

## EXPOSED RUN TRAY CABLES - U.S.

This Wire Wisdom addresses some of the most frequently asked questions regarding a supplemental rating for type TC, ITC and PLTC tray cables—the ER rating for cables used in exposed or extended runs.

### WHAT IS AN ER RATING?

In the 1990s, a new ER rating for unarmored but physically rugged instrumentation, control, and power tray cables was made possible by changes in NEC (National Electrical Code) and UL (Underwriters Laboratories) requirements. The new rating was created for Type TC (tray cables), Type ITC (instrumentation tray cables) and Type PLTC (power-limited tray cables). If these cable types meet certain additional crush and impact test requirements, UL permits the manufacturer to add an “-ER” suffix to the basic listing printed on the cable, i.e., “TC-ER”, “ITC-ER” or “PLTC-ER”.

The “-ER” signifies that the cable is sufficiently rugged to permit its use as extended run or exposed wiring. Exposed wiring is wiring that is not installed in a tray, conduit or other raceway. It is also sometimes referred to as open wiring.

### WHY THE INTEREST IN ER-RATED CABLES?

Tray cable types TC, ITC and PLTC are permitted in cable trays by the NEC. However, if more than 1.8 meters (6 feet) of cable is brought out of the tray for a connection to a motor or other electrical device, cables without an ER rating must be either armored (type MC) or be installed in conduit or some other type of raceway.

Cables with an ER rating, on the other hand, can extend outside the tray if given adequate protection and support. Thus, in some applications, the use of ER-rated cables can eliminate the cost of installing conduit between the tray and an electrical device or the cost of using armored cable.

### ER CRUSH AND IMPACT TESTING

Cables are required to meet crush and impact testing to be marked -ER. For the crush test, a cable is laid over a steel rod and a flat horizontal steel plate slowly crushes the cable on the rod. The cable passes the test if, at a particular crushing force, no contact is found between circuit conductors, and no contact is found between a circuit conductor and any shield or grounding conductors.

Passing the impact test requires withstanding the energy of a steel block dropped onto the cable laid over a steel rod without contact of circuit conductors. Momentary electrical contact between circuit conductors or between any circuit conductors and any shield or grounding conductors indicate an impact test failure.

### CABLE MARKINGS

The jacket of ER-rated tray cables must be marked (printed) with the letters “TC-ER”, “ITC-ER” or “PLTC-ER,” as appropriate for the specific cable. Industry codes and standards require the markings so that the electrical inspector at the job site can confirm the cable meets applicable requirements. Prior to 2005, exposed run cables were marked with the words “open wiring” instead of the “-ER” suffix.

### GROUNDING CONDUCTOR REQUIREMENTS

TC-ER constructions are required to have an equipment grounding conductor if the cable contains circuit conductors greater than 6 AWG. Cables containing circuit conductors 6 AWG and smaller can select an insulated conductor to use as the grounding conductor per 2017 NEC Section 250.119(B). This can be accomplished by stripping the insulation from the entire exposed length, coloring the exposed insulation green, or marking the exposed insulation with green tape or green labels. Cable types ITC-ER and PLTC-ER are not required to have an equipment grounding conductor.

### NEC REQUIREMENTS- SUMMARY

The NEC has several additional requirements that must also be met before ER-rated cables can be used in exposed runs. These include:

- Exposed runs are permitted only in industrial establishments where the conditions of maintenance and supervision ensure that qualified persons service the installation.
- The exposed run must be between a cable tray and equipment, such as a motor.
- Cables must be supported and protected against physical damage using mechanical protection such as struts, angles or channels.
- Cables must be secured at intervals not exceeding 1.8 meters (6 feet).