



Position Paper on the Design Responsibility for Steel Deck Diaphragms

Introduction

This document is intended to clarify the responsibility of the steel deck manufacturer, steel deck installer and structural engineer with regards to the structural design of a steel deck diaphragm, forming part of the design of the building structure. The steel deck manufacturer is most often just a supplier to a subcontractor hired by the general contractor to install the steel deck. Erection drawings provided by the deck installer are only intended to identify the location of the various deck sheets. The structural engineer is responsible for the design of the steel deck diaphragm and communicating the necessary information to the deck installer.

Requirements

In Canada, the structural design of a steel deck diaphragm requires that the diaphragm behave elastically under seismic forces. The steel deck diaphragm is an integral part of the building design and so the requirements must be clearly indicated on the structural design documents. The requirements of CSA-S16-09 *Design of Steel Structures*, clause 4.2.2(f) states that the structural design documents shall include the requirements for roof and floor diaphragms. This information must be supplied by the structural engineer responsible for the design of the building and needs to include the specification of connector type and spacing; alternatively the performance specifications for the fastening system can be supplied and the installer will then select the fastener. Additional information supplied by the structural engineer would include the shear forces to be carried by the diaphragm, horizontal deflection criteria, special detailing along bracing lines and any other considerations relevant to the diaphragm design. The more complete the information in the structural documents, the more accurate will be the estimates and

less re-approval process that may be necessary afterward.

Connectors

The strength and stiffness of a steel deck diaphragm is achieved by the thickness and type of steel deck, but equally by the connectors at the supports (sheet-to-structure) and at the side-laps (sheet-to-sheet). The required strength and stiffness of the entire diaphragm assembly determines the choice of the appropriate connectors. There are a variety of connectors currently available with new products being introduced every year. Other factors affecting the selection of the best connector would be field conditions and erector's preferences. The deck installer may assist in picking connectors suited to the installation, but the final selection needs the approval of the structural engineer responsible for the design of the building.

Knowledge of the Building

The structural engineer responsible for the design of the building has the knowledge to determine the steel deck diaphragm requirements based on the design of the lateral load resisting system. Therefore, the engineer needs to communicate the diaphragm requirements and specifications to the deck installer if they are being asked to size the diaphragm. Some information is absolutely required from the structural engineer like the path of the shear forces, how to handle large openings, entry and exit points for the forces in the diaphragm and any unique conditions. These factors are decided during the design phase of the building and can significantly influence the type and the spacing of connectors for the installation of the steel deck.

The deck installer could assist the structural engineer regarding the strength of the steel deck under diaphragm shear forces using a variety of connector types, spacing and sizes. However, the design itself must be made and approved by the structural engineer who decides what kind of system will resist the lateral forces in accordance with the structural design.

Responsibility

The steel deck must be designed by the structural engineer to carry the gravity loads and should also be designed for the diaphragm shear forces like any other structural member. The information about the diaphragm (deck size, connector type and fastening pattern) must be part of the structural design documents provided to the deck installer and approved by the structural engineer of the building. The deck installer has to supply the appropriate material and may also provide the erection drawings made according to the structural documents. These erection drawings should clearly show the location of various sheet lengths, sheet quantities, piece marks, sheet thicknesses, grade of steel and coating designations. The type and spacing of the connectors may be shown on the erection diagrams to accommodate the installer, but must follow the structural engineer's specifications. The responsibility for the diaphragm design rests with the structural engineer. The deck manufacturer is responsible for supplying the products according to the specifications received from the installer. The installation and the inspection are normally carried out by the installer under the responsibility of the general contractor.

Conclusion

Complete structural documents must be provided by the building structural engineer to the steel deck installer. These documents should include the steel deck diaphragm performance specifications, with fastener type and pattern, and complete structural drawings including the deck design. With this information the steel deck design can be done according to a published manufacturer's catalogue, or a manual like CSSBI B13-06, *Design of Steel Deck Diaphragms*. Erection drawings do not need to be stamped or sealed by a professional engineer unless

some special deck alterations were made by the installer. However, some structural engineers may ask that the erection drawings be sealed. Alternatively, a letter by a professional engineer saying the erection drawings have been prepared under that engineer's supervision remains acceptable.

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.