And Non-hazardous Locations

NEC changes allow companies to save with new alternative

‘The NEC permits ITC cable to be used in cable trays, raceways, hazardous locations, or as open wiring in specified circumstances.’‘Implementing cabled systems offers a simpler, less labor intensive installation, accelerating project cycle times.’ By Randy Durick and Karen Keller

Recent amendments to the National Electric Code (NEC) have permitted new and innovative methods for installing electrical equipment in both general purpose and classified locations, including modifications for cabling requirements. The addition of new cable types allows an alternative to traditional and more labor intensive installation methods like pulled wire and rigid metal conduit. When used with flexible wire management products like a wire basket cable tray, these new cable types greatly reduce the costs associated with the installation of electrical equipment.
One such cable, Type ITC cable (Instrumentation Tray Cable), provides a cost effective alternative for installation of low power instrumentation and control circuits. The NEC defines Type ITC cable and its permitted uses, which include ordinary (non&#151hazardous) and classified (hazardous) locations. These environments have specific installation requirements for electrical equipment, including requirements for cabling that passes between environments (from hazardous to non&#151hazardous locations). Traditionally, rigid metal conduit has been used to install instrumentation and control equipment, although ITC cables, along with other cables, are used in these environments due to the many benefits they provide.

Utilizing cables, like Type ITC cable, in hazardous and non&#151hazardous locations benefits users by decreasing costs associated with installation time, commissioning, and maintenance. By nature, systems using rigid metal conduit require more time to install because wires must be pulled and cut, and the conduit must be bent and fitted. Additionally, sealing and boundary fittings may be required in hazardous locations. This is generally not an issue when using cables, and those like Type ITC with quick&#151disconnects may not require precautionary measures (like sealing) to pass from hazardous to non&#151hazardous locations. Rigid metal conduit also requires hand wiring terminations, and is therefore more susceptible to human error, whereas pre&#151molded cables with quick&#151disconnects can be installed much more easily.

What is ITC cable?

Type ITC cable consists of two or more insulated conductors enclosed in a nonmetallic sheath, with or without grounding conductors for instrumentation and control circuits operating at up to 150 Volts and 5 Amps, per NEC (National Electrical Code) Article 727. This cable can be used as an alternative to conduit in many hazardous and non&#151hazardous environments, like those found in pharmaceutical industries, chemical plants and refineries. As with all cabling methods, the NEC requires that only qualified people service the installation, as they would notice if cables were damaged, understand associated hazards, and repair the installation.

Where can ITC cable be used?

The NEC permits ITC cable to be used in cable trays, raceways, hazardous locations, or as open wiring in specified circumstances. Also, per NEC rules, the insulation on the conductors must be rated for 300 Volts, and the conductors to be 22 AWG through 12 AWG. Using this insulation results in a smaller diameter cable that is more flexible and does not require Class II power supplies. Type ITC cable is required by the NEC to follow specified installation rules. For instance, ITC cable without a metallic sheath can be used outside of cable trays in specified circumstances. If mechanically protected, the cable can be dropped as much as 50 ft. out of the tray. ITC cable that meets the crush and impact requirements of Type MC (metal clad) cable can be dropped as much as 50 ft. out of trays without protection supported every 1.8 m (6 ft.). In addition, ITC cable with a continuous metallic sheath or aluminum tape can be installed as open wiring in or out of a cable tray supported every 1.8 m (6 ft.).

NEC permitted uses of ITC cable include installation in classified (hazardous) locations including those where fire or explosion may occur due to flammable gas, vapors or liquids. The NEC allows ITC cable to be used in Class I, Division 1 locations, along with the traditional practice of using threaded rigid metal conduit, and in Class I Division 2 locations per NEC 501.10. In Class II locations, permitted wiring methods include both ITC cable along with rigid metal conduit. Other locations where ITC cable can be used include Class III Division 1, Class I Zone 1, and other intrinsically safe locations. ITC cable may also be used for nonincendive field wiring to low&#151voltage, low&#151energy nonincendive circuit or equipment connections for Class I, Division 2 locations. As outlined by the NEC, wiring methods suitable for ordinary (non&#151hazardous) locations can be used for nonincendive field wiring. Seals are required in conduit and cable systems to eliminate the propagation of an explosion, or passage of flammable gases from hazardous locations to non&#151hazardous locations. Manufacturers use different sealing compounds for different applications, as compounds have different rates of expansion/contraction that may affect their performance within a given fitting. Even after the conduit is sealed, the NEC asserts that in hazardous locations it is nearly

impossible to make conduit joints gas tight due to temperature fluctuations that cause expansion/contraction and can allow gases and vapors to permeate the conduit resulting in an explosive mixture. If an explosion occurs, enclosures must be able to contain the explosion and minimize the passage of hot gases. Enclosures have been designed to withstand internal explosions so any explosive mixture outside the enclosure/conduit system could not be ignited. Assembly is equally important in these locations, since conduit must be constructed so that arcing between the conduit and enclosures does not occur, as this can also cause an explosion. Joints within the system must be wrench&#151tight at couplings, threaded hubs of junction boxes, conduit bodies (among other things) per NEC 501.10. Conduit entering and exiting an explosion&#151proof enclosure or pressurized enclosure requires that conduit to be sealed within 450 mm (18 in.) from the enclosure. Conduit must also be sealed within 450 mm (18 in.) when entering and exiting a hazardous area.

The ITC advantage

In explosion&#151proof protection schemes, employing ITC cable as a wiring method has many advantages over traditional threaded rigid metal conduit. Explosion&#151proof methods are utilized for numerous reasons, such as when point requirements or equipment dictate the protection scheme. The gastight/vaportight construction of Type ITC cable allows for usage in hazardous locations, and may not require seals or fittings when entering/exiting an enclosure or when traveling from hazardous to non&#151hazardous areas.
Boundary seals are also used to prevent gases or vapors from traveling within the enclosure from a hazardous location to a non&#151hazardous location, or between locations, i.e. from Division 1 to Division 2. Using ITC hazardous&#151rated cable may also eliminate the need for Class I, Division 1 & 2 boundary seals that are required when using conduit. This is due to the molded construction of the connector and the gas/vapor tight continuous sheath of the cable, and is consistent with NEC Article 501.5. Utilizing armored ITC cable can provide significant benefits when used in hazardous and non&#151hazardous locations, as there is no requirement for further mechanical protection. This metal&#151armored cable grounds itself and is rated for Open Wiring, making it particularly suitable for hazardous locations as allowed by the NEC. In the aforementioned locations/applications, cabled systems may eliminate the need for seals and simplify installations. To increase the benefits of a cabled system, quick&#151disconnect cables and glands (receptacles) may be used in hazardous locations. Field equipment can be specified with pre&#151terminated receptacles, simplifying installations, reducing field terminations, and eliminating errors associated with field terminations. To be used in Class I, Division 2 locations, guards requiring a tool for removal must be incorporated into the design of the quick-disconnects to render the connection "not normally arcing." Other wiring alternatives available include explosion&#151proof feed&#151throughs for Class I, Division 2 hazardous areas, eliminating the need for a poured seal, conduit or hand wiring. The feed&#151through installs directly in standard conduit entries, and is

used with quick&#151disconnect cables to eliminate field terminations. Whereas traditional explosion&#151proof protection schemes required numerous parts and were labor intensive to install, employing explosion&#151proof feed&#151throughs can eliminate many of these parts, and greatly reduce installation labor. When installed in conjunction with ITC rated cable, more time and cost savings can be experienced, along with streamlining systems in these locations.

Acceptable locations for wiring methods:

Implementing cabled systems offers a simpler, less labor intensive installation, accelerating project cycle times. Utilizing cabled systems also eliminates the need to seal conduit, which can also improve maintenance and installation time and reduce errors. ITC cables used with junction bricks that offer four or eight ports, with a choice of home&#151run quick&#151disconnect or integral home&#151run cable and associated receptacles, can provide an integrated, code&#151compliant wiring method that adds the benefits of quick&#151disconnects to the ITC installation concept.

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