

Prequalified Seismic Moment Connections (Revisited)

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DO YOU DESIGN STEEL STRUCTURES in high-seismic applications ($\mu > 3$)? Do you use Special or Intermediate Moment Frame systems (SMF or IMF)? If the answer to these questions is yes, the overview of existing and new prequalified moment connection options in this article may help you on your next project. Also, we'll look at what's being considered for future prequalification.

Sections 9.2b (SMF) and 10.2b (IMF) of ANSI/AISC 341 (the AISC 341) provide four options for determining the suitability of a particular moment connection for use in an SMF or IMF:

1. Project-specific testing can be performed according to the requirements in Appendix S of the AISC 341. Generally, this option is used if there is thought to be an economic advantage that can be gained through a project-specific test (or when none of the other following options works for the project).
2. Tests of similar connections that previously have been performed within the limits specified in Appendix S of the AISC 341 can be used. These are tests reported in the literature, or otherwise documented, that may have been performed for another project with similar connections. Connection test results reported in FEMA 350, related and similar documents, are examples of such literature.

Appendix P in the AISC 341 is governed by AISC's Connection Prequalification Review Panel (CPRP). The remaining information in this article is focused on Option 4 and Supplement No. 1 (ANSI/AISC 358-05s1).

When it was first introduced in 2005, AISC 358 covered three connection types: reduced beam section (RBS) moment connections, bolted unstiffened extended

end-plate (BUEEP) moment connections, and bolted stiffened extended end-plate (BSEEP) moment connections. See Figures 1 and 2. For a detailed visual summary of the 2005 prequalified connections, reference the January 2007 Steelwise article "Prequalified Seismic Moment Connections."

Expanding the applicability of the 2005 BUEEP and BSEEP

The 2005 AISC 358

tional testing, the CPRP was able to remove this limitation in Supplement No. 1. BUEEP and BSEEP moment connections can now be used with composite slabs in SMF. In the connection, the beam is welded to an extended end-plate, which is then bolted to the column in one of three specified configurations as provided in AISC 358-05. Supplement No. 1 thus allows moment end plates to be considered for use in the majority of buildings.

Also thanks to Supplement No. 1 to ANSI/AISC 358-05, three more connection types now are prequalified; Supplement No. 1 adds prequalified details for bolted angle plate (BFP) moment connections, welded unreinforced angle-welded web (WUF-W) moment connections, and Kaiser

anges. The beam web is bolted to a single-plate shear connection for erection. Subsequently, this plate is used as a backing bar for a CJP groove weld between the beam web and the column ange. A fllet weld also is used as shown in Figure 4. Inelastic rotation is intended to occur in the beam in the region adjacent to the face of the column. Connection fracture is controlled through special detailing requirements associated with the welds joining the beam anges to the column ange, the welds joining the beam web to the column ange, and the shape and finish of the weld access holes.

The welded unreinforced ange-welded web (WUF-W) moment connection is an all-welded moment connection, wherein the beam anges and the beam web are welded directly to the column ange. A number of welded moment connections that came into use after the 1994 Northridge Earthquake, such as the reduced beam section and connections provided with beam ange reinforcement, were designed to move the plastic hinge away from the face of the column. In the case of the WUF-W moment connection, the plastic hinge is not moved away from the face of the column. Rather, the WUF-W moment connection employs design and detailing features that are intended to permit the connection to achieve SMF performance criteria without fracture.

The beam anges are welded to the column ange using CJP groove welds that meet the requirements of demand critical welds in the AISC Specification, along with specific requirements for treatment of backing and weld tabs and welding quality control and quality assurance requirements.

the brackets is protected under U.S. patent number 6,073,405 held by Steel Cast Connections LLC. Additional information can be found at www.steelcastconnections.com. The connection is not prequalified when brackets of an unlicensed design and/or manufacture are used.

Futur Work

The AISC CPRP continues to work on the prequalification of additional moment connection types for high-seismic applications. Several connection types currently are under consideration:

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