

## WHAT IS WIRE?

A wire is a single, usually cylindrical, elongated string of drawn metal. Wires are used to bear mechanical loads and to carry electricity and telecommunications signals. Standard sizes are determined by various wire gauges. The term wire is also used more loosely to refer to a bundle of such strands, as in 'multi-stranded wire', which is more correctly termed a cable in electricity.

## WHAT IS SOLID v STRANDED?

**Solid wire or solid-core wire:** The standard for thermostat wire, solid conductors consist of one piece of metal wire and typically are easier to terminate than stranded wire. Solid single strand wire is often less expensive than stranded wire and is used where there is less need for flexibility in the wire. Solid wire also provides strength and protection against the environment. The nomenclature most common for Thermostat wire "SOL BC" meaning Solid Bare Copper.

**Stranded wire** is composed of a bundle of small-gauge wires wound together to make a larger conductor, which may optionally be insulated. Stranded wire is more flexible than a solid strand of the same total gauge. Stranded conductors are commonly used for electrical applications carrying small signals, such as computer mouse cables, and for power cables between a movable appliance and its power source; for example, sweepers, table lamps, powered hand tools, welding electrode cables, and trailing machine cables.

## WHAT IS AWG and Number of Conductors?

**AWG (Gauge)** AWG stands for American Wire Gauge and is represented by a number. 22 thru 12 gauge is most common. The smaller AWG number represents larger wire sizes. Utilize larger sizes for longer runs to combat power loss. Power loss should be calculated to determine the appropriate Gauge size for any application.

**Number of Conductors:** In the HVAC market, complex systems and multiple zones make 5, 6, 8, & 10 conductors most popular. In most wire/cable applications 2 & 4 conductor are used for less complex systems.

## WHAT IS SHIELDED v UNSHIELDED?

**SHIELDED:** Offers excellent protection against interference (EMI & RFI).

- **EMI (Electro Magnetic Interference):** Electrostatic sparks or spiking from motors, neon or fluorescent lighting ballasts, or any other sources that cause electrical noise. Shielded cables should be considered for installations in areas near dimmer panels and light switches, in parallel runs, near neon or fluorescent lights and near power cables.

- **RFI (Radio Frequency Interference):** Some frequencies used for radio communications have a tendency to become coupled onto conductors to produce RFI. Depending on the level of interference, shielded cables offer excellent protection against this common noise.

**UNSHIELDED:** Cost effective in areas where interference is not a concern.

## What Really Matters in Selecting the RIGHT Thermostat Wire? – Know your application.

Thermostat wire applications and ratings fall under the jurisdiction of the National Electric Code (NEC), specifically, NEC Article 725. This article applies to remote-control, signaling and power-limited circuits that are not an integral part of a device or appliance. Applications under this article carry requirements on the wire/cable that should be used. In all instances the Local Authority Having Jurisdiction (typically the Fire Marshall) has the final say as to the definition of the wiring space and the wire requirements for the installation.

### Understanding ratings: Plenum vs. Riser vs. General Purpose

**PLENUM RATED:** Plenum spaces are defined as any space used as return passage for environmental air (such as ducts). NEC Code states that all cabling not in conduit, installed in plenum spaces, shall be listed as having adequate fire-resistant and low smoke producing characteristics. This is intended to limit smoke or flame traveling to adjacent rooms/spaces in the event of a fire.

Beware of imitation wire or cable that are "plenum-listed" or "plenum-approved". All listed and classified wires/cables must be identified every 24 inches with printing on the jacket or internal marker tape.



The illustration shows a plenum air space. In this case, you must use plenum-rated wires above the ceiling.

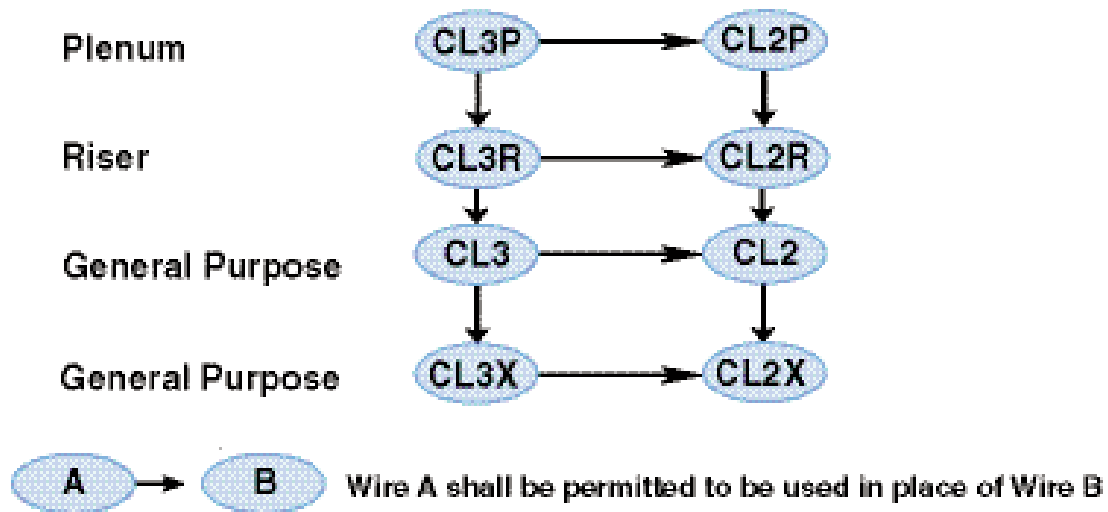
**RISER RATED:** Riser rating a NEC requirement for wire installations penetrating more than (1) floor and primarily used in commercial applications with vertical wire runs. NEC Article 725.154.B.3 allows for general purpose cables to be used in one- and two-family dwellings as opposed to riser rated cables.

**GENERAL PURPOSE:** "Non-Plenum" This is the most prominent wire utilized for HVAC wiring applications. For most residential applications, general purpose wire is the norm.

### When in Doubt? ...Cable Substitution Hierarchy

It is always best to check with the Authority Having Jurisdiction when you are unsure of the wire type to use in an application. However, choosing the most "robustly" rated wire/cable is typically a safe choice for most situations.

General rules in wire selection: Plenum wire usage trumps Riser wire usage which trumps General Purpose wire usage. Class 3 wire usage trumps Class 2 wire usage.



### MINI Split wire installations:

Mini-split installers and HVAC contractors looking to save on labor costs while meeting local codes for mini-split sub-power feeds have the choice between traditional installations including conduit and wire pulls or mini-split wire and cables rated at 600v that can save on the frustration of conduit. There are multiple options available for mini-split cables today. First is a MC (metal clad) mini-split cable consisting of UL listed THHN soft drawn annealed solid copper conductors, cabled with fillers and wrapped with an overall solid ribbed sheath. The continuous sheath provides watertight protection and is covered with a PVC outer jacket for outdoor use or direct burial. When shielding is an important component to your installation the second option in mini-split cables is a viable choice. Compact 600v shielded cables provide the power and control required for mini-split installations while protecting against EMI and RFI interference from the equipment. Regardless of your choice, it is important to ensure that the cables you choose for a mini-split wiring application meet or exceed the requirements of NEC article 330 in your efforts to save on installation costs.