**STRUCTURAL ENGINEERS PERPETUALLY STRIVE** for more economical designs.

Finding ways to reduce needed material is often one of the rst steps, but opportunities for reducing the cost (while maintaining the value) of the steel package are also available when it comes to connections. One method of getting more out of connections is to have them resist compressive loads through steel-on-steel bearing. But as the saying goes, "With great power comes great responsibility"—and if we are going to rely on bearing, then we also have to ensure bearing will exist.

The AISC *Speci cation* provides opportunities for designers to incorporate bearing, and taking advantage of them can lead to better, more ef cient connection design.

## The Power

Section J1.4 of the AISC *Speci cation* addresses the required strength of the connections joining compression members in bearing. One thing that is immediately obvious is that the member types are separated into two groups: columns and members other than columns. This distinction occurs repeatedly in the AISC *Speci cation*, and members other than columns are generally subjected to more stringent requirements. The reason is that the conditions that exist for a column are assumed to be

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the *Speci cation* once again distinguishes between columns and members other than columns. In Table J2.5, consistent with Section J1.4(1), the PJP welds between columns in bearing are not required to resist any de ned load and instead exist merely to hold the parts together. In contrast, PJP groove welds used in bearing joints for members other than columns are obviously subject to the loads provided in Section J1.4(1). This is no surprise. What might be unexpected is the assumed design strength of these welds, which is given as 0.6 $F_{EXX}$. The Commentary does not provide an explanation as to why this reduction in the strength of the weld is applied for the case of a bearing connection. It does state that it "...has been used since the early 1960s to compensate for the notch effect of the unfused area of the joint, uncertain quality in the root of the weld due to the inability to perform nondestructive evaluation and the lack of a speci c notch-toughness requirement for ller metal. It does not imply that the tensile failure mode is by shear stress on the effective throat, as in llet welds."

Many of these stated reasons for the reduction do not apply to joints that are assumed to remain in compression. Notch-toughness and notch effects are considerations for joints in tension, and the statement that the failure mode is not by shear stress on the effective throat is equally applicable to welds in compression. Again, it comes down to uncertainty about the joint. With a column, the configuration of the joint is well defined and gravity will tend to aid in attaining bearing, but this might not be the case with other configurations.

### The Responsibility

As we've demonstrated, the AISC *Speci cation* gives the en-

**T c** Often, trusses resist gravity loads such that the top chord remains in compression. Though engineers often con gure the top and bottom chord splice similarly, half of the splices can often be economized by taking advantage of compression bearing. Figure 3(a) shows a splice designed to transfer compression through a bolted splice without bearing. Figure 3(b) provides two alternatives designed to transfer compression through bearing.

Figure 3: Truss splices.

**Ca n d b a n** Another common condition where bearing can be used to considerable advantage is at cantilevered beams. Figure 4 shows a detail in which the tension side of the moment is resisted by a bolted ange plate while bearing is used to resist the compression. The web connection bolts resist only vertical shear. In this case, the use of bearing to resist compression results in less shop and eld work. It also has the added