

Building Wire Types – Thermoplastic Insulation

Building Wire (sometimes referred to as “construction wire”) is usually rated 600 volts and includes some of the more common UL types: THHN, THWN, THWN-2, THW, THW-2, MTW, TW, TFN and TFFN which are thermoplastic insulated, and XHHW-2, USE-2, RHH and RHW-2 which are thermoset insulated. The conductor size of building wire typically ranges from #14 AWG up to 1000 kcmil. This Wire Wisdom addresses the thermoplastic types. Thermoset types are addressed in Wire Wisdom B-3.

THHN, THWN and THWN-2

Underwriters Laboratory (UL) Types THHN, THWN and THWN-2 building wires are used in residential, commercial and industrial buildings for general-purpose lighting, appliance, power, control and relay panel applications. These types of building wire may be installed in conduit, duct or other raceways. In some cases, one product (one part number) has two or more ratings — for example THHN/THWN. Type THWN can be installed in 75°C dry or wet locations. A wire with a combination THHN/THWN rating (most common), can be installed in 90°C dry or in 75°C wet locations. THWN-2 rated wire can be installed in 90°C dry or wet locations. Sizes 1/0 AWG and larger are suitable for cable tray use when identified with the optional UL marking “For CT Use”. The smaller diameter of these particular wires is appropriate for new work and rewiring applications, because it allows additional circuits or larger conductors to be installed in conduit, without exceeding maximum fill limitations. The insulation is a heat and moisture resistant polyvinyl chloride compound (PVC) that meets UL requirements. A nylon jacket applied over the insulation provides abrasion-resistance and has good resistance to acids, alkalis, chemicals, oil, gasoline and grease. The mechanical toughness of the nylon jacket is what allows the thickness of the PVC insulation to be reduced and thus permits a smaller overall diameter. The “T” in these wire designations stands for thermoplastic, the “H” for heat resistant, the “N” for nylon and the “-2” for a 90°C rating in both wet and dry locations.

THW and THW-2

UL Type THW and THW-2 building wires are also used in residential, commercial, and industrial buildings for general-purpose lighting, appliance, power, control and relay panel applications. These types of building wire may be installed in conduit, raceways, masonry or in direct contact with the earth. THW rated wire can be installed in 75°C dry or wet

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locations in accordance with the National Electrical Code (NEC). THW-2 rated wire can be installed in both 90°C dry or wet locations. The combination insulation/jacket is a heat and moisture resistant polyvinyl chloride compound (PVC) that meets UL requirements. The “W” in the designation stands for water-resistant.

MTW

Type MTW wire is used for wiring of machine tools, internal wiring of appliances and control circuits at voltages not exceeding 600 volts. This type of wire can be installed in 90°C dry or 60°C wet locations. The insulation is a heat and moisture resistant polyvinyl chloride compound (PVC) that meets the UL requirements. The letters “MTW” stand for machine tool wire.

TW

Type TW building wire is used in residential, commercial and industrial buildings for general-purpose lighting, appliance, power, control and relay panel applications. This type of wire may be installed in conduit, duct or other raceways. UL Type TW wire can be installed in 60°C dry or wet locations. TW rated building wire is also suitable for installations in ambient temperatures down to -10°C. The insulation is a heat and moisture resistant polyvinyl compound (PVC) that meets UL requirements.

TFN and TFFN

Type TFN and TFFN wires are recommended in most types of industrial and commercial applications where fixture wires are required. These types of wire can be installed in 90°C dry locations. The insulation is a heat resistant polyvinyl compound (PVC) that meets UL requirements. The nylon jacket is abrasion-resistant and has good resistance to acids, alkalis, chemicals, oil, gasoline and grease. The first “F” in the type designation stands for fixture wire, the second “F” for flexible.

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