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## Commercial Buildings Frequently Asked Questions Fire Rated Assemblies

### **IBC 703.2, IBC 721.1/Table 721.1(2) footnote f., IBC 722.3.1.4 Does the application of foam insulation including but not limited to sprayed, injected or solid/rigid inserts to the cores of a two hour fire resistance rated concrete masonry unit wall increase the fire resistance rating of the wall?**

Answer: No, the installation of foam insulation within the cores of a CMU wall does not increase the fire resistance rating of the wall unless demonstrated through testing in accordance with ASTM E 119. The use of loose fill insulation in accordance with footnote f. to Table 721.1(2) will increase the fire-resistance rating from 2 hrs to 4 hrs and will modify the equivalent thickness of a CMU wall per s. 722.3.1.4 for determination of the calculated fire-resistance rating. Loose fill insulation includes silicone-treated perlite; vermiculite; or expanded clay, shale or slate lightweight aggregate, sand or slag having a maximum particle size of 3/8 inch.

### **IBC 402 For a change of use of a tenant space within a mall, must the tenant space be separated from any other tenant spaces by a fire partition having a fire-resistive rating complying with IBC 708?**

Answer: The requirement for separation of tenant spaces by fire partitions complying with IBC 708 applies only if the mall is a "covered mall building" designed to comply with IBC 402. Consequently, if the mall, or if a portion of the mall that is separated by fire walls into a "separate building," complies with IBC 402 and the designer chooses to use the covered mall option, fire partitions are required.

Otherwise, separation between tenant spaces may or may not be required, based on nonseparated-use or separated-use options that may be selected, and the corresponding code requirements. (June 30, 2008)

### **IBC 412.4.1 Do the setback requirements in IBC 412.4.1 for exterior walls of aircraft hangers apply either to an "imaginary line" between two buildings on the same property - as that line is referred to in the definition for fire separation distance in IBC 202 - or to an "assumed" property line between two buildings on the same property, as that line is referred to in IBC 705.3?**

Answer: No. (September 1, 2011)

### **IBC 706.8 Where two buildings of different lengths are separated by a fire wall, can the length of the fire wall be extended to include the exterior wall of the larger building, such that I can exceed the 25 percent limitation on the length of openings located in the portion of the wall that is common with the smaller building?**

Answer: No. The percentage of openings in the fire wall between the buildings is limited to the length of the common wall, plus the length of extensions that are required. Although we will allow the length used to determine the allowable openings permitted by IBC section 706.8 to include the length of required extensions, we will not allow larger extensions beyond those specified within IBC section 706.5. (September 1, 2011).

### **IBC 706 Can structural elements pass through the various rated fire-resistive rated wall assemblies (i.e. fire walls, fire barriers, fire partitions, etc.) that are required for other than class of construction purposes?**

Answer: In short, NO for fire walls, and YES for all the other vertical assemblies. The only separation that prohibits other structural members from passing through/over or "penetrating" the separation is a fire wall [see IBC 706]. The restrictions relative to that thought are outlined in IBC 706.2. The performance language requires the wall to have sufficient stability to allow the collapse of the construction on either side without a collapse of the fire wall. That same performance language does not exist for exterior walls [IBC 705], fire barriers [IBC 707], shaft enclosures [IBC 713], fire partitions [IBC 708], smoke barriers [IBC 709], or smoke partition [IBC 710]. (September 1, 2011)

**IBC 717.6.2.1 and IMC 607.6.2.1 Does the language “within the cavity of a wall”, under the exceptions of sections IBC 717.6.2.1 and IMC 607.6.2.1 regarding ceiling dampers, preclude some or all of the exhaust duct system from being located within the cavity of a floor/ceiling assembly or roof/ceiling assembly?**

Answer: No. The exceptions under IBC 717.6.2.1 and IMC 607.6.2.1 indicate that “Ceiling radiation dampers are not required where exhaust duct penetrations are protected in accordance with IBC section 713.4.1.2, are located within the cavity of a wall, and do not pass through another dwelling unit or tenant space.”

In this context, the exhaust system and some or all of the associated ductwork are often located within the ceiling cavity. The reference to a “wall cavity” emphasizes the condition that the duct system for the exhaust system may not pass through the space of another dwelling or tenant. Ductwork within the cavities of horizontal and vertical assemblies separating dwelling units or tenant spaces are not considered to be “passing through” the space of another dwelling or tenant. (September 1, 2011)

**IBC 402 For a change of use of a tenant space within a mall, must the tenant space be separated from any other tenant spaces by a fire partition having a fire-resistive rating complying with IBC 708?**

Answer: The requirement for separation of tenant spaces by fire partitions complying with IBC 708 applies only if the mall is a "covered mall building" designed to comply with IBC 402. Consequently, if the mall, or if a portion of the mall that is separated by fire walls into a "separate building," complies with IBC 402 and the designer chooses to use the covered mall option, fire partitions are required.

Otherwise, separation between tenant spaces may or may not be required, based on nonseparated-use or separated-use options that may be selected, and the corresponding code requirements. (June 30, 2008)

**Question: IBC 712.1, IBC 713.1, IBC 711.2.2, IBC 714.1.1, IBC 714.4.1.2, IBC 714.4.3, IBC 717.1, IBC 717.2.1, and IBC 717.7.** What protection is required for a duct penetration through the ceiling membrane of a fire resistance rated floor/ceiling or roof/ceiling assembly?

**Answer:** It depends on the type of duct penetration and what types of tested and listed protection components are available for the particular application. A fire resistance rated floor/ceiling or roof/ceiling assembly is required to be constructed as a horizontal assembly meeting the requirements of s. 711. The applicable code sections are reprinted in part below:

**IBC 712.1 Vertical Openings.** Vertical openings shall comply with this section.

**IBC 713.1 Shaft enclosure.** Openings through a floor/ceiling assembly protected by a shaft enclosure shall comply with this section.

**IBC 712.4 Continuity.** Assemblies shall be continuous without openings, penetrations, or joints except as permitted by this section and Sections 714.4, 715 and 1023.

**IBC 712.5 Penetrations.** Penetrations of horizontal assemblies shall comply with Section 714.

**IBC 712.7 Ducts and air transfer openings.** Penetrations in horizontal assemblies by ducts and air transfer openings shall comply with Section 716.

**IBC 714.1.1 Ducts and air transfer openings.** Penetrations of horizontal assemblies not protected with a shaft as permitted by Section 712, and not required to be protected with fire dampers by other sections of this code, shall comply with Sections 714.4 through 714.4.4. Ducts and air transfer openings that are protected with *dampers* shall comply with Section 717.

**IBC 714.4.2 Membrane penetrations.** Penetrations of membranes that are part of a horizontal assembly shall comply with 714.4.1.1 or 714.4.1.2.

**IBC 714.4.3 Dissimilar materials.** Noncombustible penetrating items shall not connect to combustible materials beyond the point of firestopping unless it can be demonstrated that the fire-resistance integrity of the horizontal assembly is maintained.

**IBC 717.1 General.** The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected.

**IBC 717.2.1 Ducts that penetrate fire-resistance rated assemblies without dampers.** Ducts that penetrate horizontal assemblies not required to be contained within a shaft and not required by this section to have dampers shall comply with the requirements of Sections 714.2 through 714.3.3.

**IBC 717.7 Flexible ducts and air connectors.** Flexible ducts and air connectors shall not pass through any fire resistance rated assembly.

A ceiling membrane penetration does not create an opening through a floor/ceiling assembly, therefore Section 714 does not require a shaft enclosure. Section 712.1.6 requires penetrations of horizontal assemblies by ducts and air transfer opening to comply with s. 717 and s. 717.1.2 states where a shaft is not required and dampers are not required the penetration shall comply with 714.2 through 714.3.3. Section 714.1.1 makes it clear that not all penetrations are required to be protected with either shaft enclosures or dampers but in cases where neither is appropriate or applicable, penetrations of horizontal assemblies shall comply with 714.2 through

714.3.3. Horizontal fire dampers are for through penetrations of horizontal assemblies and generally have been tested and listed for use in masonry and concrete floor assemblies. Ceiling radiation dampers are generally tested and listed for use at air outlet or inlet terminals (i.e. ceiling supply air diffusers and return air grilles). Other protective assemblies for use at a ductwork ceiling termination that may be part of a tested and listed fire resistance rated horizontal assembly and would not require the use of a ceiling radiation damper include Air Terminal Units (UL product category BZGU) and Ceiling Air Diffusers (UL product category BZZU).

Section 717.6.2 does not require a fire damper or ceiling radiation damper for a ceiling membrane penetration by ductwork that does not terminate at a supply air diffuser or return air grille. In cases where continuous non-combustible ductwork penetrates a ceiling membrane, tested and listed dampers are not appropriate and therefore the penetration shall comply with 714.2 through 714.3.3. Section 714.4.2 requires that penetrations of membranes that are part of a horizontal assembly shall comply with section 714.4.1.1 or 714.4.1.2, either installed as tested in the approved fire-resistance rated assembly or protected with a through penetration firestop system respectively. Section 717.7 prohibits flexible duct and air connector penetrations of fire resistance rated assemblies and Section 714.4.3 prohibits connection of non-combustible penetrating items to combustible materials. Therefore continuous ductwork penetrating a ceiling membrane must be continuous metal ductwork from the appliance to the air outlet or inlet terminal. Where continuous ductwork penetrates a ceiling membrane and does not terminate at a supply air diffuser or return air grille the annular space around the duct penetration shall be protected by an appropriately tested and listed through penetration firestop system.

See also the Q&A for IBC 708.4, 710.3 and 718.4.2 which indicates a fire resistance rated roof/ceiling assembly is not required to satisfy the dwelling and sleeping unit separation requirements of s 420.

Some example scenarios and available or alternative protection components/requirements follow:

1. Ceiling membrane duct penetration with a supply air diffuser mounted in the plane of the ceiling membrane. An appropriately tested and listed Ceiling Radiation Damper (tested for dynamic airflow conditions as necessary) shall be provided. If one is not available for the specific application or as an alternative a Ceiling Air Diffuser may be provided as indicated in the tested and listed fire resistance rated assembly or Duct Outlet Protection System A or B as described in the guide information for the assemblies in the UL Directory.
2. Ceiling membrane duct penetration with a return air grille mounted in the plane of the ceiling membrane. An appropriately tested and listed Ceiling Radiation Damper (tested for dynamic airflow conditions as necessary) shall be provided. If one is not available for the specific application or as an alternative an Air Terminal Unit may be provided as indicated in the tested and listed fire resistance rated assembly or Duct Outlet Protection System A or B as described in the guide information for the assemblies in the UL Directory.
3. Ceiling membrane duct penetration by continuous noncombustible metal ductwork from the supply plenum of an upflow furnace and direction of airflow into the floor/ceiling assembly above. Appropriately tested and listed Ceiling Radiation Dampers, Ceiling Air Diffusers, Air Terminal Units, or Fire Dampers are likely not available for this configuration nor would the UL Duct Outlet Protection Systems be appropriate. Therefore the annular space around the noncombustible penetrating ductwork must be protected with a tested and listed through penetration firestop system.
4. Ceiling membrane duct penetration by continuous noncombustible metal ductwork on the return side of an upflow furnace and direction of airflow out of the floor/ceiling assembly above. Appropriately tested and listed Ceiling Radiation Dampers, Ceiling Air Diffusers, Air Terminal Units, or Fire Dampers are likely not available for this configuration nor would the UL Duct Outlet Protection Systems be appropriate. Therefore the annular space around the noncombustible penetrating ductwork must be protected with a tested and listed through penetration firestop system.

**IBC 1011.7.3 & 1011.7.4 When creating enclosed usable spaces under enclosed and unenclosed interior and exterior stairways, the code requires that the walls and soffits be protected by 1-hour fire-resistance-rated construction or the fire resistance rating of the stairway enclosure, whichever is greater. When addressing the underside of the stair stringers, can the minimum required fire resistive rating be achieved by way of a finish rating rather than an assembly rating?**

**Answer:** Yes. The IBC requires the use of fire resistance rated assemblies and is silent on the use of finish ratings. In very limited instances when it is obvious where the hazard exists, what is being protected, and due to typical construction practices it is not practical to provide a full fire resistance rated assembly the department will consider the use of a finish rating. Wallboard membranes meeting the required fire resistance duration may be attached as specified in a tested and listed fire resistance rated assembly or other fire resistance provisions of the IBC to the bottom of the stair stringers to provide the required finish rating protection. In this particular case, it is clear that the stairway is the building element to be protected from the enclosed usable space below it and not the other way around. Further, cut stair stringers typically do not provide the minimum continuous nominal 10" deep wood joist required by tested and listed fire resistance rated horizontal assemblies. It should be noted, however, that a finish rating is not recognized for

use at the top or cap of a stairway exit enclosure, since the fire resistance requirements associated with IBC 1023.1 require that the assembly be a fire rated horizontal assembly when stair enclosure walls do not extend to the roof deck above. (May 12, 2015)

**Question:** IBC 703.2, IBC 721.1/Table 721.1(2) footnote f., IBC 722.3.1.4 Does the application of spray foam insulation to the cores of a two hour fire resistance rated concrete masonry unit wall increase the fire resistance rating of the wall?

**Answer:** No, the installation of spray foam insulation does not increase the fire resistance rating of the wall unless demonstrated through testing in accordance with ASTM E 119. The use of loose fill insulation in accordance with footnote f. to Table 721.1(2) will increase the fire-resistance rating from 2 hrs to 4 hrs and will modify the equivalent thickness of a CMU wall per s. 722.3.1.4 for determination of the calculated fire-resistance rating.

**SPS 362.0705(2) Substituted Table 362.0705-2 establishes restrictive limits on the required distance of projections from the line used to establish Fire Separation Distance (FSD) for buildings with a FSD greater than 3 feet to less than 30 feet of up to 19 feet-4 inches for a building with a FSD of 29 feet. However, for buildings with a FSD of 30 feet or greater projections may extend to within 40 inches of the line used to establish FSD. How can this apparent contradiction in the requirements be explained and how will it be enforced?**

Answer: During the rulemaking process the department became aware that this Table and its requirements were modified in the 2018 edition of the IBC. It was the department's intent to incorporate the changes in 2018 IBC Table 705.2 into the WI amendment, but inadvertently only the right hand column of the Table was amended. Given the department's intent and authority to interpret department rules, the 2018 Table, as reprinted below, will be enforced as if it were part of this code.

**TABLE 705.2  
MINIMUM DISTANCE OF PROJECTION**

<b>FIRE SEPARATION DISTANCE (FSD)</b>	<b>MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD</b>
0 feet to 2 feet	Projections not permitted
Greater than 2 feet to less than 3 feet	24 inches
3 feet to less than 5 feet	24 inches plus 8 inches for every foot of FSD beyond 3 feet or fraction thereof
5 feet or greater	40 inches