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size and spacing of a smaller diameter stud that doesn't violate the provision noted above.

Susan Burmeister, PE

nection and the center of the beam web be considered in the design of the single-plate connection?

I know little about your particular conditions, so you must use your own judgment to determine what is appropriate for your situation. However, I will provide some thoughts.

Even though your condition may not be designed to satisfy the AISC *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341), the AISC *Seismic Design Manual* has several examples which provide some guidance, including Examples 5.2.4, 5.3.12 and 8.4.2, for single-plate connections subjected to axial loads (both publications are available at **www.aisc.org/publications**). The example calculations do not consider the eccentricity between the plate and the beam web. I'm not aware of any other practical design-oriented publications on this topic, but I provided further information below to help with your decision.

Based on my research on bracing connections, for connections subjected to compression I believe the continuity at the plate-to-beam connection is the primary variable affecting the eccentric moment in the plate. The eccentricity between the plate and the beam web causes a moment that must be resisted somewhere within the connection. In many situations, the beam will be much stronger and stiffer than the connection plate. In these cases, the moment in the plate can be neglected, but the local strength of the beam web must be adequate to properly transfer the moment into the beam flanges. You may also want to review the research by Thomas (2014), who tested extended single plate connections in compression.

For connections subjected to tension, self-alignment decreases the eccentricity. I recall some older tests have shown this. It is also discussed in the commentary to Section D3 of the *Specification*. The magnitude of the eccentricity reduction is probably dependent on the connection geometry, the boundary conditions, the ductility of the welds and the level of continuity at the plate-to-beam connection. An estimate of the elastic eccentricity reduction is $1/(1 + P_r/P_e)$, where P_r is the axial tension load and P_e is the Euler elastic flexural buckling load of an equivalent plate in compression. This estimate would likely be very conservative to use in design because it does not account for inelastic deformations.

Reference:

Thomas, K. (2014), *Design and Behavior of Extended Shear Tabs under Combined Loads*, Master's Thesis, University of Alberta.

Bo Dowswell, PE, PhD

Eccentricity in Combined Axial and Shear Beam End Reaction

When both axial and vertical beam end reactions coexist at single-plate connections configured similar to the single-plate shear connections shown in Part 10 of the AISC *Steel Construction Manual*, must the out-of-plane eccentricity between the center of the single-plate con-

Specifying Welds to Develop the Strength of the Base Metal

I am an engineer who has to specify weld requirements on design documents. I have a number of questions about complete joint penetration (CJP) groove weld symbols.

steel interchange