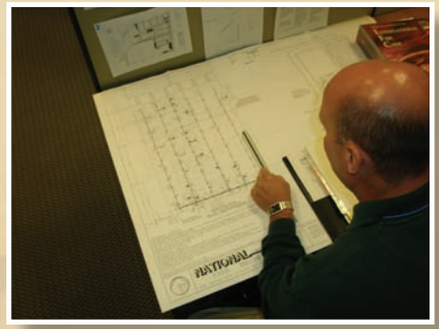
PART I

Code Administration and Enforcement



CHAPTER

1

Introduction to Building and Fire Codes

Building and fire codes are a group of regulations that address the construction, alteration, maintenance, and use of buildings. The fire code is unique because it is the only code that establishes requirements for land on which a building is located. The fire code requirements address buildings, including access roadways and water supplies for firefighting operations. The fire code contains certain limitations on how an individual uses their property, as it grants the fire code official the authority to prohibit locations where certain hazardous materials may be stored. It authorizes the code official to regulate site development and construction of buildings located in an area that can be impacted by a wildland fire.

Commonly called construction codes, the separate volumes include requirements for the design of the structure itself based on the materials used to erect the building and the internal and external forces they may face, such as a seismic ground movement, wind load, heavy roof loading due to

snow or rain, or flooding. Construction codes have extensive requirements to limit or control the development and spread of an unwanted fire and to ensure the life safety of the occupants. A major consideration of these codes is the health and safety of the building occupants, including requirements for delivering drinking water to the occupants and removing human and food waste for proper treatment and disposal, as well as heating, cooling, and electrical systems to conserve the required energy for these systems while efficiently perform their function. Building construction codes also establish requirements for protecting the envelope from weather and from fires that may initiate in or spread to a building.

The *International Fire Code* (IFC) is one of several construction codes published by the International Code Council (ICC). A major theme of the IFC is the protection of the public from the various hazards that are present in a variety of building uses and activities, as well as the safe storage and handling of hazardous materials. The IFC establishes the minimum requirements for fire department apparatus and firefighter access to buildings, firefighting water supplies, and provisions that address fire hazards inside and outside of buildings. The IFC references the companion International Codes for the construction of buildings regulated by the *International Building Code* (IBC), and one- and two-family dwellings and townhouses, which are regulated by the *International Residential Code for One- and Two-Family Dwellings* (IRC). It also references a variety of national standards, such as those from the National Fire Protection Association (NFPA) or Underwriters Laboratories (UL), which provide specific installation or product details that might not be included in the codes.

This chapter reviews how the IFC and the other codes published by ICC are developed and the scope of the other companion codes, and the chapter concludes with an extensive review of the IFC scope.

CODE DEVELOPMENT

The technology and esthetics of how buildings are constructed, as well as how goods and materials are manufactured, is constantly evolving. Accordingly, the model International Codes are systematically revised at periodic intervals to keep up with technical changes and to address the improved understanding of hazards. The International Codes are revised and updated through an open development process that invites participation by all stakeholders and affected parties. This process can involve exhaustive research, review, and debate of the technical, operational, and administrative issues.

A code change begins with the submittal of a proposal. Any interested group or individual may submit a code change proposal and participate in the proceedings in which it and all other proposals are considered. Following the publication and distribution of the proposals, an open public hearing is held before a committee of representatives from the industry and government, including code officials, contractors, builders, architects, engineers, and industry professionals with expertise related to the applicable code or portion of the code being considered. This open debate and broad participation before the committee ensures that a consensus of the construction community and those impacted by fire

and building codes are involved in the decision-making process. The committee may approve, modify, or disapprove the code change proposal.

The ICC membership present at the hearing has the opportunity to overturn the vote of the committee. Following the published results of the hearing, anyone may submit a written comment proposing to modify or overturn the hearing results. The next public hearing is the Final Action Hearing, in which the merits of code change proposals that received public comment are debated. Though any interested party may offer testimony, only ICC Government members (designated public safety officials of a government jurisdiction responsible for administering and enforcing codes) are permitted to cast votes at the final action hearing. The vote is limited to public safety officials because they have no vested financial interest in the outcome and they legitimately represent the public interest. This important process ensures that the International Codes will reflect the latest technical advances and will address the concerns of those throughout the industry in a fair and equitable manner.

A new edition of the code is published every three years. The IFC and all of the other model codes are developed during a single 18-month cycle of the three year period. Code changes to the other codes in the ICC codes family are reviewed and acted on during the later 18-month period. The code changes and the results of the actions by the Code Development Committee, proponent and the membership are published in the Code Change Proposals and Report of the Hearings monographs.

Code Basics

Three year IFC development cycle:

1. Anyone can submit a code change proposal.
2. Proposals are published and distributed.
3. Open public hearings are held before the committee.
4. Public hearing results are published and distributed.
5. Anyone can submit public comments on hearing results.
6. Public comments are published and distributed.
7. An open public final action hearing is held.
8. Final votes are cast by ICC Government members.
9. A new edition of the IFC is published. ●

FIGURE 1-1 International Codes

Although the codes are updated every three years (See Figure 1-1), they cannot be enforced in a community until that jurisdiction adopts them. The 2009 IFC might be published and ready for use, but if the jurisdiction has adopted only the 2006 IFC, the latter is the legally enforceable code. (See Chapter 2)

THE BUILDING AND FIRE CODES—SCOPE

Each of the International Codes has common features that are consistent across the entire library of construction and property maintenance codes. Each code begins by stating its scope. The scope establishes the range of

buildings, facilities, construction, equipment, and systems to which the particular code applies. The scope of the IFC is different from the other construction codes because its provisions apply to storage, activities, and hazards located indoors or outdoors of new or existing buildings. The other construction codes are generally limited to new buildings or buildings undergoing renovations—when they regulate outdoors uses or systems, the requirements are limited to a particular building service such as plumbing or fuel gas systems.

The International Codes contain a cross reference to the applicable codes based on the system or element of a building. The IFC makes extensive references to the requirements in the *International Mechanical Code* (IMC) for refrigeration systems, hazardous exhaust mechanical ventilation systems, and commercial cooking operations. The IFC defers to the IBC construction requirements for new buildings or buildings undergoing renovation. Fire code officials are generally are not well-versed in the structural design of buildings or the design of building mechanical, plumbing, and electrical systems, so the IFC defers to the IBC in these instances. The IBC charges the Building Official as the individual responsible for these and other elements regulated by the IBC, including fire-resistive construction, structural integrity, means of egress, and accessibility. Any new buildings or existing buildings that are altered or changed must comply with the requirements in the IFC and the IBC. **[Ref. 102.4]**

All of the International Codes refer to nationally recognized standards. Standards establish the minimum requirements or criteria for the acceptance of materials, components, assembled equipment or machinery, and systems. Standards are considered as part of the IFC requirements and must be complied with. If an instance arises where a conflict exists between a code and standards, the provisions in the IFC take precedence. **[Ref. 102.7]**

Each of the model International Codes contains one or more Appendices. Appendices are not mandatory requirements unless they are specifically adopted by the governmental entity. (See Chapter 2)

International Building Code (IBC)

The provisions of the IBC apply to the construction, alteration, maintenance, use, and occupancy of all buildings and structures except detached one- and two-family dwellings and townhouse and their accessory structures which are covered by the IRC. The IBC prescribes various requirements based on the relative risks and hazards of the intended uses within the building and controls the design accordingly. In addition to structural components and systems, the IBC classifies the occupancy of the building, provides for safe interior finish and means of egress, accessibility for mobility impaired individuals, passive and active fire protection, weather resistance, and interior environments. (See Figure 1-3) These requirements are based on the use and occupancy of the building. The occupancy classification of a building or use is based on its intended function. The IBC prescribes various requirements based on the intended uses within the building and controls the design accordingly.

You Should Know

The IFC applies to new and existing buildings and conditions that are hazardous to life, property, or public welfare inside or outside a building. (See Figure 1-2) Its requirements are correlated to other International Codes. ●

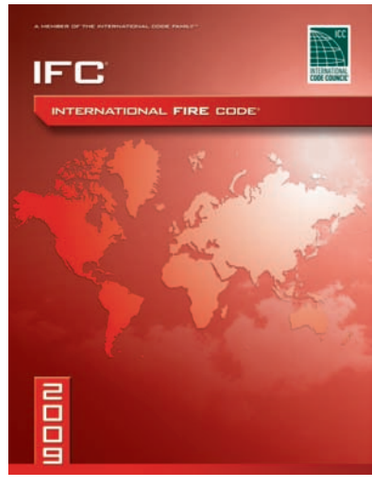


FIGURE 1-2 *2009 International Fire Code*

IBC provisions limit the building's height and area, location on property, means of egress, construction, and degree of fire protection, and the provisions vary greatly among covered malls, high-rise buildings, warehouses, night clubs, schools, apartments, and grocery stores.

International Residential Code (IRC)

The requirements in the IRC apply to the construction, alteration, use, and occupancy of detached one- and two-family dwellings and townhouses. Such buildings are limited to not more than three stories above grade in height, and each dwelling unit must have a separate means of egress. (See Figure 1-4) This construction code includes provisions for structural elements, fire and life safety, indoor air quality, energy conservation, and the building's mechanical, electrical, and plumbing systems. The IRC requires compliance with prescriptive construction provisions or the use of performance design criteria. The provisions in the IFC are applicable to the exterior elements of IRC regulated buildings, including premises identification, fire apparatus access, and water supplies. The IFC administrative, operational, and maintenance provisions are also applicable. **[Ref. 102.5]**

International Wildland-Urban Interface Code (IWUIC)

The *International Wildland-Urban Interface Code* (IWUIC) sets forth requirements for geographical areas of a governmental jurisdiction where structures and other human development meet or intermingle with wildland or vegetative fuels. (See Figure 1-5) IWUIC requirements are applied to mitigate the risk of life and property loss of a fire from wildland fire exposures and fire exposures from adjacent structures and to limit the potential of a structure fire igniting adjacent wildland areas.

FIGURE 1-3 IBC regulated building

FIGURE 1-4 A single-family dwelling. The requirements for its construction or alteration are set forth in the IRC

The IWUIC accomplishes this by requiring the jurisdiction to legally identify and map its Wildland-Urban Interface areas followed by applying scaled construction requirements to improve the ignition-resistance of buildings and structures. The Code also prescribes requirements for establishing and maintaining defensible space around buildings.

International Mechanical Code (IMC)

The *International Mechanical Code* (IMC) regulates the design, installation, maintenance, and alteration of building mechanical systems that are used to control the environment and related processes. The IMC does not apply to the installation of fuel-gas distribution piping and appliances—these systems are regulated by the provisions in the *International Fuel Gas Code* (IFGC).

The IFC makes extensive reference to the requirements in the IMC for refrigeration systems, commercial kitchen cooking systems, fuel oil piping, and hazardous exhaust ventilation systems used in battery rooms, flammable finishing operations, semiconductor fabrication facilities, and buildings storing and handling hazardous materials. (See Figure 1-6)

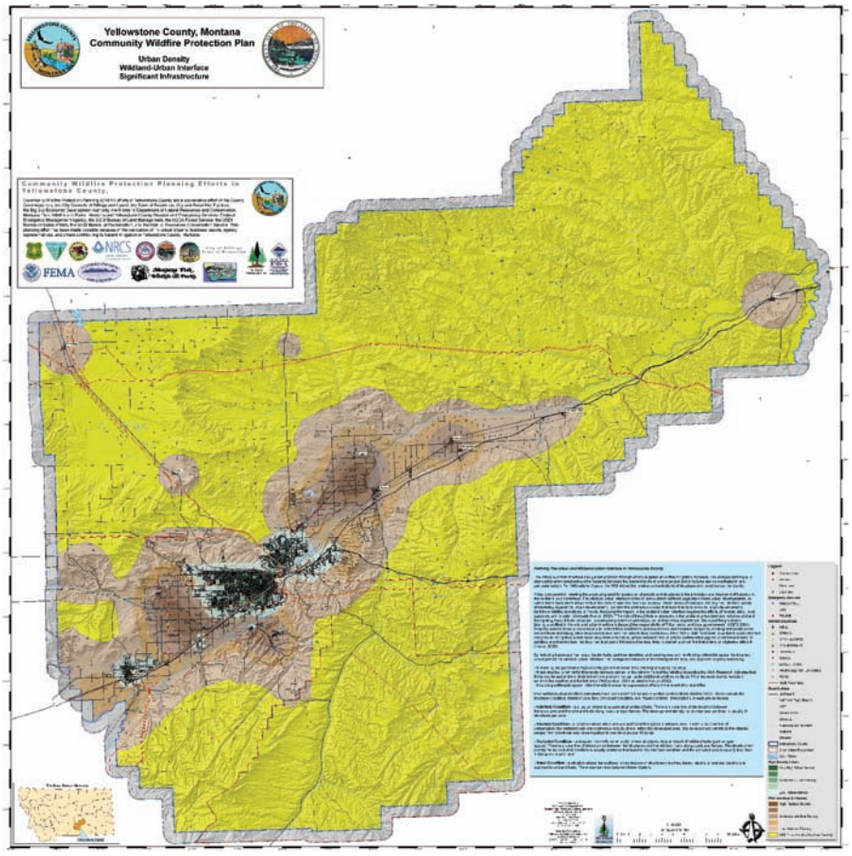


FIGURE 1-5 **Wildland-Urban interface map (***Courtesy of Billings (MT) Fire Department***)**

FIGURE 1-6 **A commercial kitchen cooking system is regulated by the IMC and IFC. If the appliances are supplied by fuel gas, the system is also regulated by the IFGC**

International Fuel Gas Code (IFGC)

The *International Fuel Gas Code* (IFGC) regulates the installation of natural gas and liquefied petroleum gas (LP-Gas) systems, fuel gas utilization equipment (appliances), gaseous hydrogen systems, and related accessories. (See Figure 1-7) The scope of the IFGC extends from the utility company's point of delivery to the appliance shutoff valve. Its requirements address pipe sizing and arrangement, approved materials, installation, testing, inspection, operation, and maintenance. The equipment installation requirements include combustion and ventilation air, approved venting, and connections to the fuel gas system. The IFC Chapter 38 requirements references the IFGC requirements for LP-Gas.

International Property Maintenance Code (IPMC)

The *International Property Maintenance Code* (IPMC) establishes minimum regulations for the maintenance of property. Its purpose is to adequately protect the public safety, health, and general welfare of individuals who may be affected by the continuous occupancy of buildings and the maintenance of structures and premises. Existing structures and premises that do not comply with these provisions must be altered or repaired to provide a minimum level of health and safety. The provisions of the IPMC apply to all existing residential and nonresidential structures. It includes minimum requirements for light, ventilation, space, heating, sanitation, protection from the elements, fire and life safety, and for safe and sanitary maintenance. (See Figure 1-8)

FIGURE 1-7 Natural gas meters. The piping on the discharge side of each meter is regulated by the IFGC

FIGURE 1-8 A leaking sewage system would require repair under the provisions in the IPMC

INTERNATIONAL FIRE CODE

The provisions of the IFC address the hazards of fire and explosion arising from the storage, handling, or use of materials, structures, devices, and conditions that are fire hazards or that are hazardous to life, property, or public welfare in any occupancy, structures, or premises. The IFC requirements address the design, construction, installation, testing and maintenance, or removal of fire protection systems, including automatic sprinkler systems and fire alarm and detection systems. Conditions that can affect the safety of firefighters and emergency responders during the emergency operations are also regulated by the IFC. (See Figure 1-9) **[Ref. 101.2]**

The IFC, like other International Codes, is arranged and organized to follow sequential steps that generally occur during a plan review or inspection. The IFC is divided into eight different parts:

Chapters	Subjects
1 – 2	Administration and Definitions
3 – 4	General Safety Requirements
5 – 10	Building and Site Requirements
11 – 26 and 45	Special Processes and Uses
27 – 44	Hazardous Materials
46	Construction Requirements for Existing Buildings
47	Reference Standards
Appendices A-J	Appendices

The IFC requirements for fire-resistive construction, interior finish, fire protection systems, and means of egress are directly correlated to the requirements in the following IBC chapters:

FIGURE 1-9 Part of the IFC scope is the safety of first responders operating at the scene of an emergency

Chapter	Subject
7	Fire-Resistance-Rated Construction
8	Interior Finish, Decorative Materials and Furnishings
9	Fire Protection Systems
10	Means of Egress

Applicability of the IFC

Given its broad scope, the requirements in the IFC are applicable to the design and construction of new buildings or when a change of use or occupancy occurs. Its requirements are intended to be used in conjunction with the requirements of the IBC. The IFC also establishes requirements for the operations and maintenance of a building, processes, or systems located indoors or outdoors. **[Ref. 102.2]**

Construction and design requirements in the IFC are applicable to:

1. Structures, facilities, and conditions that arise after the Code is adopted.
2. Existing structures, facilities, and conditions not legally in existence at the time the Code is adopted.
3. Existing structures, facilities, and conditions when required by the provisions in IFC Chapter 46.
4. Existing structures, facilities, and conditions which, in the opinion of the fire code official, constitute a distinct hazard to life or property. **[Ref. 102.1]**

FIGURE 1-10 Two portable outdoor gas-fired heaters used inside a building. Based on the requirement in Section 102.1, item 2, a fire inspector would cite this installation as a violation of the requirements in Section 603.4.2.1.1

The requirements of the IFC are applicable for any conditions that arise after the date the code is adopted and for any new facilities or structures that are constructed. If a developer wishes to construct a new apartment community and the jurisdiction has adopted the 2009 family of International Codes, then the site and building would be required to comply with the 2009 IFC.

During an inspection, it is common to find a condition that is a violation of the IFC. If the violation is identified during an inspection and the jurisdiction has adopted a fire code, item 2 of Section 102.1 requires that the violation be corrected using the requirements in effect at the time the violation was observed. As an example, a fire inspector performing an inspection of a restaurant and night club finds that portable outdoor gas-fired heating appliances are being used inside of a canopy-covered area of an outdoor balcony. (See Figure 1-10) The jurisdiction has adopted the 2009 IFC. In this case, the inspector would cite the owner of violating Section 603.4.2.1.1, because it is violation of this section to use this type of heater inside of a canopy.

Item 4 of Section 102.1 grants the fire code official the authority to retroactively enforce any provision in the 2009 IFC when, in the opinion of the code official, a hazard is considered to be *distinct*. Declaring a building, process, or use as being a distinct hazard requires a great deal of consideration because once such a declaration has been made, the requirements must be equally enforced on all other similar buildings, processes, or uses. Such a declaration commonly results in legal

challenges by the plaintiffs, due to the costs associated with the retroactive construction and renovating systems or features to comply with the IFC. In those instances where a fire code official considers a building, process, or use a distinct hazard, such a decision should be discussed with the jurisdiction's attorney before making the declaration. In many cases, the retroactive application of a particular code requirement should consider the time required to obtain construction permits and to perform inspections, because immediate compliance may be difficult, if not impossible.

Retroactive application of the IFC

Chapter 46 of the IFC stipulates requirements that are applicable to all existing buildings and facilities. These requirements specify the minimum fire safety requirements for existing buildings, such as the protection of vertical openings in shafts. Opening protection in shafts is required to limit the vertical spread of smoke. In occupancies that represent a high life safety risk, such as an elementary school where the children must be under supervision [educational (Group E)], or a hospital, where patients may not be capable of effecting self-rescue [institutional (Group I)], the IFC requires the retroactive installation of a fire alarm and detection system to ensure that an unwanted fire is detected early in its growth. Other retroactive requirements address means of egress components, address numbers or letters on buildings, interior finish, or the installation of automatic sprinkler systems in Group I-2 occupancies.

Change of use or occupancy

The building official will issue a Certificate of Occupancy when a building is approved for occupancy. Every building constructed or renovated under the IBC receives a Certificate of Occupancy. (See Figure 1-11) In addition to the building's address, its building permit number, and the

You Should Know

The IFC applies to new buildings, structures, and uses, any uses that are not legal at the time of the Code's adoption, or when the fire code official declares a building, structure, or use a distinct hazard. ●

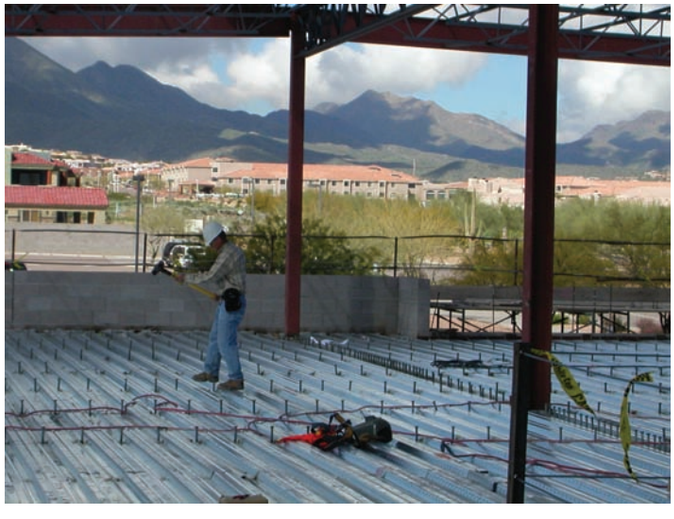


FIGURE 1-11 New building construction or renovation must comply with the requirements of the IFC and IBC

adopted edition of the IBC used as the basis for its construction, the certificate of occupancy documents:

- The use and occupancy of the building,
- The building's construction type,
- The design occupant load,
- If an automatic sprinkler system is provided, whether the system is required,
- The permitted design live load if a floor is designed to support a live load greater than 50 pounds/square foot and,
- Any special conditions or stipulations issued by the building official.

Fire code officials commonly use the certificate of occupancy during building inspections to verify the building's occupancy or use has not changed. If a building changes occupancy, for example, if a grocery store [mercantile (Group M occupancy)] is converted to a church with an occupant load of 550 [assembly (Group A-3 occupancy)] without a review and approval of the jurisdiction, such an act can result in the fire code official issuing a stop use order. This occupancy change could require the building construction to be upgraded to increase its fire-resistance, providing additional means of egress components, installation of automatic sprinkler manual fire alarm systems, or an upgrade of the building's plumbing system. If the building is not designed for a particular use, it can potentially place the occupants in danger.

The IFC generally prohibits a change of occupancy or building use unless the change is done in conformance with the requirements of IBC. The IFC allows changes in the use of a building provided it does not change the overall use or character of a building. When approved by the fire code official, a building's use can change without conforming to all the requirements of the IBC, provided the new or proposed use is a less hazardous fire risk or life risk. For example, consider a Group S-1 storage occupancy storing rolled carpet. Rolled carpet has a very high heat release rate and requires a specialized automatic sprinkler system design. If the rolled carpet were removed and the warehouse were used for the storing pallet loads of bottled water, the building could be reclassified as a Group S-2 occupancy, because the stored commodity has a much lower heat release rate. **[Ref. 102.3]**

FIGURE 1-12 Historic buildings must comply with a fire protection plan approved by the fire code official

Historic buildings

In 1966, the U.S. Department of the Interior was assigned the responsibility of ensuring historic buildings were preserved under the National Historic Preservation Act. The legislation required each state to establish a historical building preservation office. As a result of this act, many communities also enacted their own local historic building preservation laws.

Historic buildings generally must be maintained in their original condition. Historic buildings may lack fire safety features normally required for new buildings having the same occupancy classification. (See Figure 1-12) These buildings also may not comply with means of egress requirements because they were constructed prior to the development of fire and life safety design regulations in model codes and standards.

Unless the building is a distinct hazard, the IFC requires that historic structures be provided with fire protection and life safety features based on an approved fire protection plan. The criteria for developing a fire protection plan is contained in NFPA Standard 914, *Code for Fire Protection in Historic Structures*. In some cases the fire protection plan may need to be prepared as a performance based design. In these instances, the design should be prepared based on the requirements in ICC *Performance Code® for Buildings and Facilities.* **[Ref. 102.6]**

Referenced codes and standards

The design, construction, testing, and maintenance of a variety of systems or components is required by the IFC to comply with various technical standards. The IFC adopts over 300 different standards by reference in Chapter 47. Standards are formal documents that establishes consistent and uniform technical or engineering criteria, methods, and practices. When designing an automatic sprinkler system for the protection of a building, the IFC requires that it be designed in accordance with one of the three NFPA standards that govern the design of these systems.

The IFC also requires the evaluation of certain materials or components to be performed using standard test methods, which are definitive procedures for evaluating a product or component. The classification of a liquid as being either flammable or combustible is required by the IFC to be tested in conformance with one of four American Society of Testing and Materials (ASTM) standard tests to measure its boiling point and closed cup flash point temperatures. Compliance with the adopted technical standards or test methods is a requirement of complying with the IFC. (See Figure 1-13) **[Ref. 102.7]**

Code Basics

The IFC contains certain requirements that are retroactive to certain buildings or hazards. Its requirements are also applicable when a building changes its use or occupancy or if the building is designated as a historical structure. ●

FIGURE 1-13 The design of these petroleum storage tanks was required by the fire code official to comply with one of the atmospheric storage tank design and construction standards developed by the American Petroleum Institute