



Copper Development
Association Inc.
Copper Alliance

Specialty Cables



Introduction

Sometimes a standard cable doesn't quite fit the requirements of special applications. Engineers and designers often need to meet specific requirements that can be met only with specialty cabling. Several manufacturers offer that capability. Among them are [Draka Cableteq USA](#), [Pentair Thermal Management](#), [The Okonite Company](#) and [RSCC Wire & Cable](#).

Specialty cable applications might include areas where:

- hazardous materials are found
- fire hazards are found
- above average safety concerns are imperative
- critical circuits are required
- special capabilities are demanded

Applications such as:

- nuclear
- medical
- high-rise buildings and infrastructures
- petrochemical (shut-off valves, paging systems, fire pumps, emergency systems, fire alarms, field bus, extra flexible, mud-resistant, Variable Frequency Drive motors, high-temperature)
- transportation
 - automotive
 - locomotive: heavy and light rail vehicles, push-pull cars, high-speed trains, people movers
 - marine
 - aerospace
- Military installations and apparatus

Types of specialty cables that might be used:

- Circuit integrity (fire-resistant)
 - Mineral Insulated (MI)
 - Polymeric Insulated Cables
 - Metal Clad (MC)
 - instrumentation and control
 - sensors and communications
- Electronics
 - audio/video
 - USB
 - communication
 - flat cable
 - ribbon cable
 - extra flexible cable

- network wiring
- coax cable
- flexible printed circuits
- Commercial/military/industrial
 - Metal clad (MC) cables
 - probe cables
 - high voltage cables
 - ignition wiring
 - wiring harnesses
 - sensor cables (off-shore oil and gas well monitoring)
 - thermocouple wire and cable:
 - carbon composite curing for aircraft, aerospace and others, autoclaves, furnaces and ovens, heat treating and annealing for metal and metal parts production, precise temp measurement in pharmaceuticals-chemicals-petrochemicals, cryogenics, HVAC, automotive, food processing, appliances, sensors.
 - rig cables

There are stock cables designed to meet most of the above situations; however, unique applications may call for custom-fabricated cables. Additional information on meeting your particular cabling needs may be obtained by contacting the manufacturers listed above. Some of the more common specialty cables are readily available and are discussed below.

Fire-Resistive Cable

What do high-rise buildings, hospitals, historic buildings, tunnels, subways and other vital structures have in common? They all need fire-resistive wiring to keep them operational and smoke-free in their most vulnerable areas when fire breaks out. Common sense demands it and the National Electrical Code (NEC) requires it.

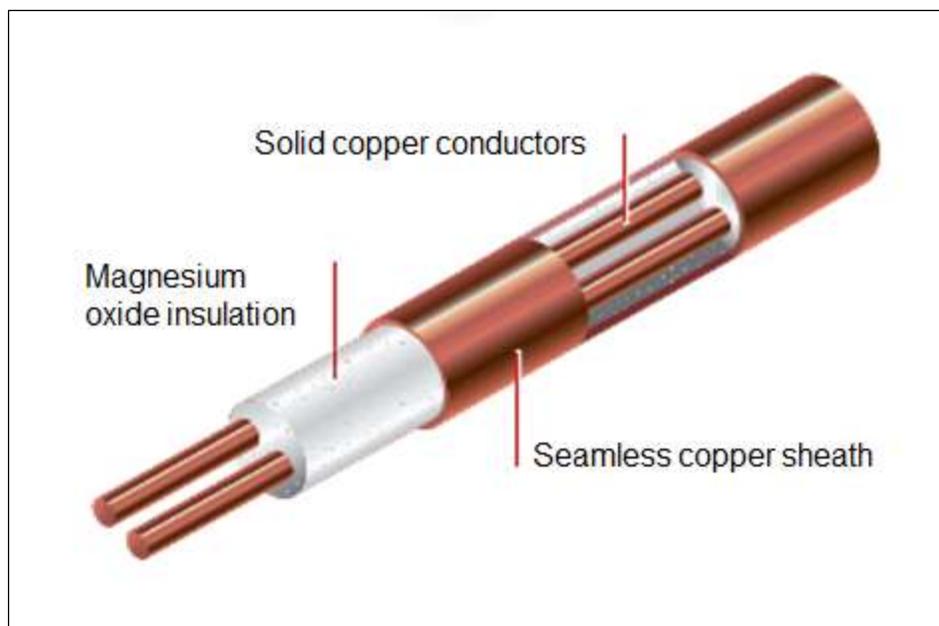
According to the NEC, wiring with a two-hour fire rating used for power feeds to fire alarms, fire pumps, fire-fighting systems, elevators, and extraction and pressurization fans must be kept intact and remain functional. That's also required where occupant mobility is limited and time must be allowed for egress, such as in hospitals and other institutions that care for people. Fire-rated wiring also offers enhanced protection for airports, railroads, data centers, and other critical applications.

All cables currently approved for these life-safety applications share one critical component - copper conductors. There are two basic cable types to consider for various applications: mineral insulated and polymer insulated.

MINERAL INSULATED CABLE

Mineral insulated (MI) cable uses an inorganic insulation of magnesium oxide, making it smokeless and highly effective. The conductors and sheathing are copper with a melting point of 1982°F (1083 °C), exceeding typical fire temperatures that might range anywhere from 300°F to 1,500°F (149 °C to 816 °C) MI cables are commonly fire-rated for two hours at 1,850°F (1,010°C), may contain from 1 to 19 conductors and may have a color-coded covering. The copper sheath effectively shields the cable's conductors from electromagnetic interference.

Note: *The NEC and the Canadian Electrical Code both require all fire-resistive cables to be listed by a third party, such as Underwriters Laboratories (UL).*



Typical Type FHJR mineral insulated (MI) power cable from Pentair Thermal Management meeting the interim UL-2196 standard with a two-hour rating.

In September 2012, Underwriters Laboratories and Underwriters Laboratories of Canada (ULC) formally advised all fire-resistive cable manufacturers that they are no longer authorized to place the UL mark or the ULC mark on the following products:

- UL Classified Fire Resistive Cable (FHJR)
- ULC Listed Fire Resistant Cable (FHJRC)
- UL Listed cable with the “-CI” suffix (Circuit Integrity)

This includes polymer insulated cable in zinc-coated conduit, because of inconsistent test results found with some polymer insulated cables.

UL also removed all Electrical Circuit Protective Systems constructed with Fire Resistive Cable (FHIT) from the UL Certifications Directory. These cables are referenced in NFPA 73, Articles 695, 700, 725, 760 and 800, among others. According to the International Association of Electrical Inspectors (IAEI), certification was retained for systems that use protective materials like intumescent wraps, tapes, composite mats, etc. Armored cable is not affected.

Shortly thereafter, UL conducted further examinations of MI cables because they utilize a different technology than polymer-insulated cables and are constructed of noncombustible, inorganic materials. The process included a detailed review of cable design and the manufacturing process, technical explanations of the critical design factors related to fire resistance, and the cable's performance in extensive fire tests. UL concluded that MI cables were not subject to the failure modes used in their research and, as a result, reinstated MI cables' fire-resistive rating in January 2013.

A joint technical committee of the Underwriters Laboratories in the USA and Canada is currently reevaluating their harmonized certification programs for power wiring used in fire-resistive and circuit-integrity systems. They anticipate completion of their work around mid-2014. A listing of cables which are currently certified to meet UL-2196/ and ULCS-139 under the interim certification program may be found at:

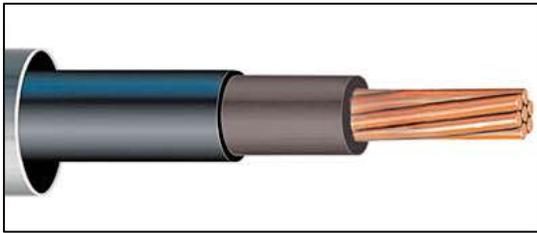
<http://www.ul.com/global/eng/pages/offerings/perspectives/regulator/fire/cables/>



Pyrotenax MI Cable System 1850 from Pentair Thermal Management for use in System No. FHIT.1850 when installed in accordance with manufacturer's installation instructions dated December 2012. Applications include fire alarm wiring as well as wiring for other for critical life-safety circuits in high-rise buildings, subways, tunnels, airports and health care facilities.

POLYMER INSULATED CABLES

There is a multitude of other fire-resistive, circuit-integrity cables especially manufactured for specific applications that are not affected by the UL and ULC suspension cited above. Such specialty cables are also used wherever there's a potential for fire and the need to keep critical circuits alive. Varieties of these cables can perform in petrochemical facilities, commercial and industrial processing, transportation (aerospace, airplanes, ships and other vehicles), electronic controls and instrumentation, freeze protection, snow and ice melting, as well as temperature sensing and instrumentation functions, and even nuclear applications, among others.



These cables typically use a polymer-based insulation. Cables sheathed in silicone rubber, cross-linked polyethylene, thermoset and other proprietary materials depend on copper conductors, too, for maximum reliability. The cables may be metal clad (armored) or not, as long as the cladding or conduit does not contain zinc and meets other

performance considerations. There is a wide variety of Code-compliant cables that are heat- and fire-rated for their specific applications.

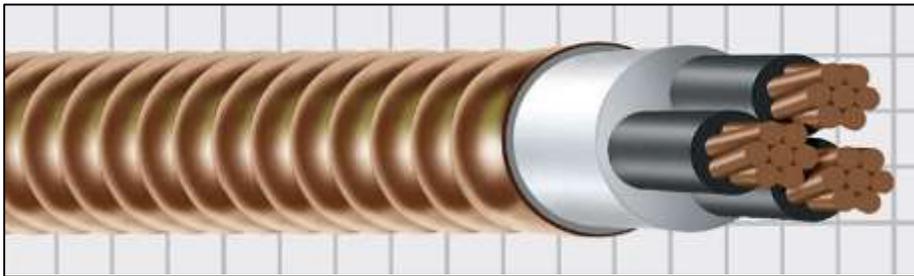


Type FR-XLPE/CSPE cables from RSCC Wire & Cable are able to endure the harsh and demanding environments associated with a variety of nuclear reactor types. It uses cross-linked polyethylene insulation.



Type RHW-2 from DRAKA CABLETEQ USA's Lifeline Series may be used with or without steel conduit in fire detection systems and signaling line circuits and communications. For use in System No. FHIT.25A when installed in accordance with the applicable sections of the NEC, NFPA 70. It has a two-hour rating.

Specialty copper cables can perform important tasks critical to your applications. Be sure you're using the right cable for the right application. Your manufacturer's rep should be able to steer you in the right direction. Finally, be sure it's Code-compliant, and be sure it's copper.



VITALink Type MC (metal clad) from RSCC Wire & Cable for use in System No. FHIT.120 when installed in accordance with manufacturer's

installation guide dated February 2013 and installation instructions revised February 2013. Meets circuit integrity requirements for Fire Pump and Emergency Systems cable applications with respect to NEC Articles 695 and 700; one-hour rating.

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