steel quiz

LOOKING FOR A CHALLENGE? *Modern Steel Construction*'s monthly Steel Quiz tests your knowledge of steel design and construction. Most answers can be found in the 2005 *Specification for Structural Steel Buildings*, available as a free download from AISC's web site, **www.aisc.org/2005spec**. Where appropriate, other industry standards are also referenced.

This month's Steel Quiz was developed by AISC's Steel Solutions Center. Sharpen your pencils and go!

1. Does the 2005 AISC *Specification* (a free download at **www.aisc.org/2005spec**) prescribe the loads for which steel structures must be designed?
2. True/False: Service-level seismic loading and design criteria in the IBC and ASCE 7 are based on preventing damage and keeping the building functional after the maximum considered seismic event.
3. Does the 2005 AISC *Seismic Provision* (a free download at **www.aisc.org/2005seismic**) address the design of composite lateral force resisting systems for seismic applications?
4. True/False: A design engineer has to use the prequalified moment connections in AISC 358 (a free download at **www.aisc.org/aisc358**) for Special Moment Frames in Seismic applications.
5. When using the Direct Analysis Method, is it necessary to reduce *E*, the modulus of elasticity of members in the lateral force resisting system, when evaluating drift after checking for stability?
6. What AISC document provides guidance on the design and detailing of Steel Plate Shear Walls?
7. True/False: AWS publishes a document that specifically addresses seismic welding requirements.
8. True/False: All bolted connections in the Seismic Lateral Force Resisting System must be designed as slip-critical connections.
9. In sustainability, what is an LCA?
10. I recently saw a chart indicating that the carbon footprint of a ton of concrete was less than the carbon footprint of a ton of steel. Is the carbon footprint of steel then greater than that for concrete?

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ANSWERS

1. No. The AISC *Specification* does not prescribe loads on structures. Loading criteria is contained in governing building codes or the referenced standards, such as ASCE 7.

2. False. The IBC/ASCE 7 seismic loading and design criteria are meant to prevent structural collapse but do not necessarily prevent damage to the structure. The provisions generally reduce the probability of collapse for buildings of higher importance categories by incorporating an importance factor, thus amplifying the design loads; system selection requirements have a similar impact.

3. Yes. The 2005 AISC S*eismic Provision* provides requirements for the design of composite lateral force resisting systems for seismic applications in Part II of the document.

4. False. An engineer can use any feasible moment connection as long as it is qualified as per the requirements of Appendix P or tested as per the protocols in Appendix S in the 2005 *Seismic Provisions.* However, it is common for engineers to select prequalified connections covered in AISC 358, due to the expediency of doing so.

5. No. The Direct Analysis Method contained in Appendix 7 of the 2005 AISC *Specification* does not require that the stiffness of the lateral force resisting system be reduced for serviceability checks. It only requires such reduction to be made when checking for stability. Please see the commentary to Appendix 7.3 for more information on this.

6. AISC *Design Guide 20* provides in-depth discussions and procedures on how to design and detail Steel Plate Shear Walls in both low-seismic and high-seismic applications.

7. True. The new AWS D1.8 works with AWS D1.1 to provide for additional welding requirements that apply to high-seismic projects.

8. False, but this is a bit of a trick question. All bolted connections in Seismic LFRS that have to comply with AISC 341 must be prepared and installed as slip-critical, but the design can consider the connection as "bearing type" for strength calculations.

9. An LCA is a Life-Cycle Analysis. The current draft of the 2009 edition of USGBC's LEED program for new construction does not include an LCA methodology. However, LCA is on the horizon and might appear in LEED v3.0 sometime in 2010. This approach looks at the actual impact of a structure on the environment from an analytical perspective. Rather than specifying a minimum recycled content or a radius for transportation of products to the project site, an LCA will assess the energy, carbon, and resources used in the construction of the building, as well as its operation, maintenance, and eventual deconstruction.

10. No. What a statistic like that doesn't take into account is the equivalent weights of structural steel and concrete in a typical building frame. In a building-to-building comparison (the only realistic way to make a comparison), the carbon footprint of structural steel is typically 10% to 30% lower than the carbon footprint of concrete.

Anyone is welcome to submit questions and answers for Steel Quiz. If you are interested in submitting one question or an entire quiz, contact AISC's Steel Solutions Center at 866. ASK.AISC or at **solutions@aisc.org**.

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