

Demystifying Building Codes

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Building codes appear more confusing than they actually are. Admittedly, one's first encounter with building codes can be rather daunting. They appear to be a random hodge-podge of regulations accompanied by a few baffling tables. Despite this, building codes do have a rational structure. This discussion attempts to further the understanding of the building codes by addressing:

- What codes attempt to accomplish,
- How codes are structured, and
- How to determine which code applies.

Origin of the building codes.

The building codes were literally born out of fire. They were an attempt on the part of governing bodies and insurance companies to minimize the loss of life and property when buildings burn. To this end, building codes devote a considerable portion of their volume to containing fire and evacuating people from burning buildings. Building codes would be incomplete if their only concern was limiting fire damage. Creating a safe environment includes other issues: minimizing the potential for falls, prescribing the loads a building must support, establishing a healthy environment, and eliminating various hazards.

Structure of the Building Code.

Building codes are actually organized in a rational manner and generally have three distinct parts. First codes establish their authority. This is followed by a methodology for categorizing buildings. Finally, codes provide prescriptions for proper construction.

Authority. Local governmental bodies usually administer building codes. Codes derive authority only when that governing body formally adopts them. Validation of that authority usually appears as a brief statement in the front of the code book. This is usually followed by a section that addresses administrative procedures.

Categorizing buildings by type. The next section of the code provides guidelines for categorizing buildings. To understand this part of the code, consider what building codes attempt to accomplish and the complexity of their task. The primary objective of the building codes is to provide a safe environment. In doing this, building codes must address an almost unlimited number of construction systems, numerous uses, and buildings that range in sizes from a few square feet to millions of square feet. Building codes deal with this challenge by categorizing buildings as follows:

- Use. How the building is used and the hazard that use represents. For instance, using a building as a factory that employs flammable liquids in its manufacturing

processes represents a greater fire potential than using a building as a residence or a retail establishment.

- Occupancy. The number of people occupying the building and their degree of mobility (for example, prisoners or patients versus office workers).
- Size. The amount of floor area and the number of stories.
- Construction type. The ability of the building components to maintain their integrity during a fire and to retard the spread of fire from one part of the building to another.

The code dictates construction type based on size and use of the building. Construction type is actually a prescription for the fire resistance of the components (structural frame, stair enclosures, walls, etc.). Area is limited by building smaller buildings or subdividing larger buildings with fire-resistant walls. In effect, this part of the code says: *“if you want to build a building of this size for that purpose, you must construct it of materials that meet these standards.”*

The model building codes devote a significant amount of text to the subject of building use, construction type and building size. As an interesting aside, although the number of pages in the model building codes has steadily increased over the last thirty years, the number of pages devoted to this topic has remained roughly constant.

Prescriptive code sections. The remainder of the code is more prescriptive in nature. The building design evolves by addressing smaller and smaller pieces of the building. The prescriptive portion of the code parallels this process by describing how to construct assemblies and the component parts of the assemblies. The issue of exiting from a building illustrates this point. Consider the following:

The code first prescribes the number, separation and size of exits throughout the building. Note that the code uses the term “exit” generically. It includes everything along the path of egress, from any point in the building and traveling to a place of safety outside the building. Then, the code defines and prescribes the construction of each element of the exit (doorways, stairways, corridor walls, etc.). Finally, each component of those egress elements is disassembled and prescribed. For example, the components of a stair (including the treads, risers, handrails, distance between landings, etc.) is defined and specified. The process continues in this manner until all parts of the building are addressed.

This perspective of the building code offers the non-technician insight into how the engineering mind works. Building codes are structured in the same way that engineers solve problems. One begins at the macro scale and works toward more detailed issues. Engineers take large problems and break them into smaller and smaller problems. When all the problems are identified and resolved, the problem is solved.

Which code applies?

When evaluating a building's compliance with a building code, it is vital to answer three questions:

- 1) What governing body has authority over construction at the subject site?
- 2) What was the promulgated code under which the building permit was issued?
- 3) What is the actual text of the code that governs the issue(s) being addressed?

Which code governs? There are three prevalent model codes (Uniform Building Code, Building Officials Code of America, Southern Building Code Conference International). These different codes are published by independent organizations whose purpose is to develop, maintain, publish and sell building codes. Even when municipalities adopt model codes, they never adopt them without modification. They usually amend the code to suit their particular needs or preferences. This ranges from inserting their own version of the promulgating ordinance to completely eliminating, amending or rewriting some of the code sections. Prior to 1970, some larger municipalities even wrote and published their own codes.

Which edition of the code governs? New editions of the building codes are issued on a three-year cycle. Municipalities usually adopt the updated edition a year or more after they are first issued. Under most conditions, buildings must comply with the building code in effect on the date the governing municipality issues the building permit.

Interpreting the code.

The intent and application of the building code can sometimes be confusing. First, it is important to ensure that the building code section actually applies to the situation being considered. To illustrate this, consider the following:

A stair built according to the Uniform Building Code is 176 inches wide. How many intermediate handrails must it have? Intermediate handrails are freestanding handrails running down the center of the stair in addition to the handrails attached to the wall. In its prescriptive manner, the Uniform Building Code states: "stairs required to be more than 88 inches wide will have an intermediate handrail for each 88 inches of the required width."

In this case, the correct answer could be either zero, one or two. The essential phrase in this code section is "required width." To determine the required width in inches multiply the number of occupants from rooms that exit down that stair by 0.3 inches per person. If 587 people must exit through that stair, the required width of the stair is 176 inches and two intermediate handrails would be needed. If only 250 people exit down that stair, the *required width* of the stair is only 75

inches. Then, no intermediate handrails are required regardless of how wide the stair is actually constructed.

Defining terms. Sometimes the precise meaning of terms used in the code becomes important. Occasionally, the code is ambiguous or mute on a matter. The following illustrates this:

When the floor elevation of a grandstand drops more than 30 inches behind the last row of tiered seating, the Uniform Building Code requires a guardrail or enclosure. In this case, an open-air auditorium had seats attached to a sloping floor that ended in a four-foot drop behind the last row of seating. There were no steps in the floor; its slope made each successive row of seating higher as one proceeded from the front to the back of the auditorium. Did this qualify as tiered seating? If so, the auditorium could be considered a grandstand and require a guardrail behind the last row. The code does not define the term, “tiered seating.” Technical assistance from UBC told us they relied on Webster’s dictionary when the code lacked a definition. Webster’s dictionary resolved the matter; it defined “tiered” in such a way that an enclosure or guardrail was mandated behind the last row.

In evaluating a building for its conformance to the building code, there is no substitute for the experience of actually dealing with the nuances and subtleties of codes. Although one may be familiar with the structure and intention of the building code, it is unwise to trust one’s memory in performing code reviews. There are many subtle differences and variations in the different versions of the building code that can make the difference in the strategy and outcome of a case.

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