Because corridors serve as an important part of many means of egress systems, it is important to assure that they are properly constructed and protected. Roughly three-quarters of fire deaths are related to smoke, so it is imperative that building occupants be provided with a relatively smoke-free egress route. That is why the provisions given in the 2006 International Building Code (IBC) for corridors differ somewhat from what is typically required for fire-resistive assemblies.

Part 1 of this article, which appeared in the January–February issue of Building Safety Journal, focused on corridor construction details. This concluding entry addresses code issues related to the protection of corridor ventilation systems.

Opening Protection

Because openings into a corridor can provide a path for smoke and fire to enter and thereby compromise its integrity, the code will generally require that the openings are protected. IBC Section 708.9 requires that penetrations by ducts and air transfer openings comply with Section 716. Depending on which of the four construction options are used for the corridor, the location and requirements for protecting the openings can vary. The majority of the requirements for corridors are given in Section 716.5.4 and its subsection, Section 716.6.2, and Section 712.

Figure 1(a). In corridor construction where fire partitions extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above, a fire damper and smoke damper or combination damper are required where a duct penetrates the fire partition.
To properly apply the code, all relevant sections should be reviewed. For example, the requirements for fire dampers in corridor walls are given in Section 716.5.4 while smoke damper requirements are given in Section 716.5.4.1 and ceiling dampers are addressed in Section 716.6.2. It is also important to review any exceptions that may be applicable. Section 716.5.4, Exception 1, allows the omission of fire dampers in corridor walls in other than Group H occupancies if the building is sprinklered. In this instance, being aware of the separate requirements and exceptions may not only make compliance easier but may also make it less costly.

Figure 1(a) shows the damper requirements for a corridor constructed with fire partitions that extend to the floor or roof sheathing, slab or deck above as permitted by Section 708.4. In this type of construction, a fire damper is required by Section 716.5.4 and a smoke damper is required by Section 716.5.4.1 where a duct penetrates the fire partition. Note that it is permissible to install either separate fire and smoke dampers or a combination damper. Additional information on damper testing and listing is given in Section 716.3.

Figure 1(b) depicts essentially the same situation as Figure 1(a) except a non-fire-resistive-rated ceiling is installed within the corridor. In such cases, fire and smoke dampers are required at the point where a duct penetrates the wall but not where a duct penetrates the ceiling. Therefore, any type of ceiling diffuser or register can be used. Figures 2 and 3 depict the provisions given in Section 716.5.4, Exception 3, and Section 716.5.4.1, Exception 2, respectively, for the elimination of fire damper and/or smoke dampers in corridor wall penetrations.

Where corridor wall fire partitions end at the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly, duct work above the ceiling only needs to be protected in accordance with Section 716.6.2, as illustrated in Figure 4. Ceiling radiation dampers are typically required at all openings in the ceiling, whether there is a duct attached or a diffuser with no duct attached is used, such as at an opening to a return air plenum. Section 716.6.2.1, item 1, allows that assemblies which have been shown to meet the requirements of ASTM International E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, fire test or equivalent without ceiling radiation dampers may be left unprotected.

This exposes a coordination problem between Section 716.6.2.1 and Section 716.5.4.1, which generally requires a smoke damper where duct or air transfer openings penetrate a “corridor enclosure.” The wording “corridor enclosure” is used for both the vertical fire partitions regulated by Section 716.5.4 and the horizontal “lid” of a tunnel corridor.
constructed per Section 708.4, Exception 3, as well as, potentially, the ceiling of a corridor constructed per Section 708.4, Exception 2.

While constructing a corridor per Figure 4 is somewhat unusual and the elimination of ceiling radiation dampers per Section 716.6.2.1, item 1, is rare, if both of these situations occur the ductwork shown would be permitted to have openings into both the corridor and the adjacent spaces without any type of damper. The legacy *Uniform Building Code* addressed this situation by limiting the requirements corresponding to IBC Section 716.6.2.1, item 1, so that they did not apply to fire-resistive ceilings in corridors. That way even though a smoke damper is not provided, the opening is protected by a radiation damper.

Another potential concern with this type of construction is duct penetration of the required fireblocking or draftstopping above the partition in combustible construction. The IBC does not require that any type of damper be installed at such penetrations, but most code officials would require that some method of protecting the annular space between the duct and the fire-block or draft-stop be provided, and language in support of this viewpoint is given in Section 717.2.1 and Section 717.3.1 requiring that the integrity of fireblocks and draftstops, respectively, be maintained.

When using the construction option provided by Section 708.4, Exception 2, illustrated in Figure 5, there are essentially two points that provide the protection for the corridor enclosure and must therefore be protected by dampers. The requirements of Section 716.5.4 and Section 716.5.4.1 require both a fire damper and a smoke damper at the penetration of the wall membrane, while Section 716.6.2 requires a ceiling radiation damper at the penetration of the ceiling.

Requiring dampers at two fairly proximate locations may seem excessive to some, but in fact usually indicates a design problem. The designer would be wise to consider revising the duct layouts to reduce or eliminate the number of locations where the requirement for multiple dampers occurs or select a different method of corridor construction. That said, this is a detail for which some code officials are willing to accept an alternate method of compliance. ICC staff have seen two possible alternatives, both dependant on the use of minimum 0.0179-inch-thick metal ducts.

The first is to require the ceiling radiation damper and not require the fire and smoke damper in the wall. If this is
allowed, Section 716.1.1 requires that the wall opening be protected as a penetration in accordance with Section 712. A more moderate alternative is to allow the omission of the fire damper at the wall but still require the smoke damper. The rationale is that ceiling radiation dampers are not required to meet the smoke damper requirements of Underwriters Laboratories (UL) 555S, Standard for Smoke Dampers, so the radiation damper serves to protect the integrity of the corridor’s ceiling while the smoke damper limits the potential for smoke to enter the corridor through the duct. Both of these methods are based on the consideration that with the use of metal ducts the benefit of providing dampers at both the ceiling and wall penetrations is not substantially greater than just providing ceiling dampers.

Penetrations in the lid of a “tunnel corridor” constructed in accordance with Section 708.4, Exception 3, are not permitted to be protected by a ceiling radiation damper. Rather, a “corridor damper” specifically listed for this purpose—having successfully passed both UL 555S and UL 555, Standard for Fire Dampers, test criteria—must be used. However, corridor dampers are not tested or intended for wall penetrations. If a duct enters a tunnel corridor by penetrating the wall, either a separate fire damper and smoke damper or a combination damper are required per Section 716.5.4 and Section 716.5.4.1.

Finally, IBC Section 407.3, which covers Group I-2 occupancies, allows the use of the smoke partition provisions of Section 710 to provide a unique method of constructing corridors. Section 710.7 addresses the penetration of the smoke partition by a duct and locations where an air transfer opening may be used. The term “air transfer opening” is not explicitly defined in the International Codes but is generally viewed as referring to a relief vent, hole, louvered grill or other such feature that does not have a duct connected to it. As such, a duct penetration that terminates at a supply diffuser or return air grill would not be considered an air transfer opening.

If a duct is used for the penetration a damper is not required and the protection requirements given in Section 712 do not apply and only the use of an “approved material to limit the free passage of smoke” per Section 710.7 to seal the annular space around the duct is needed. Except under very limited circumstances, however, the code requires that an air transfer opening be protected by a smoke damper. Hospital designers who must comply with both the IBC and NFPA 101: Life Safety Code should be aware that the two codes conceive of an “air transfer opening” differently, which may affect the interpretation of whether a smoke damper is required for a ducted penetration.

Figure 5. This type of corridor construction requires a fire damper and a smoke damper at wall membrane penetrations and a ceiling radiation damper at ceiling penetrations.

Figure 6. Duct penetrations in the lid of a “tunnel corridor” require the use of a listed corridor damper.