

U.S. Fire Administration / National Fire Academy

*Coffee Break Training***Topic: Protecting Membrane Penetrations**

Learning objective: The student shall be able to identify fire protection requirements and exceptions for membrane penetrations.

When cables, pipes, electrical boxes, tubes, combustion vents, wires, or similar items penetrate one side of a wall, floor, or floor-ceiling assembly, the condition is known as a membrane penetration. The membrane may be a ceiling tile, a concrete masonry unit (block), concrete wall, or, as illustrated here, gypsum wallboard.

The space between the penetrating item and the membrane is called the annular space. When the penetrated construction is required to be fire-resistance rated, the penetration must be protected by firestopping. The firestopping must be tested to satisfy ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops* or UL 1479, *Standard for Safety for Fire Tests of Through-Penetration Fire Stops*.

Exceptions to the test criteria are permitted for any of the following:

- Ceiling penetrations that are not part of a fire-resistance rated floor-ceiling or roof-ceiling assembly.
- In ceilings, where metallic item penetrations where the annular space is protected by an approved material and the total area of penetrations does not exceed 100 in² (64,520 mm²) in any 100 ft² (9.3m²).
- In walls or partitions, where steel electrical boxes not exceeding 16 in² and the total area of penetrations does not exceed 100 in² (64,520 mm²) in any 100 ft² (9.3m²), and the boxes are adequately spaced apart on opposite sides of the wall.
- Where listed electrical boxes are installed.
- Where the annular space between fire sprinkler pipe and the ceiling is covered by a metal escutcheon.



The sprinkler escutcheon in this photograph has been pushed above the ceiling membrane, and the annular space filled with nonrated silicone sealant. This does not meet the fire-resistance membrane protection requirements of the building codes.

For additional information, refer to *International Building Code*[®], Chapter 7; or *NFPA 5000, Building Construction and Safety Code*[®], Chapter 8.

Photo courtesy Ralph Foster, South Carolina State Fire Marshal's Office