Sheet Steel Facts 17

August, 2005

CSSBI Position Paper on Using Welding Washers with Steel Deck

This document has been published by the *Canadian Sheet Steel Building Institute* (CSSBI) as a position paper in response to discussions taking place in the engineering community on the feasibility of welding steel deck to structural steel supports when the weld includes a washer. The impetus for this paper is in response to testing carried out at École Polytechnique in Montreal, Canada with the subsequent published papers. See references listed below for work related to welds with washers.

The published reports and papers were based on research looking for a way to dissipate seismic forces through the use of the inelastic behavior of steel deck. The existing design methods for steel deck diaphragms are based on the elastic response of the steel deck to the seismic forces applied to the deck diaphragm. **Inelastic behavior of steel deck** under seismic loads implies that some of the roof deck would need to be replaced after an earthquake strong enough to require the inelastic behavior of the deck.

The strength of welds used in the diaphragm design manuals published by the CSSBI and the Steel Deck Institute (SDI) are **based on welds without washers** for material thickness equal or greater than 0.75 mm (0.0295 in.). The appropriate resistance and safety factors allow for normal variability in workmanship.

Welding and other types of **attachments should always be monitored on site** to verify that the proper size of attachment is provided, and the proper procedures are followed, to produce attachments that will behave in accordance with their theoretical capacity. Furthermore, the use of washers for welded attachment of steel deck to steel supports can be detrimental for the following reasons:

- The size of the washers provided by the deck installer may not allow proper contact at the bottom of the standard deck flutes.
- There are no washers that will allow welding to the support on either side of an interlocking side lap, which is a very important attachment since it is often a controlling failure mode for diaphragm action.
- Welding with washers needs special welding procedures that require more welding time to produce the proper fusion between weld material, steel washer, steel deck, and steel support.

For those reasons, the **CSSBI does not recommend the use of welding washers to weld steel deck to structural supports for sheet material thickness equal or greater than 0.75 mm (0.0295 in.)**

For More Information

For more information on sheet steel building products, or to order any CSSBI publications, contact the CSSBI at the address shown below or visit the web site at **www.cssbi.ca**

References

Tremblay, R., Rogers, C.A., Martin, E., Yang, W., (2004) "Analysis, Testing and Design of Steel Roof Deck Diaphragms for Ductile Earthquake Resistance", Journal of Earthquake Engineering, Vol. 8 No. 5, 775-816.

Peuler, M., Rogers, C.A., Tremblay, R., (2002) "Inelastic Response of Arc-Spot Welded Deck-to-Frame Connections for Steel Roof Deck Diaphragms", Research Report No. G01-03, Dept. of Civil Engineering & Applied Mechanics, McGill University, Montreal, Canada.

Peuler, M., Rogers, C.A., Tremblay, R., (2002) "Inelastic Response of Arc-Spot Welded Deck-to-Frame Connections for Steel Roof Deck Diaphragms", 16th International Specialty Conference on Cold-Formed Steel Structures, Orlando, USA.

CSSBI
652 Bishop St. N., Unit 2A
Cambridge, ON N3H 4V6
Telephone (519) 650-1285
Fax (519) 650-8081
Web site: www.cssbi.ca