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## CHAPTER

# 1

# Building Safety, Resiliency

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For at least 5,000 years, man has exercised some limited controls over the construction and use of buildings and structures throughout the civilized world. Evolving controls were only partially effective—considering the burning of Rome during the reign of Emperor Nero, the destruction of London in 1666 and the Chicago Fire of 1871. There were, of course, many, perhaps thousands, of destructive fires that struck cities and towns all over the world, but these three are best remembered by most people.

From 1800 to 1900, 11 major American cities were devastated by fires that took an unrecorded number of lives and damaged or destroyed property worth hundreds of millions of dollars. The effect of each and every disaster or successive conflagration has served to strengthen codes and construction laws, where such laws were already in existence, and to bring about some controls in areas where there were none previously. It seems that a disaster is necessary before people will accept that bad things can happen and that appropriate regulations to mitigate these bad things are warranted.

Building officials should keep this bit of knowledge at the forefront as they attempt to secure support in a proposal for necessary legislation to strengthen or adopt construction codes. A classic example of this type of reaction was the adoption of the *Basic Building Code* in 1979 by the State of Kentucky after the disastrous fire that took 165 lives at the Beverly Hills Supper Club on May 28, 1977. The objective of this action was to replace an antiquated, poorly maintained state code with a modern and adequately maintained model code. A more recent example of this kind of reaction is the one to the fast-moving fire that swept through The Station, a night club in West Warwick, Rhode Island, in February 2003. That event was something that never should have happened, and as a result the government of Rhode Island formed committees and charged them with devising ways to make Rhode Island the safest state in the nation.

## Historical Background

The building code is not a modern concoction. As previously mentioned, building regulation and codes extend back thousands of years, but because it is neither dramatic nor romantic, the history can be difficult to retrace. Historians did, however, record some of it. We find mention of building laws from the time of the ancient Babylonian empire of Hammurabi about 2,000 BC through Nero's Rome to 12th century Europe, to England in the 1600s and to America as soon as urban life indicated the need.

### DID YOU KNOW?

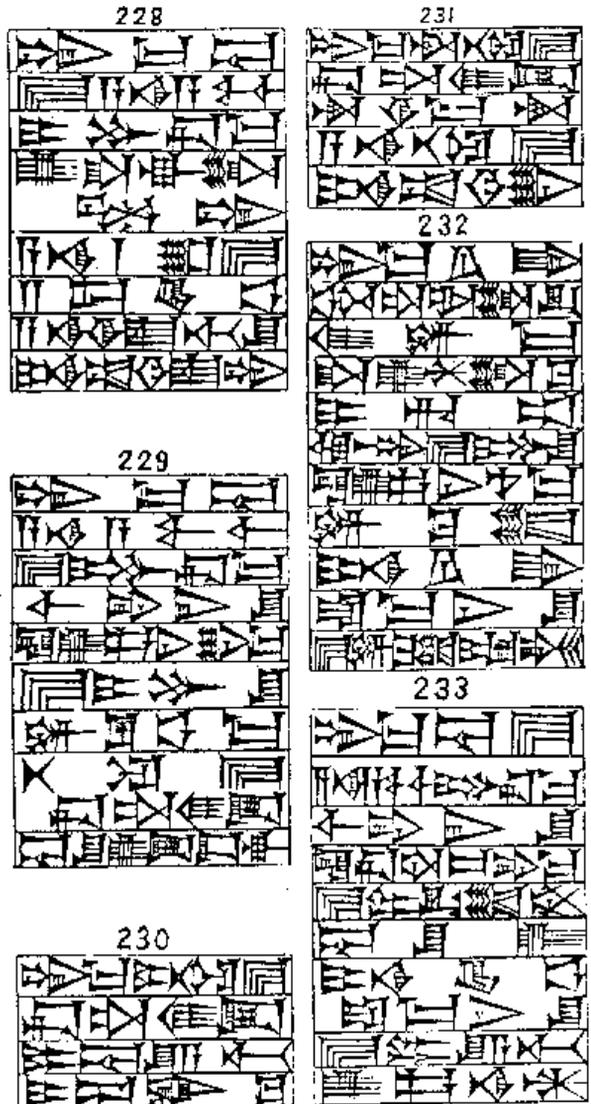
Fire is not the only disaster that has caused devastation in recent history. Other disasters such as earthquakes, floods and hurricanes, as well as the study of their effects, have influenced the evolution of other parts of the model building codes.

## Hammurabi

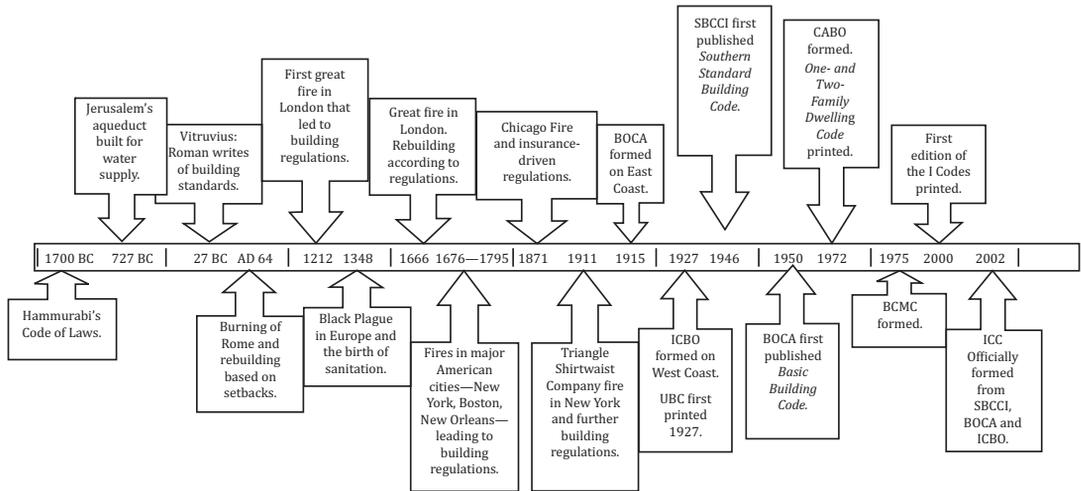
The building code of Hammurabi, founder of the Babylonian Empire, is the earliest known code of law. Figure 1-1 depicts, in the cuneiform writing of the Babylonians, an excerpt from the Hammurabi code pertaining to buildings, translated as follows:

228: If a builder build a house for a man and complete it, that man shall pay him two shekels of silver per sar of house as his wage. 229: If a builder has built a house for a man and his work is not strong, and if the house he has built falls in and kills the householder, that builder shall be slain. 230: If the child of the householder be killed, the child of the builder shall be slain. 231: If the slave of the householder be killed, he shall give slave for slave to the householder. 232: If goods have been destroyed, he shall replace all that has been destroyed; and because the house was not made strong, and it has fallen in, he shall restore the fallen house out of his own material. 233: If a builder has built a house for a man and his work is not done properly and a wall shifts, then that builder shall make that wall good with his own silver.

Figure 1-1  
The Code of Hammurabi



Historians did not clearly differentiate between “building laws” and “building construction specifications,” and it is possible that reference to ancient “laws,” except for those of Hammurabi, should refer instead to building specifications. The important point is that there were controls, however narrow or limited their scope (see Figure 1-2).



**Figure 1-2**  
Timeline of Building Controls

## The Historical Perspective

### The Burning of Rome

Even before the fire that burnt Rome—standards for construction existed that were enforced by the aediles, who were the building inspectors of that day. It was their duty to oversee construction, put out fires and generally protect the public from the danger of poor construction.

But not every building in Rome was built to high standards. In fact, some buildings collapsed under their own weight while they were being constructed. Many poorly built, highly combustible structures were packed together so tightly that the famous fire took its toll. After the tragic fire that may have been caused by Nero on AD July 18, 64, Rome was rebuilt. Hasty and irregular construction during the rebuilding was forbidden. Rome was rebuilt according to a master plan developed by Nero's chief architects, Severus and Celar. Building lines were maintained, and height was limited to double the width of the adjoining street. Building standards improved the safety and appearance of Rome.

History has cast Emperor Nero in the role of a cruel, obese and truculent tyrant. Perhaps he was, but he was also apparently a man of intelligence and vision who could comprehend the full meaning and apparent dangers inherent in unregulated construction. Prior to Nero's coming to power, Rome lavished its wealth and resources on the construction of public edifices but ignored construction of almost all other buildings. Poorly constructed tenements were being erected, mostly without controls of any type. Many of these monstrosities collapsed even before they were completed, killing and maiming workmen by the score. It is not too difficult to envision the chaotic state of affairs, relative to housing, that was Rome in AD 64.

Emperor Nero had a master plan for a new Rome prepared sometime prior to the fire that destroyed much of Rome, and his attitude toward the existing conditions was well known. Consequently, the charges that he deliberately ordered Rome's destruction are conceivable. To his credit, it must be stated that the rebuilding of Rome was accomplished in accordance with sound principles of construction, with particular emphasis on fire resistance, sanitation and usefulness. What is important to code history is that until the final downfall of Rome, the construction of both public and private buildings in that city was closely monitored and controlled. This burning may have been the world's first urban renewal project, one that would significantly impact the history of building safety.

## **The Great Fire of London**

In 1660, London was crowded with combustible buildings. In the early 1600s, many buildings had balconies or cantilevered roof structures that projected to near the center of the street. More than likely, many building owners were reluctant to tear down their buildings on account of the law requiring them to rebuild with brick or stone. The fire may have started in a ramshackle neighborhood near the Tower of London. It was a modest fire until it hit a group of warehouses storing animal fat and alcohol.

London was almost two-thirds destroyed in the Great Fire of 1666. Some historians have stated that the destruction was more of a blessing than a calamity, for London was a crowded, filthy city of low timber-framed warehouses, churches and houses. Most thoroughfares had open drains that carried raw sewage, and homeowners threw their garbage into the narrow cobblestone streets. Overcrowding was a way of life, and sanitation was practically unknown. Under these circumstances it is little wonder that epidemics were common. London had been ravaged by bubonic plague for nearly a year prior to the fire, and people were dying at the rate of a thousand a week.

The fire is reported to have started in a run-down neighborhood near the Tower of London. It attracted little attention, for fires were not uncommon in the city, and only half-hearted attempts to control it were made. It finally spread to warehouses where highly combustible tallow, oil and alcoholic spirits were stored. The fire then increased

in its intensity and was soon engulfing even the London Bridge. King Charles attempted to halt the spread of fire by ordering the demolition of yet undamaged buildings in the path of the fire, but its advance was relentless. Even the magnificent Cathedral of St. Paul suffered extensive damage. The fire raged for 5 days and nights. It destroyed 15,000 buildings, including 84 churches. Miraculously, only six lives were lost in accidents directly attributable to the fire.

It took Parliament 2 years to enact controls for building, called the “London Building Act.” The law applied only to the boundaries of the City of London, leaving the balance of England with no controls over building. While Parliament was wrestling with the problem of “code” writing, London began to rise again, almost at the whim of individual builders. Besides being an astronomer, Christopher Wren was also an architect. Wren’s plan for rebuilding London included wide streets and spacious parks. It is the first modern city planning document on record. However, Parliament passed a law the next year that did not include wide streets but had other protective provisions in place. In fact, it may be regarded as the first modern building code.

### **DID YOU KNOW?**

The London Building Act included four sorts of buildings that were defined and regulated as to their proximity:

1. *Those fronting on bylanes*
2. *Those fronting streets and lanes of note*
3. *Those fronting high and principal streets*
4. *Mansion houses for persons of extraordinary quality, not fronting either of the three ways*

## **The Chicago Fire**

The most devastating and costly fire in American history was the fire that almost destroyed Chicago in 1871 (see Figure 1-3). Chicago at that time consisted of about 60,000 buildings, more than half of which were of wooden construction. Lloyds of London, alarmed by the extent of combustible construction, warned its underwriters of the conflagration potential. But little heed was paid to Lloyds’ warnings, and insurance companies continued to issue fire insurance coverage.

The initial fire, blamed, as every schoolchild knows, on Mrs. O’Leary’s cow, started on October 7, 1871, and was thought to be under control, but on the night of October 8, a new fire broke out and, fanned by winds coming off the lake, was soon raging out of control. Measures were employed by the US Army, under the command of General Sheridan, that included the use of explosives to create fire breaks. Before the fire was extinguished 2 days later, 17,000 buildings had been destroyed and 250 lives had been lost. Almost 100,000 persons were homeless. Without the outpouring of help that soon arrived from every corner of the world, thousands might have died from exposure, starvation or disease because winter was approaching.

The Chicago Fire devastated not only a major portion of the city but the financial reserves of many insurance companies, 60 of which went into bankruptcy. Those that



**Figure 1-3**  
Great Chicago Fire

survived financially threatened to leave the city *en masse* unless adequate laws regulating building were enacted. It took a little more time for the city fathers to overcome resistance to new controls, but in 1875, a building code and a fire-prevention ordinance became effective.

These condensed versions of episodes in world history indicate that building regulation as we know it today is the result of an evolutionary process that has its roots deeply embedded in disaster and tragedy. Those responsible for the absence of controls and enforcement must share accountability for the needless loss of lives and property. When the question “Why do we need building laws?” is asked, it would be appropriate to answer that lives and property have been lost because of their absence.

### Early Controls in the United States

In America, a familiar cycle of needs and dangers arose out of unregulated construction followed by scattered laws, ordinances and codes seeking to correct the conditions. This cycle repeated in a span of some 300 years the experiences of much older countries. For example, the colonists took whatever building materials were at hand and at first were content with hastily improvised shelters. Early accounts tell of fires that originated in log chimneys imperfectly protected with layers of mud. These experiences resulted in laws forbidding such dangerous practices.

English common law formed the basis for American legal philosophy. In fact, colonial building laws in the Americas were a result of regulation progress in England. The colonies were not necessarily bound by laws passed in England, unless those laws were spe-

cifically mentioned. Building codes seemed less important than commercial or criminal law to the early American colonists. The first building codes in the United States were based on an attempt to prevent the spread of fire. Individual cities passed ordinances that took aim at fire prevention. A general requirement for building chimneys (albeit wood with mud parging) in buildings at Jamestown was said to be the first-ever building code in the new world. The first building law recorded was passed by the City of New Amsterdam (later New York) in 1625 when its population stood at around 200. The first building inspector was entitled *Surveyor*, and the first fire marshal was called *Firemaster*. Their duties often overlapped. Building regulations appeared in the 1630s in Plymouth, Massachusetts. Thatched roofs were required to be removed and replaced with boards or palings. Hartford, Connecticut, rules required a ladder to the roof but allowed a nearby tree to substitute. A fine of 5 shillings per month could be assessed for a lack of roof access. A law in Boston in 1630 stated that no chimney may be built of wood, nor may a homeowner cover a roof with thatch.

### DID YOU KNOW?

In 1639, the governor of Massachusetts issued a declaration that . . . *in the future no chimneys could be constructed of wood.*

In 1657, orders complained that the previous requirements had been “obstinately and carelessly neglected by many of the inhabitants” and called for the removal of both wooden chimneys and thatched roofs. A fire district was established in 1766 where “all buildings shall be made of stone or brick and roofed with tile or slate.”

In 1648, Governor Peter Stuyvesant, governor of New Amsterdam (later New York), appointed four men to act as fire wardens. They were empowered to inspect chimneys and fine violators. A few years later, volunteers, who were called the *rattle watch*, patrolled the streets late at night to alert residents of a fire. When they detected a fire, they would rattle the spin, and the rattles would direct residents to form bucket brigades. This appears to be the forerunner of organized fire alarms and firefighting. Cities in other regions of the early nation adopted similar regulations that attempted to prevent damage from fire or shoddy workmanship. Colonial Virginia adopted an early building law in 1662 entitled *An Act for Building a Towne*. It described the settlement of Jamestown, establishing the size, shape and materials prescribed for each building. The thickness of walls was ordered, and slate or tile was prescribed for the roof covering.

Washington, D.C., is an example of a city that was designed before any settlement was established (see Figure 1-4). Pierre Charles L’Enfant developed a master plan for the new city. Because the plan seemed too expensive for the new nation, he was removed from the project after the first year. After discussions between George Washington and Thomas Jefferson, official building regulations were promulgated by the Department of State on October 17, 1791.



**Figure 1-4**  
Plan of the City of Washington

Some of these early regulations required brick and stone for outer, or party, walls. Building roof heights were limited to 40 feet unless they were built of wood, which was limited to 12 feet in height. Wooden buildings were also limited to a maximum area of 328 square feet. Washington had some influence over the adoption of building regulations and appears to have been influenced by his familiarity with regulation in Philadelphia. New Orleans was founded by Lemoyne d'Iberville in 1718 as a seat of government for the French Territory of Louisiana. The original city was platted as 66 blocks that went 300 feet each way. Each block was further divided into 60- by 150-foot lots. In 1722, the population of this township stood at 200 residents. Fires between 1788 and 1795 destroyed much of the settlement. Attorney General Don Miguel Fortier ordered that future two-story apartments be built of brick or stone to prevent fire. In 1803, the United States acquired the Louisiana Territory, and the first legislature took action that divided the territory into 12 parishes and allowed for the township of New Orleans to be incorporated. Building law evolved within the city over the next several years and included length structural regulations, fire districts and fire prevention requirements.