



# Electrical Connections

For regulatory authorities in the electrical inspection community.

## Reinforced Thermosetting Resin Conduit: Type RTRC *A new home in the code*

The 2008 edition of the National Electrical Code® (NEC®) includes a new Article 355 covering Reinforced Thermosetting Resin Conduit: Type RTRC. Does UL List Type RTRC conduit and, if so, for what type of application does UL evaluate this conduit?

Yes, reinforced thermosetting resin conduit (Type RTRC) is UL Listed. RTRC can be found under the UL product category for Reinforced Thermosetting Resin Conduit (DZKT/DZKT7). Guide Information is available on Page 103 of the 2007 UL White Book and on Page 250 of the 2007 UL Canadian White Book. This information can also be found on UL's Online Certifications Directory at [www.ul.com/](http://www.ul.com/) database. This type of conduit was originally Listed in the early 1980s for underground use only, but has now been additionally Listed for aboveground applications, if identified for that use.

Article 355 is new to the 2008 NEC, but RTRC is not new to UL or to the NEC.

This product has been mentioned in the NEC as early as the 1981 edition, where Section 347-1, covering rigid nonmetallic conduit, specifically noted fiberglass epoxy (now known as reinforced thermosetting resin) as a material "recognized as having suitable physical characteristics... ." In later editions of the NEC, this mention of suitable materials was relegated to a fine print note until the 1999 edition, where Table 347-9(B), covering the thermal expansion characteristics of RTRC (then known as fiberglass reinforced conduit), was added.

In an effort to clarify the NEC requirements for the numerous types of rigid non-metallic conduit covered in Article 352 (previously Article 347), a new Article 353 was created in the 2005 NEC for high density polyethylene conduit. Similarly, a new Article 355, specifically for RTRC, was created for the 2008 NEC. At the same time, Article 352 has been revised to delete the term "Rigid Nonmetallic Conduit," and instead, limit that article to

cover only "Rigid Polyvinyl Chloride Conduit: Type PVC."

The basic standards used to investigate products for use in the U.S. are ANSI/UL 1684, "Standard for Safety for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings," and ANSI/UL 1684A, "Standard for Safety for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings." For Canada, the basic standard used to investigate products is CAN/CSA No. 22.2 No. 211.3-96, "Reinforced Thermosetting Resin Conduit (RTRC) and Fittings." ANSI/UL 1684 and CAN/CSA No. 22.2 No. 211.3-96 are harmonized, and the requirements are technically identical for both countries.

UL 1684 was first published in 1993, although UL developed requirements and had Listings prior to this date. At the time, and as indicated above, RTRC was only

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## John Cangemi: Answer Man

**In the course of an inspection, sometimes I am able to find a UL Listing Mark on the industrial control panel for large HVAC equipment or industrial machinery, but I can't find a separate Listing Mark on the overall equipment. Does the Listing Mark on the industrial control panel cover the entire assembly?**

No. Industrial control panels are assemblies of two or more components such as motor controllers, switches, disconnecting means and motor branch circuit protective devices. They do not include the controlled loads, such as motors, luminaires, heaters or utilization equipment. If the Listing covers the overall system or assembly, a separate Listing Mark would be provided.

Guide Information for Industrial Control Panels (NITW/NITW7) can be located on Page 201 of the 2007 UL White Book and on Page 371 of the 2007 Canadian White Book. This information is also available in UL's Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database).

Industrial control panels bearing the UL Mark that are marked "Industrial Control Panel for Industrial Machinery" have also been investigated to verify that they meet the requirements of ANSI/NFPA 79, "Electrical Standard for Industrial Machinery," as well as Article 670 of the National Electrical Code® (NEC®).

Industrial control panels bearing the UL Mark for Canada that are marked "Industrial Control Panel for Industrial Machinery" have been investigated to determine that they meet the requirements of CSA-C22.2 No. 73, "Construction and Test of Electrically Equipped Machine Tools," and appropriate sections of the Canadian Electrical Code®, Part I.

Where uncertified equipment or systems have been installed, or when equipment has been modified in the field, UL offers Field Evaluation Services to investigate the equipment at the installation site. Field Evaluations are available for all installed equipment. Commonly requested field-evaluated products include:

- Industrial control equipment.
- Automated manufacturing, assembly and packaging equipment.



Industrial control panel mounted to HVAC equipment

- Luminaires, signs and display cabinets.
- Switchboards, panelboards and motor control centers.
- Heating, ventilating and air conditioning equipment.
- Commercial cooking and food service equipment.
- Distributed generation equipment.

UL's Field Evaluation Services may also provide a solution where a Listed industrial control panel has been installed, but an evaluation of the overall system (including loads or other equipment) will facilitate approval by the regulatory authority.

For further information regarding UL's Field Evaluation Services, please visit [www.ul.com/field](http://www.ul.com/field) or contact UL at +1-877-UL-HELPS (+1-877-854-3577), prompt #2.

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Listed by UL as being suitable for underground use. Requirements covering above-ground use were adopted in 1997, including additional testing for Resistance to Sag, Weather Resistance, and Flame Retardant Properties. RTRC Listed and identified as suitable for aboveground use is marked "AG," "Above Ground," or equivalent. RTRC marked as suitable for aboveground use is also suitable for underground use.

Standard UL 1684A covers aboveground (AG) extra heavy



Photo courtesy of FRE Composites (2005), Inc.

wall conduit, designated and marked as Type "XW." This conduit is suitable for use where exposed to physical damage in accordance with the NEC. It is also permitted to be used in Class I, Division 2 hazardous locations, in accordance with Section 501.10(B)(7) of the 2008 NEC.

For more information about reinforced thermosetting resin conduit (RTRC), contact George Walbrecht in Northbrook, IL, at +1-847-664-3126; or at [George.F.Walbrecht@us.ul.com](mailto:George.F.Walbrecht@us.ul.com).