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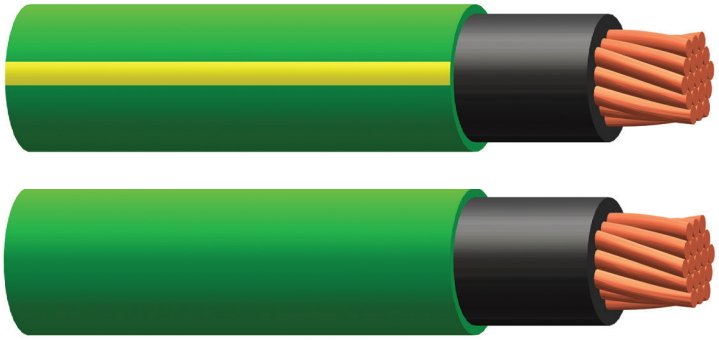
TECHNICAL ARTICLE

Choosing the Correct Grounding/Bonding Solution



The electrical industry has often incorrectly used a one product suits all solution for the supply of grounding/bonding cables, unaware of the electrical code requirements and safety risk implications. This paper clarifies the safety and code requirements related to the proper use of grounding conductors in cable trays. TW75 and RW90 cables are commonly used as insulated grounding cables. These selected cables may not meet CEC code requirements and may have created additional safety risks.

While cables rarely start fires, cables can be affected by fire from other sources. Improperly specified cables may propagate or grow those fires. Fire can often be quickly spread around an industrial site or from building to building via the cable trays. Industrial facilities have recognized these risks and have standardized on FT4 flame resistant cables as part of their safety/risk management policies.

There are many instances where a project will specify insulated grounding/bonding conductors. The preference is to use insulated grounds so that a fault does not carry from one piece of equipment via a bare ground to the cable tray or to another piece of equipment. Another benefit of using insulated grounds is to isolate the grounds so that electrical noise is not transmitted via "dirty grounds". Regardless of the reason for using insulated grounds, the addition of insulation to the conductor increases the fire hazard due to the fuel load contained in these combustible materials.

CEC rule 2-126 reads "Electrical wiring and cables installed in buildings shall meet the flame spread requirements of the National Building Code of Canada or local building legislation." This rule goes on to reference Appendices B and G which clarify that the National Building code requires FT1 for combustible construction and FT4 for noncombustible buildings and plenums unless the cables are totally enclosed in noncombustible raceways, masonry walls or concrete slabs.

Inspectors across Canada have increasingly become aware of the serious consequences of ignoring flame spread risks and are scrutinizing the improper use of insulated grounds in cable trays. An informal January 2011 survey of various Chief Electrical Inspectors across Canada confirmed that all cables including insulated grounds installed in cable trays in noncombustible buildings are required to be FT4. Some electrical inspectors stated that in their jurisdictions the grounds were often not inspected unless an issue was specifically addressed. This is quickly changing and electrical contractors now risk the expense of removal of improperly rated grounding cables if they do not pass inspection.

As per CEC 2-126, grounding cable selection is based upon Building Code requirements. FT1 is required for combustible construction and FT4 for noncombustible construction. Thermoplastic (PVC) insulated TW75 is allowed for use in cable trays but is typically only FT1 rated and is therefore not allowed for use in noncombustible construction. Thermoset (XLPE) insulated RW90 cables typically are neither FT1 nor FT4 rated. Common RW90 building wire is not allowed for use in a cable tray in either combustible nor noncombustible constructions.

Fire is always a serious safety concern on industrial sites, particularly in petrochemical operations due to their abundance of flammable materials and hazardous rated locations. Fires can cause extremely expensive shutdowns of portions of the facility with resulting capital damage and lost operation revenues. With oil production in the thousands of bbl/d at risk, production losses can translate into extremely large financial losses.

To best protect your facility, it is important to understand the CSA flame tests. The polymers used in typical cable insulations and jackets can be very high in fuel content and may burn intensely if flame retardants are not added. Without flame retardants, the high combustibility of cable insulations and jackets may cause fire to spread rapidly along cable trays.

Cable design and installation methods will affect flame propagation in a fire and CSA flame tests have attempted to incorporate some of these factors. In an FT1 flame test, a Bunsen burner flame is applied to a vertical sample for four 15 second applications. The sample must stop burning within 60 seconds and no more than 25% of a paper indicator can be charred.

The FT4 flame test is much more severe than an FT1 flame test. It is a vertical flame test where a 70,000 BTU/hr ribbon burner flame is applied at a 20 degree angle for 20 minutes to several cables strapped onto an 8ft vertical cable tray. The charred portion of cable must not exceed 1.5m. The FT4 flame test is a much better simulation of real life conditions that can be expected in an industrial fire.

Although FT1 cables are a significant safety improvement over cables with little or no flame retardants, FT4 tested cables are a superior choice. Grounding cables comprise a small volume of the cables in a typical cable tray, but they still contain a significant amount of fuel load that can't be ignored.

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Large industrial projects such as petrochemical facilities typically specify cables that carry an FT4 or better rating, such as Teck90, ACIC, CIC or TC. Industrial project owners have long realized the insurance of investing in flame resistant cables such as FT4 rated products, but overlook the flame ratings of the grounding conductors. This omission may have been due to a lack availability of FT4 rated grounding conductors in the past, but now they are readily available.

Why spend the extra money for the security of FT4 rated cables and leave the least expensive cables on your site, the grounding cables, as the weak point of the system? Make electrical safety code compliance your priority and specify FT4 cable tray rated grounding/bonding cables on all of your projects.

For more information on ShawFlex grounding cable solutions please visit www.shawflex.com or contact:

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