

## Do Contractors' Inserts in Concrete Affect Fire Resistance?

Some contractors install coil loop inserts (see figure 1) in the tops of pans prior to concrete placement. After the concrete has hardened, bolts in the inserts support the pans when deck panels are stripped. On a recent project, the Architect believed that that coil inserts reduced the 2-hr fire rating of the 6-in.-thick concrete slab and notified the Contractor that a fire stop caulk had to be installed in each coil insert after the pans were removed. The coil inserts were spaced at about 1 per every 40 square feet of form area or about 250 coil inserts for every 10,000 square foot concrete placement. The cost of the fire stop caulk was about \$2 an ounce but the labor involved in caulking each coil insert would also be expensive.

Since the Contractor had never been required to install fire stop caulk on the coil inserts on previous projects, he wondered if the other Architects had missed this issue or if the Architect on this project was correct. Fire resistance is a Code requirement so it was time to check the 2009 International Building Code (IBC)--the governing code for the project. We were aware that the IBC allowed electrical boxes to be installed in walls without a reduction in fire rating and hoped there would be a similar provision for the coil inserts.

IBC discusses two types of penetrations: (a) through-penetration and (b) membrane penetration. The through-penetration is defined as an opening that passes through the entire wall or ceiling and a membrane penetration is defined as an opening made through one side of a wall, floor or ceiling. IBC has provisions for both through- and membrane-penetrations for both wall and horizontal assemblies. For this project, the coil inserts are a membrane-penetration in a horizontal (floor) assembly and thus the appropriate IBC provisions of section 713.4.1.2, as shown below, needed to be considered.

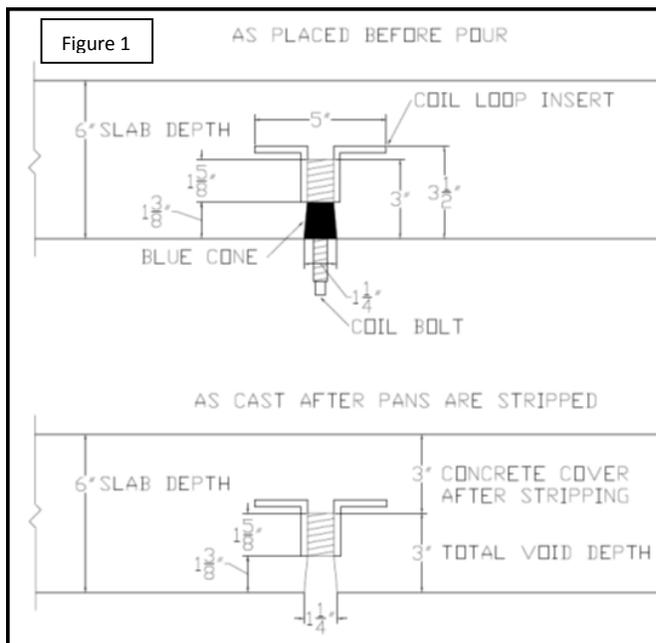
**713.4.1.2 Membrane penetrations.** Penetrations of membranes that are part of a *horizontal assembly* shall comply with Section 713.4.1.1.1 or 713.4.1.1.2. Where floor/ceiling assemblies are required to have a *fire-resistance rating*, recessed fixtures shall be installed such that the required *fire resistance* will not be reduced.

**Exceptions:**

1. *Membrane penetrations* by steel, ferrous or copper conduits, pipes, tubes or vents, or concrete or masonry items where the *annular space* is protected either in accordance with Section 713.4.1.1 or to prevent the free passage of flame and the products of combustion. The aggregate area of the openings through the membrane shall not exceed 100 square inches in any 100 square feet of ceiling area in assemblies tested without penetrations.

Fortunately, the coil inserts are addressed in Exception 1 and meet the following requirements:

- Steel item (noncombustible)
- Annular space protected (concrete seals off insert)
- Aggregate area shall not exceed 100 in<sup>2</sup> in 110 ft<sup>2</sup> (the 1 ¼ inch diameter coil insert provides an opening area of 1.25 in<sup>2</sup> per insert. They are spaced about every 40 ft<sup>2</sup>, so there might be 2.5 inserts per 100 ft<sup>2</sup> which provides a total aggregate opening coil insert area of about 3 in<sup>2</sup> per 100 ft<sup>2</sup>)



Since the total area coil insert opening area is much less than the permitted 100 in<sup>2</sup> per 100 ft<sup>2</sup>, the coil inserts will not reduce the fire resistance.

This information was submitted to the Architect and the Architect agreed that in accordance with IBC provisions no fire stop needed to be applied to the coil insert opening. Thus what started out as a potentially costly issue was handled by understanding the IBC fire resistance provisions and using them to convince the Architect.