

Fire Engineering®

Construction Concerns: Pre-Code Buildings

Article by Gregory Havel

November 16, 2015

Throughout the world, there are thousands of buildings that were constructed before building and fire codes were developed. Photo 1 shows a drawing of the United States Capitol building, begun in 1793, shortly after its completion in 1826. Photo 2 shows the building as it appeared in the 1850s. Photo 3 shows the building in 2014 after four additions and several remodels. [Photos 1-3 courtesy of the Web site of the Architect of the U.S. Capitol (www.aoc.gov)]



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In the United States, building and fire codes were developed locally in response to issues that developed, beginning in the mid-1600s. In 1873, the National Association of Fire Engineers (NAEF), the predecessor of the International Association of Fire Chiefs (IAFC), issued a document outlining its eight fire protection concerns, which follow:

- Flammable and combustible building materials.
- Excessive height buildings, beyond the reach of ground ladders.
- Fire escapes.
- Water supply.
- Space between buildings.
- Corridors and open stairways.
- Fire alarms.
- Fire department.

In 1884, the NAFE called for the development of a formal building code. At this same time, the mutual insurance companies which protected the mills and factories in New England proposed a design for mills and factories (photo 4 by author) that eliminated the eight building faults that had historically contributed to huge losses in factory fires. This design is the ancestor of present-day Type IV (heavy timber) construction.

After the Great Baltimore Fire of 1904, an organization of fire insurance companies prepared and published a *National Building Code* in 1906. This Code was based on the 1873 and 1884 NAFE reports as well as on the first edition of the New York State building code.

Several model building codes were developed by regional organizations:

- The Building Officials and Code Administrators International (BOCA) was organized in 1915 and published its *National Building Code*, which was in common use in the northeastern and Midwestern states.
- The International Conference of Building Officials (ICBO) was organized in 1922, and published its *Uniform Building Code*, which was in common use in the western and southwestern states.
- The Southern Building Code Congress (SBCC) was organized in 1945 and published its *Standard Building Code*, which was in common use in the southeastern states.

In 1994, these three code development organizations merged into the International Code Council (ICC) and published the first edition of the *International Building Code*, which is revised and updated every three years and which is supplemented by the *International Fire Code*. The original model codes are no longer published (known as “legacy codes”) and are still at the core of many state and municipal building codes.

The National Fire Protection Association (NFPA) also publishes a building code—NFPA 5000, *Building Construction and Safety Code*—and NFPA 1, *Fire Code*. Many state and municipal codes are based on these NFPA Codes.

The ICC and NFPA Codes are only models and cannot be enforced until they are adopted by a state or municipal government. They may be adopted exactly as written, or

they may be adopted with additions and deletions which will then be stated in the state or municipal code.

Building codes regulate the construction of new buildings and the remodeling of existing buildings. Fire codes regulate the use of buildings after they are completed. An example that Francis Brannigan frequently used to illustrate the difference follows:

- A nightclub is built under the requirements of the building code, including the need for an automatic fire sprinkler system and a specified number and location of emergency exits for use by the occupants.
- The fire code contains the requirements for the maintenance and testing of the automatic fire sprinkler system as well as limiting the number of building occupants and maintaining the emergency exits unobstructed.

Building codes are interpreted and enforced at the time of building construction and remodeling. Fire codes are interpreted and enforced in issuing the building's occupancy permit, at the intervals of fire inspection set by state statute and municipal ordinance, and at the time of complaints from the public.

Building codes are usually not retroactive; a change in building code will not be followed by orders to every building owner to comply until the time of significant remodeling of the building. Fire codes can be retroactive and are usually written within a period of years during which existing buildings must be updated in compliance with the new fire code. An example is the requirement for the installation or upgrading of a fire alarm system in every school after the Our Lady of the Angels school fire in Chicago, Illinois, on December 1, 1958.

An advantage that these older buildings have over modern structures is that they were built with larger safety factors than are required by building codes today. The architects and engineers of the day did not have the historical studies of building failures, or the computers and software to model the behavior of structures and structural elements under load, as we do today. Builders relied on massive structural elements and what worked in the past, with "a little extra added" for comfort, when they were designing something unusual.

A disadvantage that these older buildings have is their age. No matter how well maintained a building may be, it is rarely as strong today as it was when it was new. In addition, these older buildings have been remodeled a number of times, for appearance and for the installation of mechanical systems (i.e., central heating, ventilation, and air conditioning systems; indoor plumbing; elevators; and electrical systems) and conveniences (i.e., telephone and data system conduits and cables) that were not available at the time of the original construction. An example of structural weakness that was installed with new mechanical systems was the postfire collapse of the Hotel Vendome in Boston Massachusetts, on June 17, 1972. Three reports on this incident, which killed nine firefighters, are available courtesy of the Boston Public Library at www.bostonfirehistory.org/firestoryhotelvendomefire06171972.htm.



*(4) A mill from the 1880s that manufactured horse-drawn buggies and farm wagons, which has been transformed into an apartment building called "Mitchell Wagon Lofts."
(Photo by author.)*

As firefighters, we must know some of the history of our older buildings, understand how they were transformed from their original to their present use, and how different eras of building and fire codes were used in modifying them so that we can work in them safely.



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