# SECTION 260519 WIRES AND CABLES LESS THAN 600 VOLTS

## PART 1 - GENERAL

A. Description

This section describes materials and installation of wires and cables rated 600 volts and below.

B. Related Work Specified Elsewhere

1. General Electrical Requirements: 260500.

2. Grounding and Bonding: 260526.

C. Submittals

1. Submit shop drawings in accordance with the General Conditions and Section 260500.

2. Submit material list for each conductor type. Indicate insulation material, conductor material, voltage rating, manufacturer, and other data pertinent to the specific cable, such as shielding, number of pairs, and applicable standards.

## PART 2 - MATERIALS

A. Low-Voltage Building Wire

1. Conductor material shall be copper.

2. Low-voltage building wire for use at 600 volts or less shall be 600-volt insulated, Type XHHW or THWN, and rated for continuous operation at 75°C.

3. Use No. 12 AWG minimum conductor size for power and lighting circuits.

4. Use No. 14 AWG minimum conductor size for control circuits.

5. Conductors for lighting and receptacle circuits that are No. 10 AWG and smaller shall be solid. All other conductors shall be stranded.

B. Twisted-Shielded Cable

Single-pair cables shall be two No. 18 AWG and single triads shall be three No. 18 AWG stranded tinned-copper conductors individually insulated with fully color-

coded PVC rated at 600 volts; insulated conductors twisted together and shielded with a spiral-wound metal foil tape overlapped for 100% shielding. Outer jacket shall be PVC.

C. Grounding Conductors--Bare Copper

Refer to Section 260526 for bare copper grounding conductors.

D. Conductor Tags

Provide self-extinguishing heat-shrink individual or sleeved, nonmetallic, snap-on type. Grafoplast, Phoenix Contact, Thomas & Betts sleeve markers, or equal.

E. Plastic Adhesives

Plastic adhesives for color coding shall be 7-mil minimum thick, flame-retardant, weather-resistant tape, resisting abrasion, UL rays, moisture, alkalies, solvents, and acids. Adhesives shall meet the requirements of UL 510 and CSA C22.2.

PART 3 - EXECUTION

A. Low-Voltage Building Wire Installation

1. Install wiring and cable in conduit and terminate unless otherwise noted.

2. To reduce pulling tension in long runs, coat cables with pulling compound recommended by the cable manufacturer before being pulled into conduits.

3. Remove debris and moisture from the conduits, boxes, and cabinets prior to cable installation.

4. Group conductors No. 1/0 and smaller in panelboards, cabinets, pull boxes, motor control centers, and switchboard wireways; tie with plastic ties; and fan out to terminals. Lace conductors No. 2/0 and larger with marline.

B. Identification

1. Color Coding of Low-Voltage Building Wire: Provide color coding throughout the entire network of feeders and circuits as follows:

| Phase | 240/120 Volts | 240 Volts |
|---|---|---|
| Phase A | Black | Black |
| Phase B | Red | Red |
| Phase C | --- | Blue |
| Neutral | White | White |
| Ground | Green | Green |

2. Phase conductors No. 10 AWG and smaller and neutral/ground conductors No. 6 and smaller shall have factory color coding with solid color insulation. Do not use onsite coloring of ends of conductors or apply colored plastic adhesives in lieu of factory color coding. Larger conductors may have onsite application of colored plastic adhesives at ends of conductors and at each splice.

3. Control wires shall have colored insulation. Separate color codes for each wire shall be provided in each conduit that has up to seven wires. Conduits with more than seven wires shall have at least seven types of colored insulation.

4. Tagging of Conductors: Tag control wires and instrument cables in panels, pull boxes, wireways, and at control device. Tag control wires and instrument cables with same wire numbers as on the shop drawing submittals. Tag power wires in pull boxes and wireways where there is more than one circuit. Tag power conductors with motor control center or panelboard number and circuit numbers.

C. Low-Voltage Wire Splices

1. Solid Conductors: Use 3M "Scotchlok," Ideal "Super Nut," Buchanan B-Cap, or equal. Seal splices in underground handholes and pull boxes and in light poles with individual sealing packs of Scotchcast Brand 400 Resin or equal.

2. Stranded Conductors No. 8 and Larger: Use T & B "Locktite" connectors, Burndy Versitaps and heavy-duty connectors, O.Z. solderless connectors, or equal.

3. Stranded Conductors No. 10 and Smaller: Use crimp connectors with tools by same manufacturer and/or UL listed for connectors of all stranded conductors.

4. Retighten bolt-type connectors 24 to 48 hours after initial installation and before taping. Tape connections made with noninsulated-type connectors with rubber-type tape, one and one-half times the thickness of the conductor insulation, then cover with Scotch 33 tape.

D. Low-Voltage Wire Terminations

1. Terminate wires and cables at each end.

2. Provide ring tongue, nylon- or vinyl-insulated copper crimp terminals for termination on screw-type terminals, except for light switches and receptacles. Utilize installation tools recommended by the crimp manufacturer.

3. Terminal lugs shall be electro-tin plated copper compression type or spring compression type with a corrosion protection coating. Provide color-coded system on terminal and die sets to provide the correct number and location of crimps. Permanent die index number shall be embossed on completed crimp for inspection purposes.

4. Tighten screws and bolts to the value recommended by the manufacturer.

E. Field Testing

1. Perform insulation resistance test on all circuits and feeders with No. 10 size conductors and larger. Utilize a 1,000-volt d-c megohmmeter for 600-volt insulated conductors.

2. Test each complete circuit prior to energizing. Insulation resistance between conductors and between each conductor and ground shall not be less than 25 megohms. Repair or replace wires or cables in circuits that do not pass this test and repeat the test.

3. Evaluate ohmic values by comparison with conductors of same length and type.

4. Inspect shielded cables for proper shield grounding, proper terminations, and proper circuit identifications.

5. Inspect control cables for proper termination and proper circuit identification.

END OF SECTION