NOVEMBER 2009

The following list describes what to include in the design drawings to help make the project a success. Figure 2 provides an example of a BRB Schedule that effectively communicates several of these items.

1. Information such as the values of , , , and ρ used, and that the analysis was conducted using the equivalent lateral force procedure or nonlinear dynamic analysis, is important in the accurate determination of design brace strains.

2. . A range of 38 ksi ≤ ≤ 46 ksi is generally the accepted practice. However, it is advisable to contact a BRB manufacturer to discuss the recommended range. See Figure 2, note 3.

3. . There are two options for complying with the BRB strength requirements in AISC 341. Option 1 involves maintaining a constant steel core area ( ) and allowing (and) to vary as stated above. Option 2 involves allowing to vary and compensating by adjusting such that remains constant. Option 2 results in lower BRB overstrength but also results in a wider variation of BRB stiffnesses. BRBs with identical speci ed strengths may have stiffnesses that vary by as much as 15 to 20%. If not controlled, this may result in a different load distribution than what assumed in the design phase, which can lead to unintentional soft stories or onal behavior. See the table in Figure 2 and schedule note 2.

Specify either a minimum stiffness or both a minimum and a maximum stiffness. This can be given as a stiff-

2, note 4 for one possible method.

5. Calculated BRB strains should be smaller than those associated with successfully-tested braces. As a result, the BRB manufacturer determines BRB strains to verify code compliance and should be required to document submit proof of this compliance (see Figure 2, note 1). The most common methods used to determine brace deformations are noted below, but there are certainly

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proof of each braces' compliance with the quali ed

load and strain ranges.2. *Pu* given is the govening code level force in the brace, using LRFD force levels *Pu* ≤ 0.9 *Asc Fy min*.3. *Fysc* is the

6. Maximum ωβ not to exceed X.XX. Maximum β not to exceed X.XX.

Lessons Learned From BRBF Projects

Although the process of designing and specifying BRBFs is generally straightforward, all parties can bene t from heeding the lessons of past projects to avoid re-learning those lessons at further expense. With that in mind, two recommendations are presented below.

1. Clearly state the force level for any forces given in the design drawings. Problems with design or pricing of BRB projects have been encountered because the force level given in the documents was ambiguous. Sometimes this force level is stated as a value, or the actual load taken from the model and perhaps rounded up to make fewer brace types. The value may be a force level, or the actual force level at which the engineer requires the brace to yield (which must be greater than or equal to /ϕ). or may be obtained using either ASD or LRFD design. It is recommended that the design drawings include both the design approach used (ASD vs. LRFD) and an equation showing the manufacturer how it is intended that the loads given are to be used. For example, see Figure 2, note 2.
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