

Steel Conduit

TECH TALK

DO STEEL CONDUIT AND TUBING HAVE FIRE RATINGS?

Technical Information
About Steel Conduit and
Electrical Metallic Tubing



Steel conduit and steel tubing are both considered non-combustible by the International Building Code and NFPA 5000. They do not have fire ratings but can be included as part of a fire-rated assembly, which is a question usually asked relative to fire-rated assemblies, emergency circuits and the use of conduit or tubing. The question about fire ratings is often asked because of code requirements for firestopping through-penetrations or because of special National Electrical Code® requirements for fire pumps (Article 695), emergency systems (Article 700) and fire alarm systems (Article 760).

These articles from the NEC® cover the installation of wiring and equipment for critical life safety systems, including all circuits controlled and powered by the fire alarm system. All three articles listed above include enclosing the raceways in a fire-rated enclosure, embedding them in 2" of concrete, wrapping them with a listed wrap system for protection from fire and/or using a listed electrical circuit protective system or a listed fire-resistive cable system.

There is often confusion on the three topics below; for clarity, we will explain them in more depth.

1. Penetrations

The NEC and building codes require the sealing of openings around raceways that penetrate a fire-rated assembly. This requirement is to maintain the fire rating so that smoke, gases and flames do not spread from one area to another. There are many listed through-penetration firestopping systems that can be used to seal openings; the listing instructions should be strictly followed.

Most building codes permit the openings around galvanized steel RMC, IMC and EMT in concrete or masonry to be filled with mortar or grout. However, since local codes sometimes vary, these requirements should be checked prior to installation. NEC 300.21 states that openings around electrical penetrations must be fire-stopped using approved methods to maintain the fire resistance rating.

2. Emergency Circuits (NEC 700.10 (D)(1)) and Fire Pump Circuits (NEC 695.6(A)(2)(d))

Prior to installing these circuits, the NEC and local or state code requirements should be reviewed. Steel raceways withstand fire; however, ordinary conductor insulation may be compromised when exposed to elevated temperatures, and a short circuit can be created. This is the reason for special protection of emergency fire-pump circuits.

Methods of fire protection include enclosing the raceways in a fire-rated enclosure, embedding them in concrete, wrapping them with a listed wrap system for protection from fire or installing them as part of a listed electrical circuit protective system. The assembly as a whole provides protection for the fire rating, not the individual component. Information on fire ratings and fire-stop methods can be found under Building Materials, Systems and Installation Codes at <https://iq.ulprospector.com/info/>

3. FHIT — Electrical Circuit Integrity Systems

Currently, both IMC and EMT are permitted to be used in several FHIT — Electrical Circuit Integrity Systems listed by UL®.

HOW IS A FIRE-RATED ASSEMBLY TESTED?

In order to meet the fire rating, you need to use the components listed for the system. Please see the UL Time-temperature testing standard below:

UL10D Fire Tests of Fire-protective Curtain Assemblies: Conduct of Tests:

Time of Test:

- The test assembly construction shall have the strength to retain the horizontally or vertically oriented fire-protective curtain assembly securely in position after the operational test, and throughout the fire endurance test.

Operational Tests:

- Prior to the conduct of the fire endurance test, the horizontally or vertically oriented fire-protective curtain assembly is to be cycled through three closing operations causing the mechanism to activate the closing release of the fire-protective curtain. Each cycle shall consist of the curtain being closed from the fully open position. The average closing speed of the horizontally or vertically oriented fire-protective curtain shall not exceed 24 inches per second and shall not be less than 6 inches per second. The horizontally or vertically oriented fire-protective curtain is to close in one continuous motion without interruption.



Fire Endurance Test:

- The pressure in the entire furnace chamber at the beginning of the test is to be maintained nearly equal to the atmospheric pressure.
- Within 5 minutes of elapsed time into the fire endurance test, the neutral plane of the furnace is to be established at a maximum of 40 inches (1016 mm) up from the bottom of the fire-protective curtain assembly. The exposed area of the test assembly required to be in the positive pressure zone shall be at a positive pressure for the full duration of the fire endurance test.
- For horizontally oriented fire-protective curtain assemblies, the pressure that is maintained over or under the test assembly is not to exceed 0.08-inch H₂O (20 Pa) over any portion of the test sample.
- For vertically oriented fire-protective curtain assemblies, the pressure that is maintained over the top one-third of the test assembly is not to exceed 0.08-inch H₂O (20 Pa) over any portion of the test sample.
- The test is to be continued until the fire endurance period of the classification or rating being evaluated is reached.

Cotton Pad Test for Vertically Oriented Fire-protective Curtain Assemblies:

- The passage of flames and gases that may be hot enough to ignite combustibles through cracks, holes or other openings in or around a fire-protective curtain assembly shall be determined by applying a cotton pad to such openings at regular intervals during the test. The cotton pad shall not be in contact with the element but shall be held for not less than 10 seconds and not more than 30 seconds between $1 \pm 1/4$ inches (25 ± 5 mm) away from and centrally opposite any cracks, holes or other openings in or around the fire-protective curtain assembly. The cotton pad shall not be reused if it has absorbed any moisture or become charred during a previous application.
- The cotton pad, measuring 4 inches (100 mm) square by 3/4 inches (20 mm) thick, shall consist of new undyed and soft cotton fibers without any admixture of artificial fibers and shall have a mass between 3 and 4 grams. The cotton pad shall be conditioned by drying in an oven at 212°F (100°C) for at least 30 minutes. The cotton pad shall be attached by wire clips to a 4-by-4-inch (100 mm by 100 mm) frame of 0.04-inch (1 mm) diameter wire.

Upon conclusion of testing, no flaming shall occur on the specific unexposed surface of a horizontally or vertically oriented fire-protective curtain assembly. Sustained visible flaming shall constitute a failure. For vertically oriented fire-protective curtain assemblies, the sample shall not permit the passage of hot gases sufficient to ignite the cotton pad. In addition, the movement of a vertically oriented fire-protective curtain assembly during or after the fire endurance test shall not be more than the clearances described in 18.2.1 through 18.2.3.

18.2.1 — Vertical through openings between the edge of the vertically oriented fire-protective curtain and a fixed curtain track (if employed) are limited to 3/8 inch (9.5 mm) wide maximum.

18.2.2 — Vertical through openings between the vertically oriented fire-protective curtain track (if employed) and the subassembly are limited to 3/8 inch (9.5 mm) wide maximum.

18.2.3 — Horizontal through openings between the bottom of the vertically oriented fire-protective curtain assembly and the simulated floor of the subassembly are limited to 3/4 inch (19 mm) wide maximum.

18.3 — Vertical through openings between the edge of the horizontally oriented fire-protective curtain and a fixed curtain track (if employed) are limited to 3/8 inch (9.5 mm) wide maximum.

18.4 — Vertical through openings between the horizontally oriented fire-protective curtain track (if employed) and a subassembly are limited to 3/8 inch (9.5 mm) wide maximum.

In conclusion, steel conduit and tubing are considered non-combustible by the building codes. They do not have fire ratings, but they are tested and often installed for fire-rated assemblies or use in emergency circuits.

