joists)	MAXIMUM SPAN
Solid-straight	5/8	32
Solid-diagonal	5/8	24
Spaced	3/4	24

Plywood used as structural roof sheathing shall conform to the requirements for maximum spans and identification index set forth in Table 1010-9.5.

- (f) **Plank and beam roofs.** Roof systems of plank and beam construction shall conform to the requirements of AF&PA 1989 (see EPCOT Standard 1010-3).

- (g) **Trussed rafters.** The design of metal plate-connected wood roof trusses shall comply with EPCOT Standard 1010-31. Where trusses are to support mechanical or other equipment, the trusses shall be designed for such additional loads.

SECTION 1010-9.801 HEAVY TIMBER CONSTRUCTION

1010-9.801.1 Type III buildings. Buildings classified as heavy timber construction in accordance with Subsection 601.1(b) and Table 6.2 shall conform to the requirements of EPCOT Standard 1010-1 and this Section.

1010-9.801.2 Vertical framing. Vertical framing in heavy timber construction shall conform to the following requirements:

- (a) **Wood columns.** Wood columns may be sawn or glued laminated, and shall be not less than 8 inches nominal in any dimension when supporting roof or floor loads, except as specified in Subsections 1010-9.801.3(a) and 1010-9.801.3(b).
- (b) **Columns and beams.** Columns and beams shall be continuous, or shall be supported by direct bearing or heavy timber bolsters affixed to the columns by metal connectors housed within the contact faces, or by other approved methods.
- (c) **Trusses.** Framed timber trusses supporting floor loads shall have members of not less than 8 inches nominal in any dimension.
- (d) **Floors.** Floors shall be of sawn or glued-laminated plank, splined or tongue-and-grooved, not less than 3 inches nominal thick, covered with 1-inch-nominal dimension tongue-and-grooved flooring, laid cross-wise or diagonally; or shall be of planks not less than 4 inches nominal wide, set on edge close together and well spiked, and covered with 1-inch-nominal dimension flooring. The planks shall be laid so that no continuous line of joints shall occur except at points of support. Flooring shall not extend closer than $\frac{1}{2}$ inch to walls. The space between flooring and walls shall be covered by a molding fastened to the wall so that it will not obstruct the swelling or shrinking movement of the floor. Corbeling of masonry walls under floor planks may be used in place of such molding.
- (e) **Concealed spaces.** Floors shall be without concealed spaces.

1010-9.801.3 Roof framing. Roof framing for heavy timber construction shall conform to the following requirements:

- (a) **Arches.** Frames of glued-laminated arches for roof construction that spring from the top of the wall or wall abutment, framed timber trusses and other roof framing that does not support floor loads, shall have members not less than 4 inches nominal wide and not less than 6 inches nominal deep. Spaced members may be composed of two or more pieces not less than 3 inches nominal thick when blocked solidly throughout their intervening spaces. Splice plates shall be not less than 3 inches nominal thick.
- (b) **Roof decks.** Roof decks shall be sawn or glued-laminated, splined or tongue-and-grooved plank, not less than 2 inches nominal thick; or a double thickness of 1-inch-nominal boards with tongue-and-grooved joints or with staggered joints; or interior plywood (exterior glue) $1\frac{1}{8}$ inches thick; or of planks not less than 3 inches nominal wide set on edge close together and laid as required for floors. Other types of decking may be used when approved by the Building Official as alternatives under the provisions of Section 311.
- (c) **Concealed spaces.** Roofs shall be without concealed spaces.

1010-9.801.4 Mechanically laminated floor and roof decks. Laminated floor or roof decks built up of wood members set on edge may be designed as solid floors or roof decks of the same thickness, and continuous spans may be designed on the basis of the full cross section, using the simple span moment coefficient, when the roof deck or floor deck meet the following requirements:

- (a) **Nailing.** Laminations shall be driven up and spiked close together with a row of nails near each edge at spaced intervals and staggered vertically. Nail spacing in each row shall not exceed 18 inches for 2-inch by 8-inch nominal width and shall be proportional for other plank widths. Nail lengths shall be not less than $2\frac{1}{2}$ times the net thickness of each lamination.
- (b) **Splicing.** A single-span deck shall have full-length laminations. A continuous two-span deck shall have not more than every fourth lamination spliced within quarter points adjoining supports. A continuous deck of more than two spans shall have not more than every third lamination spliced within quarter points adjoining supports. No lamination shall be spliced more than twice in any span.
- (c) **Joints.** Joints shall be closely butted over supports or staggered across the deck, but within the adjoining quarter span.

1010-9.801.5 Construction details. Heavy timber construction shall also meet the following requirements:

- (a) **Plate boxes or hangers.** Approved wall plate boxes or hangers shall be provided where wood beams, girders or trusses rest on masonry or concrete walls. An airspace of $\frac{1}{2}$ inch shall be provided at the top, end and sides of the member, unless approved durable species or treated wood is used.
- (b) **Girders and beams.** 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 may be placed on top of columns that support roof loads only.
- (c) **Intermediate beams.** Where intermediate beams support a floor, they shall rest on top of the girders, or they shall be supported by ledgers or blocks securely fastened to the sides of the girders, or they may be supported by approved metal hangers into which the ends of the beams shall be closely fitted.

(d) **Anchorage of girders.** Every roof girder and at least alternate roof beams shall be anchored to their supporting members. Where supported by a wall, roof planking shall be anchored to the wall at intervals of

not more than 20 feet. Monitor and sawtooth construction shall be anchored to the main roof construction. Anchors shall be of sufficient strength to resist vertical uplift of the roof.

**TABLE 1010-9.8
FASTENING SCHEDULE**

CONNECTION	FASTENING ^{a, m}	LOCATION
1. Joist to sill or girder	3 - 8d common (2½" × 0.131") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
2. Bridging to joist	2 - 8d common (2½" × 0.131") 2 - 3" × 0.131" nails 2 - 3" 14 gage staples	toenail each end
3. 1" × 6" subfloor or less to each joist	2 - 8d common (2½" × 0.131")	face nail
4. Wider than 1" × 6" subfloor to each joist	3 - 8d common (2½" × 0.131")	face nail
5. 2" subfloor to joist or girder	2 - 16d common (3½" × 0.162")	blind and face nail
6. Sole plate to joist or blocking Sole plate to joist or blocking at braced wall panel	16d (3½" × 0.135") at 16" o.c. 3" × 0.131" nails at 8" o.c. 3" 14 gage staples at 12" o.c. 3" - 16d (3½" × 0.135") at 16" 4 - 3" × 0.131" nails at 16" 4 - 3" 14 gage staples per 16"	typical face nail braced wall panels
7. Top plate to stud	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	end nail
8. Stud to sole plate	4 - 8d common (2½" × 0.131") 4 - 3" × 0.131" nails 3 - 3" 14 gage staples 2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail end nail
9. Double studs	16d (3½" × 0.135") at 24" o.c. 3" × 0.131" nails at 8" o.c. 3" 14 gage staples at 8" o.c.	face nail
10. Double top plates Double top plates	16d (3½" × 0.135") at 16" o.c. 3" × 0.131" nails at 12" o.c. 3" 14 gage staples at 12" o.c. 8 - 16d common (3½" × 0.162") 12 - 3" × 0.131" nails 12 - 3" 14 gage staples	typical face nail lap splice
11. Blocking between joists or rafters to top plate	3 - 8d common (2½" × 0.131") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
12. Rim joist to top plate	8d (2½" × 0.131") at 6" o.c. 3" × 0.131" nails at 6" o.c. 3" 14 gage staples at 6" o.c.	toenail
13. Top plates, laps and intersections	3 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail
14. Continuous header, two pieces	3 - 16d common (3½" × 0.162")	16" o.c. along edge
15. Ceiling joists to plate	3 - 8d common (2½" × 0.131") 5 - 3" × 0.131" nails 5 - 3" 14 gage staples	toenail
16. Continuous to stud	4 - 8d common (2½" × 0.131")	toenail
17. Ceiling joists, laps over partitions	3 - 16d common (3½" × 0.162") minimum 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail

(continued)

**TABLE 1010-9.8—continued
FASTENING SCHEDULE**

CONNECTION	FASTENING ^{a, m}	LOCATION
18. Ceiling joists to parallel rafters	3 - 16d common (3½" × 0.162") minimum 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
19. Rafter to plate	2 - 8d common (2½" × 0.131") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
20. 1" diagonal brace to each stud and plate	2 - 8d common (2½" × 0.131") 2 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail
21. 1" × 8" sheathing to each bearing	3 - 8d common (2½" × 0.131")	face nail
22. Wider than 1" × 8" sheathing to each bearing	3 - 8d common (2½" × 0.131")	face nail
23. Built-up corner studs	16d common (3½" × 0.162") 3" × 0.131" nails 3" 14 gage staples	24" o.c. 16" o.c. 16" o.c.
24. Built-up girder and beams	20d common (4" × 0.192") 32" o.c. 3" × 0.131" nails at 24" o.c. 3" 14 gage staples at 24" o.c. 2 - 20d common (4" × 0.192") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail at top and bottom staggered on opposite sides face nail at ends and at each splice
25. 2" planks	16d common (3½" × 0.162")	at each bearing
26. Collar tie to rafter	3 - 10d common (3" × 0.148") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
27. Jack rafter to hip	3 - 10d common (3" × 0.148") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples 2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail face nail
28. Roof rafter to 2-by ridge beam	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples 2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail face nail
29. Joist to band joist	3 - 16d common (3½" × 0.162") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
30. Ledger strip	3 - 16d common (3½" × 0.162") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
31. Wood structural panels and particleboard ^b Subfloor, roof and wall sheathing (to framing)	½" and less 6d ^{c, l} 2¾" × 0.113" nail ⁿ 1¾" 16 gage ^o 15/32" to 19/32" 8d common [roofs in 110-140 mph (Exp. B)] 19/32" to ¾" 8d ^d or 6d ^e 2¾" × 0.113" nail ^p 7/8" to 1" 2" 16 gage ^p 8d ^e 1⅛" to 1¼" 10d ^d or 8d ^d ¾" and less 6d ^e 7/8" to 1" 8d ^e 1⅛" to 1¼" 10d ^d or 8d ^e	6" o.c. along edges and inter- mediate, 4" o.c. at component and cladding edge strip #3 [refer to Figure 6-3 of ASCE 7]

(continued)

**TABLE 1010-9.8—continued
FASTENING SCHEDULE**

CONNECTION	FASTENING ^{a, m}		LOCATION
32. Panel siding (to framing)	$\frac{1}{2}$ " or less $\frac{5}{8}$ "	6d ^f 8d ^f	
33. Fiberboard sheathing ^g	$\frac{1}{2}$ " $\frac{25}{32}$ "	No. 11 gage roofing nail ^h 6d common nail (2" × 0.113") No. 16 gage staple ⁱ No. 11 gage roofing nail ^h 8d common nail (2½" × 0.131") No. 16 gage staple ⁱ	
34. Interior paneling	$\frac{1}{4}$ " $\frac{3}{8}$ "	4d ^j 6d ^k	

- a. Common or box nails are permitted to be used, except where otherwise stated.
- b. Nails spaced at 6 inches on center at edges, 12 inches at intermediate supports, except 6 inches at supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 1010-9.501. Nails for wall sheathing are permitted to be common, box or casing.
- c. Common or deformed shank (6d - 2" × 0.113"; 8d - 2½" × 0.131"; 10d - 3" × 0.148").
- d. Common (6d - 2" × 0.113"; 8d - 2½" × 0.131"; 10d - 3" × 0.148").
- e. Deformed shank (6d - 2" × 0.113"; 8d - 2½" × 0.131"; 10d - 3" × 0.148").
- f. Corrosion-resistant siding (6d - 1⅞" × 0.106"; 8d - 2⅜" × 0.128") or casing (6d - 2" × 0.099"; 8d - 2½" × 0.113") nail.
- g. Fasteners spaced 3 inches on center at exterior edges and 6 inches on center at intermediate supports, when used as structural sheathing. Spacing shall be 6 inches on center on the edges and 12 inches on center at intermediate supports for nonstructural applications.
- h. Corrosion-resistant roofing nails with ⅞-inch-diameter head and 1½-inch length for ½-inch sheathing and 1¾-inch length for ⅝-inch sheathing.
- i. Corrosion-resistant staples with nominal ⅞-inch crown and 1⅞-inch length for ½-inch sheathing and 1½-inch length for ⅝-inch sheathing. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).
- j. Casing (1½" × 0.080") or finish (1½" × 0.072") nails spaced 6 inches on panel edges, 12 inches at intermediate supports.
- k. Panel supports at 24 inches. Casing or finish nails spaced 6 inches on panel edges, 12 inches at intermediate supports.
- l. For roof sheathing applications, 8d nails (2½" × 0.113") are the minimum required for wood structural panels.
- m. Staples shall have a minimum crown width of ⅞ inch.
- n. For roof sheathing applications, fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports.
- o. Fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports for subfloor and wall sheathing and 3 inches on center at edges, 6 inches at intermediate supports for roof sheathing.
- p. Fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports.

SECTION 1010-9.901 FIRE-RETARDANT-TREATED WOOD

1010-9.901.1 Fire-retardant-treated wood. Fire-retardant-treated wood is 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 or UL 723, a listed flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than 10½ feet beyond the centerline of the burners at any time during the test.

1010-9.901.1.2 Pressure process. For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig).

1010-9.901.1.3 Other means during manufacture. For wood products produced by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.

1010-9.901.1.4 Testing. For wood products produced by other means during manufacture, other than a pressure process, all sides of the wood product shall be tested in accordance with and produce the results required in Subsection 1010-9.901.1. Wood structural panels shall be permitted to test only the front and back faces.

1010-9.901.1.5 Labeling. Fire-retardant-treated lumber and wood structural panels shall be labeled. The label shall contain the following items:

1. The identification mark of an approved agency in accordance with Subsection 1010.3(f).
2. Identification of the treating manufacturer.
3. The name of the fire-retardant treatment.
4. The species of wood treated.
5. Flame spread and smoke-developed index.
6. Method of drying after treatment.
7. Conformance to appropriate standards in accordance with Subsections 1010-9.901.1.6 through 1010-9.901.1.9.
8. For fire-retardant-treated wood exposed to weather, damp or wet locations, include the words "No

increase in the listed classification when subjected to the Standard Rain Test” (ASTM D2898).

1010-9.901.1.6 Strength adjustments. Design values for untreated lumber and wood structural panels, as specified in Subsection 1010-9.201.1(d), shall be adjusted for fire-retardant-treated wood. Adjustments to design values shall be based on an approved method of investigation that takes into consideration the effects of the anticipated temperature and humidity to which the fire-retardant-treated wood will be subjected, the type of treatment and redrying procedures.

1010-9.901.1.6.1 Wood structural panels. The effect of treatment and the method of redrying after treatment, and exposure to high temperatures and high humidities on the flexure properties of fire-retardant-treated softwood plywood shall be determined in accordance with ASTM D5516. The test data developed by ASTM D5516 shall be used to develop adjustment factors, maximum loads and spans, or both, for untreated plywood design values in accordance with ASTM D6305. Each manufacturer shall publish the allowable maximum loads and spans for service as floor and roof sheathing for its treatment.

1010-9.901.1.6.2 Lumber. For each species of wood that is treated, the effects of the treatment, the method of redrying after treatment and exposure to high temperatures and high humidities on the allowable design properties of fire-retardant-treated lumber shall be determined in accordance with ASTM D5664. The test data developed by ASTM D5664 shall be used to develop modification factors for use at or near room temperature and at elevated temperatures and humidity in accordance with ASTM D6841. Each manufacturer shall publish the modification factors for service at temperatures of not less than 80°F and for roof framing. The roof framing modification factors shall take into consideration the climatological location.

1010-9.901.1.7 Exposure to weather, damp or wet locations. Where fire-retardant-treated wood is exposed to weather, or damp or wet locations, it shall be identified as “Exterior” to indicate there is no increase in the listed flame spread index as defined in Subsection 1010-9.901.1 when subjected to ASTM D2898.

1010-9.901.1.8 Interior applications. Interior fire-retardant-treated wood shall have moisture content of not over 28 percent when tested in accordance with ASTM D3201 procedures at 92-percent relative humidity. Interior fire-retardant-treated wood shall be tested in accordance with Subsection 1010-9.901.1.6.1 or 1010-9.901.1.6.2. Interior fire-retardant-treated wood designated as Type A shall be tested in accordance with the provisions of this Section.

1010-9.901.1.9 Moisture content. Fire-retardant-treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels before use. For wood kiln-dried after treatment (KDAT), the kiln temperatures shall not exceed those used in kiln-drying the lumber and plywood submitted for the

tests described in Subsection 1010-9.901.1.6.1 for plywood and Subsection 1010-9.901.1.6.2 for lumber.

1010-9.901.1.10 Type I and II construction applications. See Section 602 for limitations on the use of fire-retardant-treated wood in buildings of Type I or II construction.

1010-9.901.2 Identification. All fire-retardant-treated wood shall bear an identification mark showing the flame spread index thereof issued by an approved agency having a reexamination service. Fire-retardant-treated wood shall bear the quality mark of an approved inspection agency that maintains continued supervision and inspection over the method of drying. The drying shall be done according to the EPCOT Standard 1010-21(c) for lumber and EPCOT Standard 1010-21(d) for plywood.

Where fire-retardant-treated wood is exposed to weather, it shall be further identified to indicate that there is no increase in the listed flame spread index as defined above when subjected to EPCOT Standard 1010-21(a).

Where experience has demonstrated a specific need for use of material of low hygroscopicity, fire-retardant-treated wood to be subjected to high humidity conditions shall be identified to indicate the treated wood has a moisture content of not more than 28 percent when tested in accordance with EPCOT Standard 1010-21(b) procedures at 92-percent relative humidity.

1010-9.901.3 Moisture content. 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.

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EPCOT

FIRE PREVENTION CODE

2018 EDITION

AS ADOPTED BY THE
REEDY CREEK IMPROVEMENT DISTRICT

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FOREWORD

The purpose of the *EPCOT Fire Prevention Code*[®] is to serve as a comprehensive regulatory document to guide decisions aimed at protecting the public's life, health, safety and welfare in the built environment. This protection is provided through the adoption and enforcement of the performance-based provisions contained herein.

The use of performance-based requirements encourages the use of innovative building designs, materials and construction systems, while at the same time recognizing the merits of the more traditional materials and systems. This concept promotes maximum flexibility in building design and construction, as well as assuring a high degree of life safety.

The *EPCOT Fire Prevention Code* incorporates, by reference, nationally recognized consensus standards for use in judging the performance of materials and systems. This provides for the equal treatment of both innovative and traditional materials and systems, provides for the efficient introduction of new materials into the construction process and assures a high level of consumer protection.

PREFACE

Introduction

Internationally, Code Officials recognize the need for a modern, up-to-date *fire prevention* code addressing the design and installation of systems through requirements emphasizing performance. The *EPCOT Fire Prevention Code* is designed to meet these needs through model code regulations that safeguard the public's health and safety in all communities, large and small.

This comprehensive *fire prevention* code establishes minimum regulations for systems using prescriptive and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and new system designs.

Marginal Markings

Solid vertical lines in the margins within the body of this Code indicate a change from the requirements of the 2015 edition, except where a change was minor. Deletion indicators (➡) are provided in the margin where *an entire section*, paragraph, *exception or table* has been deleted if the deletion resulted in a change of requirements.

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CHAPTER 1

GENERAL PROVISIONS

SECTION 101 ADMINISTRATION

101.1 Title. This document shall be known as the *EPCOT Fire Prevention Code*® and will be referred to as “this Code.”

101.2 Legality. The *Florida Fire Prevention Code*, as adopted by Florida State Statute 633.20, is legally a part of this Code and their provisions shall be enforced by the Fire Official. Any reference to the *EPCOT Fire Prevention Code* shall be deemed a reference to the *Florida Fire Prevention Code*.

