AISC 358 – Prequalified Moment Connections for Seismic Applications

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The genesis
Causes

- Connection geometry
  - Stress concentrations
  - Secondary stress (shear carried by flanges)
  - Tri-axial effects

- Materials issues
  - A36 wasn’t

- Welding issues
  - Low toughness materials
  - Lack of control on technique
  - Unreliable inspection procedures
SAC Steel Project

- AISC 341 Seismic Provisions for Steel Buildings
- AISC 358 Prequalified Connections for Special and Intermediate Steel Moment Frames
- AWS D1.8 Seismic Supplement to Structural Welding Code
AISC 341 – Conformance demonstration

- Connection designed in accordance with AISC 358
- Use of connection qualified in accordance with Section K
# Prequalified Connections

## TABLE 2.1. Prequalified Moment Connections

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Reduced beam section (RBS)

- W36 or shallower
- <300 #/ft
- \( t_f < 1-3/4" \)
- Clear span to depth ratio
  - SMF – 7
  - IMF – 5
- Beam \( b_f/t_f \) per AISC 341, \( b_f \) determined at center 2/3 of RBS section
- Bracing required unless structural slab provided

\[ R = \text{Radius of Cut} = \frac{4c^2 + b^2}{8c} \]
Stiffened and Unstiffened Extended End Plate Connections

- Beams flanges up to 12-1/4” x 1”
- Beam depths – 14” to 55”
Bolted Flange Plate (BFP)

- Beams < W136x150
- $t_f \leq 1''$
- Span to depth ratio <9 for SMF, 7 IMF
Welded Unreinforced Flange (WUF-W)

- Beams < W136x150
- $t_f \leq 1''$
- Span to depth ratio <7 for SMF, 5 IMF
Kaiser Bolted Bracket™ (KBB)

- Beams < W33 x 130
- $t_f < 1''$
- $b_f > 6''$
- Span to depth ratio < 9 for SMF, IMF
ConXL™

- Columns – HSS 16 or Box 16 x 16
- Beam flanges 12”x1” or smaller
- Beams W15 – W30
- Intended for use in biaxial applications
Sideplate™

- Beams W44x400 or less
- Biaxial applications permitted
- Span to depth ratio <6 (4.5) for SMF, 3 IMF
Simpson StrongFrame™

- Beams W16 or smaller
- Columns W18 or smaller
- Special compactness and bracing not required

Approval Pending
Double Tee

- Beams $\leq$ W24
- Weight limited by bolts

Approval Pending
SENSE™

- Composite- Cold-formed/concrete beam

Under Review
Pin Fuse™

- No limitations on columns or beams
- Damage-resistant

Under Review
Permissible member profiles

- **Columns**
  - Wide flange, Built-up “H” Shape, Boxed Wide Flange, Built-up Box, Cruciform W Section

HSS permitted for Sideplate and ConX
Summary

- AISC 358 presently has 8 prequalified connections that can be used to satisfy the requirements of connection design in AISC 341.
- CPRP is currently working to extend the standard
  - 2 connections “approval pending”
  - 2 connections “under review”
- Wide range of column profiles and shapes
- Biaxial connections possible
The Connections

R = Radius of Cut = \( \frac{4c + b}{8c} \)

RBS  BUEEP  BSEEP  BFP

WUF-W  KBB  ConXL  SidePlate