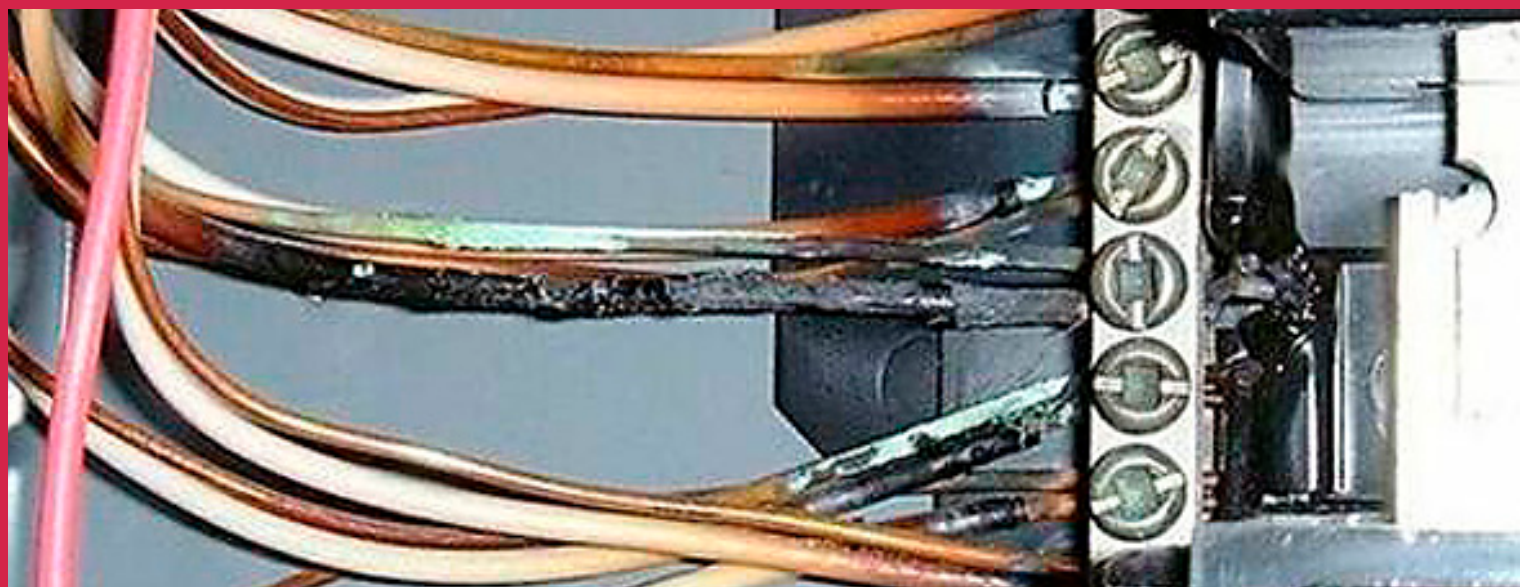




ELECTRICAL CONNECTIONS

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Electrical Connections

UL certified (Listed) wire connectors will provide a safe and reliable electrical connection when properly installed and torqued in accordance with the manufacturers installation instructions.

Electrical Connections are to be identified for the purpose and conditions of use.

The National Electric Code (NEC) section 110.14 addresses electrical connections. Due to the different characteristics of dissimilar metals, wire connectors are required to identify the type of conductor (such as copper, aluminum or copper-clad aluminum) for which they are intended and to be properly installed. Proper installation would include reviewing the installation instructions as well as any torque values identified either

on the wire connector or within the installation instructions. A majority of wire connectors as well as electrical equipment are marked with a torquing value.

Section 110.3(A) of the NEC states that while judging the suitability of electrical equipment, considerations such as the heating effects, arcing effects as well as any other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment are to be considered. When wire connectors are not matched with the applicable

conductor type and properly torqued, excessive heating and arcing are real possibilities. In addition, section 110.3(B) of the NEC requires the manufacturer's installation instructions be followed for listed equipment. This requirement is applicable wherever wire connectors or electrical equipment is marked with a conductor type and/or a torque value.

Annex I (Recommended Tightening Torque Tables from UL Standard 486A-B) is new to the 2011 NEC. Tables within Annex I provide information on torque values from UL 468A - 486B (Standard

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Electrical Connections (continued)

for Safety for Wire Connectors) and should only be used in the absence of a manufacturer's torque value either marked on the wire connector or identified within the installation instructions. If it should become necessary to use Annex I for field connections, the values in Column B would be the appropriate torque values to use.

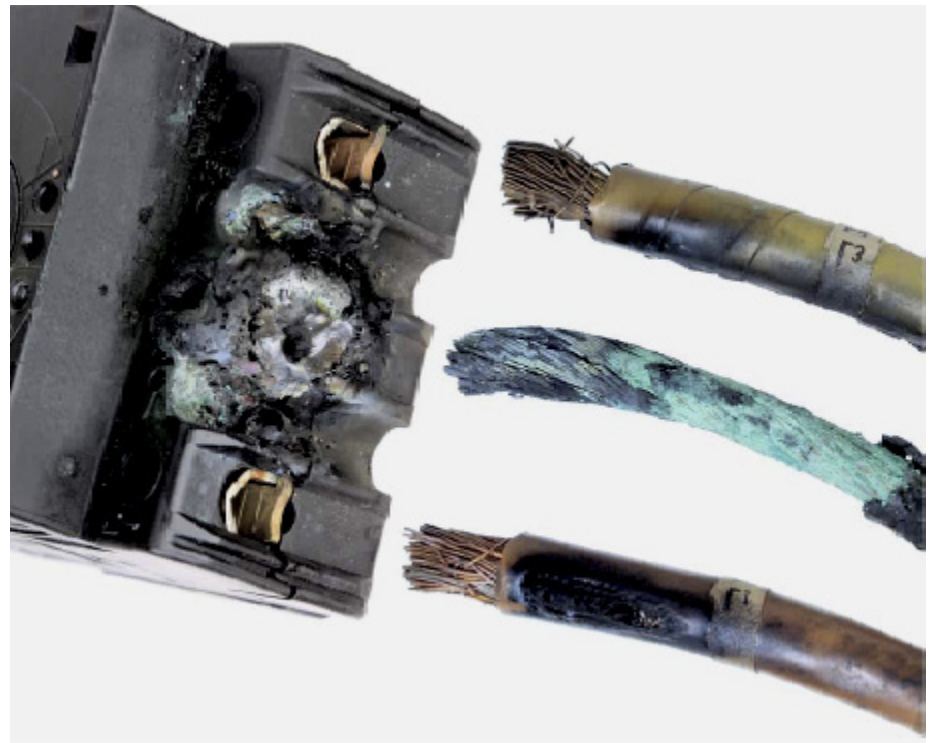
Listed Wire Connectors

Wire connectors are certified under the Wire Connectors and Soldering Lugs product category (ZMVV), which is located within the UL White Book or by accessing the **UL Online Certifications Directory**. This category covers single-polarity wire connectors for use with all alloys of copper, aluminum, or copper-clad aluminum conductors, or all three, for the purpose of providing contact between current-carrying parts.

When wire connectors are used as a part of service equipment, dead-front switchboards, panel boards, meter sockets, enclosed switches, circuit breakers, etc., reference should be made to the general information for those specific UL product categories concerning the use of the wire connectors and torque values.

Markings and Installation Instructions

The wire size, wire range or wire combinations are marked on the wire connector, or on or within the unit container. Wire connectors generally accommodate a single conductor under a clamping mechanism unless otherwise identified, such as with the number of conductors



located parenthetically in front of the wire size or range. Some wire connectors may have a single-conductor wire range as well as a second multiple-conductor wire range.

Wire connectors or the unit containers are marked with the type of conductor material that the wire connector has been evaluated for use with and may be marked with a torque value. However, the suitability of terminating aluminum or copper-clad aluminum conductors as well as the proper torquing value of the conductor within electrical equipment will be indicated by a marking on the electrical equipment and this marking is independent of any

marking on the actual wire connector. If a specific tool is necessary to assemble a wire connector to a conductor, it will be identified on the wire connector, or on or within the unit container of the connector. UL certifies crimp tools under UL product category ZMLS (Crimp Tools Classified for Use with Specified Wire Connectors).

Some wire connectors have instructions for the use of an antioxidant compound on or within the unit container. Depending on the wire connector, antioxidant compound may be required for both aluminum and copper conductors.

Summary

Wire connectors are intended for use in installations covered by the NEC, and should be installed using the prescribed manufacturer's installation instructions. Ensuring that the proper wire connector is

installed with the applicable conductor type, torqued to the manufacturers' value and the proper use of any special tools is essential for safe and reliable electrical connection.

For additional information on certified wire connectors, please contact Jeff Fecteau at Jeffrey.Fecteau@ul.com or at +1.952.838.5452.

Underground Feeder Cable Q&A

Q1) I was told by a wire manufacturer that a 12/2 with ground UF cable cannot be used inside a building. Is this true?

A1) UL Lists Type UF cable for use in accordance with Article 340 of the NEC. Section 340.6 specifies that Type UF cable shall be Listed. Consistent with Section 340.2, UL Lists Type UF cable in both single and multi-conductor versions.

Section 340.10 (4) specifies that where Type UF cable is installed as a substitute for Type NM or NMC cable, the installation and the conductor construction features shall comply with Parts II and III of Article 334. Additionally, the UF cable shall be of the multi-conductor type.

Section 340.112 indicates that when Type UF cable is installed as a substitute wiring method for Type NM cable, the conductor insulation shall be rated 90°C (94°F). Listed, multi-conductor type UF cables are permitted to include a “-B” suffix to indicate compliance.

In summary, for a Type UF cable to be eligible as a substitute for Type NM cable, it is necessary that the Type UF cable be:

- Listed
- A multi-conductor type
- Bear a “-B” suffix
- Be installed in accordance with the requirements of article 334

Q2) Since UF cable is a wet location cable, is it Listed to be embedded in plaster?

A2) With regard to Listed Type UF cable being permitted to be embedded in plaster, the 2011 NEC Section 340.10(6), permits such use if: the UF cable is of the single conductor Type, and is being used as the non-heating leads for heating cables as provided in Section 424.43.

Additional Information

UL Certifies (Lists) UF Cable under the UL product category code YDUX (Underground Feeder and Branch-Circuit Cables). This category covers single and multiple conductor underground feeder and branch-circuit cables, rated 600 V, in sizes 14 to 4/0 AWG copper, and 12 to 4/0 AWG aluminum or copper-clad aluminum. It is designated Type UF cable and is intended for use in accordance with Article 340 of the “National Electrical Code” (NEC).

Cable suitable for exposure to direct rays of the sun is indicated by tag marking and marking on the surface of the cable with the designation “Sunlight Resistant.”

Additional information on UF cable may be located in the UL White Book under product category YDUX or at UL’s Online Certification Directory www.ul.com/database, just enter YDUX in the UL category code field and then search. Any additional questions regarding the use of UF cable, please contact John Cangemi at John.J.Cangemi@ul.com or at +1.631.546.2852.

