Update: UL and Survivable Cable

by Dean K. Wilson, P.E.

Question: **Has anything changed since you reported—in the last issue of *IMSA Journal*—on the loss of UL listing for survivable cables used in meeting the requirements of NFPA 72-2013, *National Fire Alarm and Signaling Code*®. We are planning a new high rise building fire alarm system. The cost of using some other method of survivable cabling seems excessive.**

Yes. Here are the latest changes.

On January 2, 2013, Underwriters Laboratories Inc.'s UL Regulatory Services issued an e-mail to the subscribers to their "ULtimateEmail/Safety Alert" service. In this e-mail, UL reports the following:

> As of December 21, 2012, UL and ULC have re-established certification of Fire Resistive Cables for use in Electrical Circuit Integrity Systems.

The e-mail then goes on to give hyperlinks to various UL webpages that describe a number of revised listing categories for survivable cables.

The first category of survivable cables for installation in accordance with NFPA 70, *National Electrical Code*®, UL has designated as "Electrical Circuit Integrity Systems (FHIT)." UL describes this category as follows:

Electrical Circuit Integrity Systems (FHIT)

> This category covers electrical circuit integrity systems consisting of components and materials intended for installation as protection for specific electrical wiring systems, with respect to the disruption of electrical circuit integrity upon exterior fire exposure.
>
> Ratings apply only to the entire system assembly, constructed using the combination of components and materials specified in the individual system. Components and materials are designated for use in a specific individual system for which corresponding ratings have been developed, and are not intended to be interchanged between systems. Ratings are not assigned to individual system components or materials.
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> Electrical circuit integrity systems are intended to be fastened to a concrete or masonry wall or a concrete floor-ceiling assembly. The fire rating of the wall or floor-ceiling assembly is intended to be equal to or greater than the rating of the electrical circuit integrity system. This is to ensure that the complete electrical circuit integrity system will survive during fire and hose stream exposure.

You should note that UL will treat this category as a "system" where all components and materials that make up the system will work in concert to provide the desired fire resistance. Each system will stand on its own. Components of one UL listed system will not work interchangeably with another UL listed system. Further, as the second paragraph indicates, these systems must fasten to a concrete or masonry wall or floor-ceiling assembly. By requiring the fastening of these systems to inherently fire resistive materials—concrete or masonry—the system derives part of its fire resistance characteristics from the concrete or masonry construction.

The second category of survivable cables for installation in accordance with NFPA 70, *National Electrical Code*®, UL has designated as "Fire Resistive Cables (FHJR)." UL describes this category as follows:

Fire Resistive Cables (FHJR)

> This category covers fire-resistive cable, which is insulated electrical cable intended for installation as specified in the individual electrical circuit integrity systems. This cable has been investigated for its ability to remain electrically functional during a fire exposure and after the impact, erosion and cooling effect of a water hose stream test. There are two hose stream levels: low impact and normal impact. The low-impact fog

> nozzle hose stream is applied only to cable marked with the "-CI" suffix. The normal-impact hose stream, applied with a standard-taper, smooth-bore playpipe, is applied to all other types of cable.
>
> There are two fire exposure conditions: normal temperature rise (same as ANSI/UL 2196, "Tests for Fire Resistive Cables") and rapid temperature rise (to ANSI/UL 1709, "Rapid Rise Fire Tests of Protection Materials for Structural Steel"). If not stated otherwise in the individual Classifications, the normal temperature rise exposure was used.
>
> This cable is required to comply with national requirements for electrical safety in addition to requirements related to its continued operation under fire exposure.
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> The cable as used in the specified systems has been investigated and found to comply with applicable electrical requirements.
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> The cable is intended to be installed in accordance with the provisions of ANSI/NFPA 70, "National Electrical Code," where indicated in the system, and the manufacturer's installation instructions.
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> Authorities Having Jurisdiction should be consulted before installation.

This second category applies to a cable assembly intended for installation in any type of building construction wherein the fire resistance derives from the materials and construction of the cable assembly itself without relying on any inherent fire resistance of the building construction materials. This category more nearly represents what the fire alarm industry has typically used as Type CI—circuit integrity—cable. You will note that the UL description of this category references two fire test standards. With regard to each of these, UL provides the following description:

Tests for Fire Resistive Cables
UL 2196

> 1 Scope
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> 1.1 The test method described in these requirements is intended to evaluate the fire resistive performance of electrical cables as measured by functionality during a period of fire exposure, and following exposure to a hose stream.
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> 1.2 To maintain the functionality of electrical cables during a fire exposure the cables are tested using a fire resistive barrier. The fire resistive barrier is the cable jacketing if the jacketing is designed to provide fire resistance. If the cable jacketing is not designed to provide fire resistance, the electrical cables are either placed within a fire

resistive barrier or installed within an hourly rated fire resistive assembly (see 1.4). Fire resistive cables intended to be installed with a non-fire resistive barrier (such as conduit) are tested with the non-fire resistive barrier included as part of the test specimen. Otherwise fire resistive cables incorporating a fire resistive jacket are tested without any barrier.

1.3 To demonstrate each cable's ability to function during the test, voltage and current are applied to the cable during the fire exposure portion of the test, and the electrical and visual performance of the cable is monitored. The cable is not energized during the hose spray, but it is visually inspected and electrically tested after the hose spray.

1.4 The functionality during a fire exposure of non-fire resistive electrical cables which are intended for installation within fire barriers or for installation within hourly rated fire resistive assemblies is determined by tests conducted in accordance with the UL Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems, Subject 1724.

1.5 Two fire exposures are defined: a normal temperature rise fire and a rapid temperature rise fire. The normal temperature rise fire is intended to represent a fully developed interior building fire. The rapid temperature rise fire is intended to represent a hydrocarbon pool fire. See 1.7.

1.6 Two hose stream exposures are defined: a normal impact hose stream and a low impact hose stream. The low impact hose stream is applied only to cable intended to contain the identifying suffix "CI" to identify it as CI cable in accordance with the Standard for Cables for Power-Limited Fire-Alarm Circuits, UL 1424, and in accordance with the Standard for Cables for Non-Power-Limited Fire-Alarm Circuits, UL 1425.

1.7 The fire exposure and hose stream tests are not intended to be representative of all fire conditions. Conditions vary with changes in the amount, nature, and distribution of fire loading: ventilation; compartment size and configuration; and heat conducting and dissipating characteristics of the compartment in which the fire resistive cable is installed. These requirements provide a relative measure of fire performance of comparable fire resistive cables under the specified fire exposure, hose stream and electrical conditions.

1.8 The results of these tests represent one factor in determining the acceptability of fire resistive cables for use in specific applications. Application of these test results to predict electrical performance of fire resistive cables in actual installations requires careful evaluation. This test method is not to be interpreted as having determined the acceptability of cables for use after fire exposure.

Rapid Rise Fire Tests of Protection Materials for Structural Steel
UL 1709

1 Scope

1.1 These requirements describe a test method measuring the resistance of protective materials to rapid-temperature-rise fires.

> 1.2 The test method covers a full-scale fire exposure, intended to evaluate the thermal resistance of protective material applied to structural members and the ability of the protective material to withstand the fire exposure.
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> 1.3 The test method also covers a small-scale fire exposure, intended to evaluate the ability of protective materials to withstand a variety of environmental conditions anticipated.

For any Canadian readers, Underwriters Laboratories of Canada has established its own ULC Standards to address this issue within the provinces: "Electrical Circuit Integrity Systems (FHITC)" and "Fire Resistive Cables (FHJRC)." These two ULC Standards contain requirements specific to the application of Type CI cable installed in conformance with the requirements of the *Canadian Electrical Code.*

UL has obviously moved very quickly to address the deficit created when they withdrew the listing of for all 2-hour rated cables and cable assemblies on September 12, 2012. Manufacturers will now have to resubmit their various cable assemblies for listing under these revised UL Standards. You should also recall that at the time they withdrew the listing, UL stated that because no data existed to prove that prior listed cables did not meet the requirements of the standards under which they were listed, the actions UL took would *not* affect the listing of all existing cables already installed. Furthermore, any cables listed under these standards that have already shipped to distributors and job sites will remain listed and will maintain the appropriate designation under the requirements of UL 2196.

To move forward on your high rise building project, you will need to contact your cable supplier to determine which manufacturers have resubmitted their cables for listing under the new/revised UL Standards. In the meantime, as stated above, if construction has begun on other high rise building projects or other construction projects that require the use of Type CI cable, you

can still use any of the Type CI cables that had already entered the distribution chain prior to UL withdrawing the listing of those products.

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