

Steel Structures: Not Just Buildings

The scope statement of AISC's 2005 *Specification for Structural Steel Buildings* reflects that AISC's specification applies to more than just buildings.

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The scope section of recent AISC building specifications stated that they "govern the design, fabrication, and erection of steel-framed buildings." These specifications were silent, however, about whether they could also be used for design of steel-framed non-building structures, such as those found in petrochemical, power, and industrial applications. In practice, AISC specifications have been used for the design of steel structures in these applications, with an occasional challenge by West Coast building departments.

The 2005 *Specification for Structural Steel Buildings* (www.aisc.org/2005spec) and the forthcoming 2005 *Seismic Provisions for Structural Steel Buildings* now explicitly define the types of non-building steel-framed structures covered.

A typical steel-framed structure from a power plant located in California is shown below, left. Note that this structure is composed of rolled section columns, beams, and bracing connected by plates, bolts, and welds, just like steel-framed buildings. All of these structural steel elements were designed in accordance with the 1999 AISC *LRFD Specification for Structural Steel Buildings*. The structure was fabricated and erected in accordance with AISC-recommended practices.

The main distinction between this structure and a typical building is that there is not an architectural covering for the walls, the floor slab is replaced by horizontal bracing members, and it supports piping and other utilities.

This type of steel-framed structure accounts for approximately 15% of rolled section sales. Recognizing the similarity, AISC has revised the scope section in the 2005 *Specification for Structural Steel Buildings* to explicitly account for them. The section indicates that it "sets forth the criteria for the design, fabrication and erection of structural steel buildings and other structures, where other structures are defined as those structures designed, fabricated and erected in a manner similar to buildings, with building-like vertical and lateral load-resisting elements."

The term "other structures" is an abbreviated version of what building codes refer to as "non-building structures with building-like systems." Building-like vertical load-resisting elements consist of columns, beams, and their connections. Building-like lateral load-resisting elements consist of braced frames or rigid frames in the vertical plane, either a concrete slab or horizontal bracing in the horizontal plane, and their connections.

Similarly, the scope statement of the

2005 AISC *Seismic Provisions for Structural Steel Buildings* will state that it "shall govern the design, fabrication and erection of structural steel members and connections in the Seismic Load Resisting System (SLRS) in buildings and other structures, where other structures are defined as those structures designed, fabricated and erected in a manner similar to buildings, with building-like vertical and lateral load-resisting elements." Design of the SLRS members and connections of steel-framed structures are now explicitly covered.

A typical braced-frame connection from the same California power plant is shown below, right. The design of the members, gusset plates, connectors, welds, and bolts was in accordance with the *Seismic Provisions* requirements for special concentrically braced frames. The selection of a two-story X-braced frame and maintenance of a 2t dimension requirement for out-of-plane buckling were handled the same as if the frame would be later covered by architectural elements in a building application. ★

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Steel-framed structure at a California power plant.



Typical braced-frame connection at a California power plant.