

# Structural Engineering Codes and Standards in the United States

An Overview

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*The professional engineer should always remember that codes and standards do not replace well founded engineering, good judgment and experience. The codes should not be used as a checklist of work, but as a guideline of the structure's minimum requirements. An engineer needs to be fully aware of the intent of the codes and the basis of its requirements and not blindly follow what is written in the code without a full understanding of good solid engineering requirements, as well as specific structure requirements, for the project being designed.*

Structural engineering codes and standards for the built environment have been developed in the United States since the beginning of the 20<sup>th</sup> Century. The development of laws, rules and regulations to provide for the safety and the serviceability of buildings and structures in the U.S. is somewhat unique. In most countries, the national government oversees the regulatory development and enforcement process, which results in a single national code. In the U.S., however, the development of building codes and standards has become a private-sector enterprise involving federal, state, and local government participation, but with only minimal influence or control from these groups except as "users" in local enforcement.

The bridge code is an exception to the private sector based code development. Compilation of the *AASHTO Standard Specifications for Highway Bridges* began in 1921 with the organization of the Committee on Bridges and Structures of the American Association of State Highway Officials (AASHTO). The first edition of the *Standard Specifications* was published in 1931, and it quickly became the de facto national standard for bridges. The *Standard Specifications for Highway Bridges* has been reissued in consecutive editions at approximate 4 year intervals ever since.

Model building codes are consensus documents that have been reviewed by governing bodies and anyone in the general public. Any individual or industry organization may participate in the development of these codes and related deliberations. Industry tends to be heavily involved, as code provisions have an obvious impact on the marketplace. The oft-stated challenge is to develop provisions that provide an acceptable level of risk with respect

to potential hazards and at the same time safeguard the economy. Model codes reference or copy other material codes, manuals, standards and specifications. By reference or copy, they become part of the model code and thus the requirements of the jurisdiction adopting the model code. Because of the lengthy code creation process, however, references in the model codes often lag behind the most current material code, manual, standard or specification.

Local building codes in the United States are patterned after model building codes. Recently developed model building codes include the *International Building Code (IBC)* and *NFPA 5000 Building Construction and Safety Code*. Previous building codes that are gradually being phased out and replaced with the IBC include the *Uniform Building Code* by the International Conference of Building Officials (ICBO), the *National Building Code* by the Building Officials and Code Administrators (BOCA), and the *Standard Building Code* by the Southern Building Code Congress International (SBCCI). In 1994, International Code Council (ICC) was established which contained the three founding members of BOCA, ICBO and SBCCI with the goal of creating a single set of model codes. The provisions set forth in the model building codes are representations of possible regulations and do not become law until enacted by the authority having jurisdiction (state, county, city, etc.). Thus, these documents are usually adapted or adopted to satisfy local laws and ordinances and to reflect local building practices.

The model building codes in the United States adopt many of the national design standards developed by organizations involved with building materials, such as, concrete, masonry, steel, and wood. The model codes also adopt by reference many of the American Society for Testing and Materials (ASTM) Standards as the recognized test procedures to ensure construction quality. *ASTM Standards in Building Code* is a compilation of these standards.



Like the model building codes, many of the material and load standards are developed and written in a form that allows them to be adopted by reference in a general building code. Some of the widely used material codes include ACI 318, Building Code Requirements for Structural Concrete; ACI 530 / ASCE 5 / TMS 402, Building Code Requirements for Masonry Structures; AISC Manual of Steel Construction; AWS D1.1, Structural Welding Code- Steel, and AASHTO/AWS D1.5, Bridge Welding Code; National Design Specification® for Wood Construction; PS 20 American Softwood Lumber Standard, SEI/ASCE 7, Minimum Design Loads for Buildings and Other Structures, SEI/ASCE 37, Design Loads on Structures during Construction. ■

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