OSHA Subpart R – Awareness Guide for Structural Engineers

Structural Engineers Association of Colorado
Steel Liaison Committee

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Jeff Janakus – Martin/Martin, Inc.; Bill Zimmerman – Zimkor Industries, Inc.; Maynard Trostel – Puma Steel; Richard Huddleston – Zimkor Industries, Inc.; Rex Lewis – Puma Steel; Jim Ness – Monroe Newell Engineers, Inc.; John Stodola – Derr and Gruenewald; Dave Schroeder, Martin/Martin, Inc.; Rocky Turner – LPR Construction Co.; Dennis Tripp – Derr and Gruenewald; Tom Skinner – JVA Consulting Engineers, Inc.; Jeff Borger – Jirsa Hedrick & Associates; Dave Henley – Vulcraft; Bruce Wolfe – Structural Consultants; Ron Stevens – Anderson & Hastings; Stan Welton – Martin/Martin, Inc.

Executive Summary

This document is written to be a guide for increasing the level of awareness for Structural Engineers concerning the requirements contained in the Occupational Safety and Health Administration (OSHA) Safety and Health Standards for the Construction Industry, 29 CFR 1926, Part R – Safety Standards for Steel Erection (OSHA Subpart R) written by the Steel Erection Negotiated Rule-making Advisory Committee (SENRAC), which took effect in the summer of 2001. This document does not define, clarify, or interpret in any way the requirements for the Structural Engineer concerning OSHA Subpart R. It is written only to inform the Structural Engineer of issues that may be relevant to their practice and/or that may aid in improving the overall safety of the project.

In typical practice, Structural Engineers design a structure to function as a complete unit upon completion of construction and thus, do not consider construction means, methods, techniques, sequences, procedures, or temporary supports or bracing in the design. Further, Structural Engineers do not have control of and are not responsible for construction means, methods, techniques, sequences, or procedures or for safety precaution methods, sequences, or programs during fabrication or erection. The Structural Drawings shall not convey or be construed as eliminating any requirements specified by OSHA Subpart R. Further, items specified on the Structural Drawings as shop installed that may be considered trip hazards shall be brought to the attention of the Structural Engineer and shall be field attached.

There are several requirements specified in OSHA Subpart R in which the Structural Engineer may offer assistance and/or guidance to the Detailer, Fabricator, and Erector. Further, the Structural Engineer may be able to provide consistent and/or clear requirements that can aid in the clarity during the bidding process. Ultimately it is in the best interest of all parties involved in the project to point out when details, methods, situations, etc. are known to not conform with OSHA Subpart R and to correct them appropriately and in a timely manner. Coordination between the General Contractor, Detailer, Fabricator, and Erector and proper communication with the Structural Engineer are critical.

Issues for the Structural Engineer to be Aware of Concerning OSHA Subpart R

1. Tripping Hazards:
   - A. EXAMPLES: shop attached deformed anchor studs or headed anchor studs on beams, plates, edge angles/bent plates, etc.; shop attached threaded studs on beams, cap/base plates, etc.; shop attached deck support plates, angles, etc.; upturned angle legs for opening frames.
   - B. GUIDE: Specify all items that may be considered as tripping hazards as field attached and be watchful of OSHA violations of this nature on the Shop Drawings.
   - C. NOTES: If fall arrest protection is in place, tripping hazards are acceptable – if fall arrest protection is not in place, tripping hazards are a violation of OSHA Subpart R.
2. Slippery Paint:
   - A. This provision does not take effect until at least 2006. For now the requirements are not well defined – more testing/research of paints, steel surfaces, shoes, weather conditions, etc. is required.

3. Minor Metal Deck Openings:
   A. EXAMPLES: Small mechanical, plumbing, electrical, etc. openings – not large openings such as elevator shafts, stair openings, etc.
   B. GUIDE: Provide opening frames that allow the metal deck to run continuously over the opening frame – eliminate upturned angles for opening frames. The intent is for the deck openings to be cut out at a later date when sufficient fall arrest protection is installed.
4. Column Base Plate and Anchor Bolt Design:
   A. GUIDE: Each column is required to have a minimum of 4 anchor bolts/rods. The foundation, base plate, and anchor bolts/rods shall be designed to withstand the stresses induced by a 300-pound vertical load located 18" horizontally from the face of the column flange and from a plane connecting the tips of the column flanges. It is recommended that the anchor bolts be located outside the column shape at the corners of the base plate. See the AISC LRFD Manual of Steel Construction for minimum embedment lengths for anchor bolts. No additional design considerations for erection, wind, seismic, temperature, etc. forces are required.
   B. NOTES: Posts (defined as structural members with longitudinal axes that are essentially vertical and are: a. 300-pounds or less and axially loaded or b. Not axially loaded, but laterally restrained by the above member) are required to have only 2 anchor bolts/rods.
5. Double Connections:
   A. EXAMPLES: At beam to column web connections or at beam to cantilevered girders over column connections where the connections for the beams on either side share common bolts. The Erector commonly sits on the first beam of the connection and connects in the second beam. Thus, the common bolts would have to be removed and reinserted to achieve connection of the second beam for double connections. No special provisions are required at standard beam to girder connections. The Erector can sit on the girder (which is safely supported at each end) while inserting/removing/reinserting the bolts for the beam connections.
   B. GUIDE: Specify or allow for the use of connections that accommodate the OSHA Standards. Provide alternating direction single angle (horizontal angle legs pointing opposite directions for each beam) connections, staggered double angle (angles on one side of the connection have an extra row of bolts or are staggered one bolt row vertically) connections, or erection seat connections. Be watchful for OSHA violations of this nature on the Shop Drawings.
   C. NOTES: Examples of double connections are given in Appendix H of OSHA Subpart R.
6. Column Splices:
   A. GUIDE: At the building perimeter, extend the column to a height of 48" above finished floor to allow the Erector to install perimeter fall arrest protection (perimeter cable). Column splices shall be designed to withstand the stresses induced by a 300-pound vertical load located 18" horizontally from the face of the column flange and from a plane connecting the tips of the column flanges. Specify that field welded splice connections require OSHA compliant bolted temporary connections and look for OSHA violations of this nature on the Shop Drawings. Consider holes required for temporary cable support in column design.
7. Joist/Joist Girder Stabilizer Plates:
   A. GUIDE: For joists/joist girders centered on columns, stabilizer plates that slide between the bottom chord angles of the joist/joist girder must be provided. These stabilizer plates must be a minimum of 6" x 6" and extend 3" below the joist/joist girder bottom chord with a 13/16" diameter hole for guying/plumbing cables. For conditions where no joist/joist girder is centered on a column, equivalent stability must be provided (usually by the joist manufacturer without the use of stabilizer plates) to the two joists near the column. Be watchful that the joist manufacturer has designated a separate piece mark for the joists/joist girders at columns. Where the joist/joist girder is required to provide lateral support for the column at the bottom chord of the joist, the bottom chord of the joist shall be connected to the stabilizer plates – the joist/joist girder must be appropriately designed for the forces induced by this requirement. This arrangement is not recommended.
   B. NOTES: For joists/joist girders at or near columns (column joists) with spans of 60 feet or less, the joist/joist girder shall be designed with sufficient strength to allow one person to release the hoisting cable without the need for erection bridging. OSHA currently has a moratorium on the strength requirements for joists/joist girders at columns.
8. Joist/Joist Girder Seats:
   A. GUIDE: Bolt connections to columns. Specify when welded or bolted connections to beam/girders are required. Joists at or near columns not framed in two directions with solid web beams and joists with spans over 40' (unless panelized) must be bolted to the beam/girder. Check the top flange of the beams/girders at bolted joist seat connections for the net area considering the holes in the flange. Typically the hole in the joist seat is slotted to allow for erection tolerances and thus, is not adequate to be

considered a permanent connection for the joist seat – field welding is typically provided to accommodate permanent connections.

9. Joist Bridging:
   A. GUIDE: Specify the need for bridging of joists and look for bridging on the Shop Drawings. Consider gravity loads (more than just bracing loads) induced in joist bridging for sloped or curved roofs. Be watchful of joist bridging terminus points on the Shop Drawings.
   B. NOTES: Examples of bridging terminus points (anchor end points for bridging) are given in Appendix C of OSHA Subpart R.
10. Pre-Erection Meetings:
   A. Meetings with the Architect, Structural Engineer, Detailer, Fabricator, Erector, and General Contractor are integral in catching and addressing most erection concerns and problems. Each issue listed above as well as all other issues covered in OSHA Subpart R should be thoroughly addressed.

References

1. "New OSHA Erection Rules - How They Affect Engineers, Fabricators, Contractors", *Modern Steel Construction*, May 2001, Barry L. Barger and Michael A. West.
2. *Federal Register, Part VI, Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Part R – Safety Standards for Steel Erection, Final Rule*, January 18, 2001.
3. "Detailing Guide for the Enhancement of Erection Safety", *National Institute of Steel Detailing and Steel Erectors Association of America*, 2001.
4. "The Steel Joist Institute's Position on the new OSHA Regulation 29 CFR Part 1926.757 – Open Web Steel Joists", Revised May 15, 2002.