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Fire Stopping: What Every Contractor Needs to Know

Published: May 2005
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For approximately 40 years, unprotected or improperly protected penetrations have presented a subject of much concern to the fire-protection community. In 1996, an electrical fire occurred at 30 Rockefeller Plaza in New York City. The arriving firefighters discovered several fires had broken out in five remote locations, filling many different areas of the building with smoke.

According to the National Fire Protection Association's report on the fire, unprotected vertical and horizontal penetrations provided one of the major contributing causes of the rapid, erratic spread of smoke and fire. These openings allowed the smoke to spread beyond the electrical rooms and into occupied floors.

Numerous fires similar to this one have emphasized the need for fire stopping the penetrations made by electrical installations. As a result of these fires, the respective committees developed requirements for both the building code and *National Electrical Code (NEC)*. These requirements insist on the installation of through-penetration fire stopping.

The 2005 edition of the *NEC* (Article 300.21 Spread of Fire or Products of Combustion) states: "Openings around electrical penetrations through fire-resistant rated walls, partitions, floors or ceilings shall be fire stopped using approved methods to maintain the fire-resistance rating."

To ensure you understand these fire-stopping requirements, you must understand the basics of fire stopping.

Fire stopping has three elements: the fire-rated walls, partitions, floors or ceilings being penetrated, the cables, cable trays or conduits that make up the object creating the penetration; and the materials and methods used to seal the penetrations to prevent the spread of fire and smoke.

In addition to these elements, an installation designer or contractor making an installation must consider whether or not the penetrations will remain permanent; the penetrations may change during the renovations of new tenants' accommodations, which may require new electrical-system installations.

Permanent penetrations include those made for building power, while telephone and data-cable penetrations may be changed or reused by a contractor during the building's history.

Knowing the language of fire stopping

A number of manufacturers produce fire-stop materials. Most of them publish the Underwriters Laboratories (UL) information relating to the product use and installation requirements. UL has developed a Code Numbering System for fire-stopping products. UL tests these products and then publishes a listing based on the application. The UL Listing Numbers format, as it appears in the UL Directory, includes two-letter designations followed by a numeric grouping.

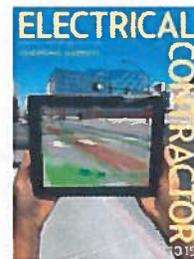
The first letter designation identifies the type of penetrated fire-rated structure:

C for both floor and wall penetrations

F for floor penetrations only

W for wall penetrations only

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The second letter designation identifies the construction type of:

A for concrete floors less than or equal to 5 inches thick

B for concrete floors greater than 5 inches thick

C for framed floors

D for deck construction

J for concrete or masonry walls less than or equal to 8 inches thick

K for concrete or masonry walls greater than 8 inches thick

L for framed walls

M for bulkheads

A number grouping follows the two letters to indicate the penetrating items. For example, these numbers might include 1000-1999 for metal pipe, conduit or tubing and 3000-3999 for cables.

UL 1479 (ASTM E814) typically categorizes fire-stopping systems by one or more of the ratings stated in the following paragraphs. ASTM E814 serves as the test standard applicable to through-penetration fire stopping used in openings in fire-resistive walls and floors.

Flame: The "F" rating is expressed in hours. This number indicates the specific length of time a barrier can withstand fire before being consumed or before permitting the passage of flame through an opening.

Temperature: The "T" rating is expressed in hours and indicates the length of time the temperature on the side of the penetration without fire does not exceed 325 F above the ambient temperature. This ensures the temperature on the side of the wall away from the flame does not reach the flash point of any materials on that side of the wall.

Smoke: The "L" rating is the amount of air (smoke) that can leak through a penetration, measured in cubic feet per minute. The test is administered at ambient temperature and at 400 F to determine the actual performance of fire-stopping materials at different temperatures.

Water: The "W" rating, established in 2004, indicates the fire-stopping material has passed the UL test for water tightness. The Class One requirements for water tightness include subjecting the material to a 3-foot water column for 72 hours, followed by a fire and hose stream test, conducted in accordance with ANSI/UL 1479. A Class Two listing requires the material to be resistant to a 20-foot water pressure head. Finally, a Class Three listing requires the material to be resistant to 57.54-foot water pressure head. According to one of its spokesmen, UL developed the new "W" rating to prevent water damage and mold-friendly moisture associated with through penetrations.

Installation methods

When installing cable trays, a contractor may choose one of two possible methods of installing fire-stop materials. When a cable tray terminates at the wall and a conduit sleeve penetrates the wall to provide a path for cables, a contractor must fire stop the conduit penetration and fill the conduit body with fire-stopping material.

A contractor might use the second method when the entire cable tray passes through a wall opening. The contractor then fills the opening with fire-stopping material. Many fire-stopping products employ intumescent materials that, when exposed to heat, expand to fill any voids in the penetration. Typically these products include fire-stop mortar, caulk, putty sticks, blocks and pillows.

Fire-stop mortar and caulk are semipermanent products. A contractor generally applies the caulk to the penetration with hand-held caulk gun. The mortar can be applied with a trowel.

Putty sticks can be molded around the cables, conduit and pipes that penetrate the fire-resistive barrier. Also, a contractor may typically install fire-stop blocks and pillows that contain intumescent material by stacking and forming the materials to fit into large penetrations.

Although the through-penetration fire-stop products mentioned above serve as effective fire-stop materials, their effectiveness could be compromised when contractors or maintenance personnel move, add or change cables; when contractors fail to follow the UL Fire Resistance Directory; and when initial installations are difficult to inspect. Certain materials, including caulks and putties, are especially difficult to inspect following installation. Inspectors must understand that an outer surface that appears Code-compliant may mask hidden gaps or voids resulting in an improper or incomplete installation.

As stated previously, while some wall penetrations remain permanent, data and communication cables will more likely experience additions or removal during the life of a building due to changes in cabling technology or changing the number of workstations in a given space.

Each time a contractor adds or removes a cable, the contractor must remove and replace semipermanent materials such as caulk and mortar. While putty does not harden or crack and can be reused, a contractor must take care following the cable change to ensure that he or she properly places the material. Manufacturers specifically design pillows so contractors can remove them. But a contractor must also install the pillows properly. Also, when installed in exposed locations, people may tamper with the pillows.

Planning serves as the key to any good electrical installation. This philosophy also applies to the installation of fire-stop materials. A well-designed cabling system must recognize the unique problems associated with through penetrations. The contractor must also provide a large-enough penetration for the expected cable loading, fire-stop materials and future growth requirements.

As a contractor, you have the responsibility for fire stopping through penetrations. Thus, you should ensure you understand the intent of the Code requirements: know the hourly rating of the fire barrier, know the UL listing of the products used and ensure they match the hourly rating of the fire barrier. EC



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