

1 **PROPOSAL 2-4C (2009)**

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3 **SCOPE: Add Commentary to Part 1 proposal on Sec. 12.8.7 of ASCE 7-05**

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6 **PROPOSAL FOR CHANGE:**

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8 **Add Commentary for Section 12.8.7 as follows:**

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10 Part 1 of the *Provisions* takes exception to portions of ASCE-7 Section 12.8.7 that allow the
11 stability coefficient, θ , to exceed 0.10. The SAC Steel Project has introduced recommendations
12 in FEMA-350 for the consideration of P-Delta effects. The recommended requirements may be
13 interpreted as requiring explicit modeling of geometric effects for steel moment-resistant frames
14 when values of the stability coefficient, θ , exceed approximately 0.04, and thus are more
15 restrictive than the *Provisions*. The application of the FEMA-350 approach to other structural
16 systems and materials (e.g. dual systems, braced frames, or wood buildings) has not been
17 specified.

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19 ASCE-7 allows amplified forces to be used in a linear elastic analysis where θ exceeds 0.10. In
20 such cases, there is a very real possibility that the tangent stiffness of the structure may become
21 negative, leading to the possibility of significantly increased dynamic displacement demands
22 (Gupta and Krawinkler, 2000). Depending on the progression of plastic hinging and strain
23 hardening, limiting θ to 0.10 will maintain a positive tangent stiffness throughout much or all of
24 the expected response. The *Provisions* allows structures to exceed this limit only if a positive
25 slope is maintained in a nonlinear static analysis (as specified in ASCE 41-06 Supplement No. 1)
26 that accounts for P-delta effects or if adequate resistance to instability is demonstrated by
27 nonlinear dynamic analysis (as specified in Chapter 16 of ASCE-7). The target displacement is
28 computed for the MCE to provide greater assurance that stability is maintained at this level of
29 demand.

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31 The occupancy importance factor, I , was inserted into Eq. 12.8-16 to correct an error in ASCE-7.
32 The stability coefficient is based on the elastic stiffness of the system.

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34 **REFERENCES**

35
36 Gupta, A., and Krawinkler, H., (2000), "Dynamic P-delta effects for flexible inelastic steel
37 structures," *Journal of Structural Engineering*, American Society of Civil Engineers 126(1), Jan.,
38 pp 145-154.

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40 FEMA-350 (2000). Recommended Seismic Design Criteria for New Steel Moment-Frame
41 Buildings, prepared by the SAC Joint Venture, Report Number FEMA-350, Federal Emergency
42 Management Agency, Washington, D.C., June.

1 **REASON FOR PROPOSAL:**

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3 Commentary is needed to Proposal 2-4, which was passed by the PUC on April 8, 2008.

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