VENTING OF COMPOSITE STEEL FLOOR DECK

This document has been prepared by the Steel Deck Institute as a position statement in response to inquiries regarding the availability of vented composite steel floor deck. The requests for vented composite steel deck appear to be based on a desire to hasten the drying time of the concrete that is cast on the deck. Problems with the application of flooring on concrete slabs have been reported on concrete slabs cast on varied concrete substrates, including slab on grade, suspended slabs, and slabs cast on steel deck. Many of the problems appear to be related to current formulations of adhesives that are more affected by moisture levels in the concrete than previously available adhesives.

Steel form deck products have traditionally been made available with venting to allow for excess mix water to drain from the cementious slurry component of lightweight insulating concrete systems (LWIC). This slurry contains excess water to allow for pumping and placement of the mix. Additionally, this venting allows for reduction of vapor pressure that will develop in the LWIC when covered with an impermeable roofing membrane. Unrelieved vapor pressure, driven by heating caused by exposure to the sun, can cause blistering in roofing membranes unless venting is provided. LWIC, an insulating product, is not to be confused with structural lightweight concrete, which is a structural component of a composite floor system.

While some deck manufacturers have the ability to provide slots in composite deck to assist in venting, it should be noted that the current research and testing on composite steel floor deck does not extend to vented products. While it is known that the inclusion of slots has little effect on the strength of the steel deck, the effect of draining mix water through the bottom of the deck on the properties of the cured concrete and the bond of the concrete to the deck is unknown. Specifiers should proceed with caution when requiring slots in this application.

The steel deck acts as a vapor barrier, preventing diffusion of water vapor out from the bottom of the slab. Some publications (References 3 and 4) note that the amount of diffusion is directly proportional to the open area in the vapor barrier (Ficks Law). For example, providing a hypothetical 1.5% open area will increase the diffusion of water vapor by 1.5%, an inconsequential amount.

Integral hanger tabs are occasionally used in composite deck to support light suspended loads and are very efficient for this application. The open area provided by these tabs is normally approximately 0.25% to 0.50%, a negligible amount. When these tabs are specified to provide minimal venting, this is a "by product" feature, and should not be counted on to provide substantial venting. This minimal open area has been shown through experience to not have an adverse effect on the concrete strength and bond.

Specifiers who are concerned about moisture in concrete slabs cast on steel deck can consider a slab cast on steel deck to be similar to a concrete slab on grade cast on a vapor barrier, when considering drying performance. References 1 and 2 contain guidelines for control of moisture in concrete slabs, including minimizing total water content (minimize cement content and use lowest reasonable water/cement (w/c) ratio) in the concrete mix, consider the use of water reducers* in the mixtures, provide protection from external moisture sources (enclose the building envelope), control drying temperature and relative humidity, and increase air movement to reduce vapor pressure, all of which may be considered to be

applicable for the particular application. These and other methods have the potential to increase the drying rate of the concrete beyond any effect of venting.

*Water reducing admixtures that contain calcium chloride or other chloride salts that are corrosive to steel deck should not be used.

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References:

1. *Concrete Floors and Moisture,* EB119, Portland Cement Association, 2008.
2. *Guide for Concrete Slabs That Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06), American Concrete Institute, 2006.
3. Lstiburek, Joseph W., "Concrete Floor Problems", *ASHRAE Journal,* Jan. 2008.
4. "Sealing Vapor Barrier Penetrations", *Concrete Construction Magazine,* July 2005.