

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections, 600V and below.

1.2 REFERENCES

- A. NECA (National Electrical Contractors Association) – Standard of Installation.
- B. NETA ATS (International Electrical Testing Association) – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS:

- A. Product Data: Submit for building wire
- B. Test Reports: Indicate procedures and values obtained.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Materials: Materials shall be new and shall be delivered to the job site in the original packaging.
- B. Wire and Cable: All wire and cable shall be delivered to the job site in unbroken packages.

1.6 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned.

## 1.7 SYSTEM DESCRIPTION

A. Product Requirements: Use products as follows:

1. Use stranded conductor for feeders and branch circuits
2. Use stranded conductors for control circuits
3. Use conductor not smaller than 12 AWG for power and lighting circuits
4. Use conductor not smaller than 14 AWG for control circuits

B. Wiring Methods: Use wiring methods indicated and as follows:

1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway or type MC cable with type THHN/THWN insulated conductors.
2. Exposed Dry Interior Locations: Use only building wire, Type XHHN or THHN/THWN insulation, in raceway.
3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation, in raceway or type MC cable with type THHN/THWN insulated conductors.
4. Wet or Damp Interior Locations: Use only building wire, Type XHHW or THWN or THWN2 insulation, in raceway.
5. Exterior Locations above grade: Use only building wire, Type XHHW THWN or THWN2 insulation, in raceway.
6. Underground Locations: Use only building wire, Type XHHW/THWN or THWN2 insulation, in raceway.
7. Encased in concrete: Use only building wire type XHHW/THWN insulation in raceway or type MC cable suitable for concrete encasement.

## 1.8 FIELD MEASUREMENTS

A. Verify field measurements are as indicated

## 1.9 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and approximate routes of conductors.

B. Section 01700 – Closeout and Turnover Procedures

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Product Description: Single conductor insulated wire #12 and larger, type THHN/THWN or XHHW U.L. listed for the application.

B. Conductor: Copper

C. Insulation Voltage Rating: [600] [300] volts

D. Insulation Voltage Rating: 600 volts

2.2 WIRE CONNECTORS

A. Split Bolt Connectors:

1. Tin-plated, high strength copper alloy connector with spacer. Spacer separates dissimilar conductors and provides long contact length to prevent high pressure point contacts. Burndy type KSU or equal

B. Solderless Pressure Connectors:

1. Polyvinylchloride insulated tin plated, ring or fork tongue type with 105 degree C. 600V max insulation color coded for the wire size used.

C. Spring Wire Connectors:

1. Insulated, 105 degree C, electrical spring connector of three part construction incorporating a non-restricted, zinc-coated steel spring enclosed in a steel shell with a outer jacket of vinyl plastic with a flexible insulating skirt.

C. Compression Connectors:

1. Heavy duty, 600V high-conductivity seamless electrolytic wrought copper electro-tin plated to prevent corrosion. Color coded to match compression die sets to provide correct location and quantity of crimps. Die embossment to indicate die used.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather
- B. Verify that mechanical work likely to damage wire and cable has been completed
- C. Verify that raceway installation is complete and supported.

### 3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

### 3.3 INSTALLATION

- A. Route wire and cable as required to meet Project conditions.
- B. Install wire and cable in accordance with the NECA “Standard of Installation.”
  - 1. All aspects of splicing and terminating shall be in accordance with cable manufacturer’s published procedures.
  - 2. All splices in outlet boxes with connectors as specified herein shall be made up with separate tails of correct color. At least six (6) inches of tails packed in box after splice is made up shall be provided.
- C. Neatly train wiring inside boxes, equipment, and panel boards.
- D. Identify each conductor with its circuit number or other designation indicated.
  - 1. All branch-circuits shall be securely tagged, noting the purpose of each. Conductors shall be marked with vinyl wrap-around markers. Where more than two conductors run through a single outlet, each circuit shall be marked with the corresponding circuit number at the panelboard.
  - 2. Conductors size #6 AWG and larger shall be color-coded using specified phase color markers and identification tags.
  - 3. All terminal strips shall have each individual terminal identified with specified vinyl markers.
  - 4. All junction box cover plates shall be identified via felt-tip pen or decal label, denoting the panel and circuit numbers and voltage contained in the box.
  - 5. All receptacles and switches shall be decal labeled on the plate, denoting the panel and circuit number.

E. Special Techniques – Building Wire in Raceway:

1. Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors such that insulation is not damaged. UL approved pulling compounds shall be used as needed.
2. All cables shall be installed and tested in accordance with manufacturer's requirements and warranty.

F. Special Techniques – Wiring Connections:

1. Clean conductor surfaces before installing lugs and conductors
2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
3. Insulate uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor or with pre-manufactured components such as heat-shrink or cold-shrink devices.

G. Connections to Circuit Breakers, Switches, and Terminal Strips; Stranded Copper Conductors:

1. #12 through 8 AWG: Wire shall be terminated in locking tongue style, pressure type, compression lugs, unless clamp type connection for stranded conductor is provided with device.
2. #6 AWG and larger: Wire shall be terminated in one-hole flat-tongue style, compression type lugs, or by connectors supplied by the manufacturer.

H. Joints in Wires in Dry Locations, Copper Conductors:

1. #8 AWG and smaller: Wires shall be twisted and secured with cap or twist-on, expandable spring type solderless connectors.
2. #6 AWG and larger: Wire shall be joined with split bolt connectors or compression sleeves. Joints shall be insulated with rubber tape and protected with half-lapped layers of vinyl plastic electrical tape. Insulation may also be provided by UL listed pre-manufactured components such as heat-shrink or cold-shrink devices.

I. Joints in Wires in Moist Locations, Copper Conductors:

1. #8 AWG and smaller: Wire shall be securely joined as specified above, then encapsulated in epoxy (Scotchcast or approved equal)
2. #6 AWG and larger shall be joined as specified above, and suitably water treated.
3. Signal, Automation and Fire Alarm: Conductors shall be joined by approved connectors and waterproofing materials. Fire alarm wire junctions per Section 16721, Fire Alarm Systems.

### 3.4 WIRE COLOR

#### A. General

1. For wire sizes 10 AWG and smaller – wire shall be colored as indicated below.
2. For wire sizes 8 AWG and larger – identify wire with colored tape at all terminals, splices and boxes. Colors to be as indicated below.
3. Use black or red for single phase circuits at 120/240 volts, use black, red, and blue for circuits at 120/208 volts single or three phase and use, brown purple and yellow for circuits at 277/480 volts single or three phase.

B. Neutral Conductor: White. Where there are two or more neutrals in one conduit, each shall be individually identified with the proper circuit.

C. Branch Circuit Conductors: Three or four wire home runs shall have each phase uniquely color coded.

D. Feeder Circuit Conductors: Each phase shall be uniquely color coded.

E. Ground Conductors: Green for 6 AWG and smaller. For 4 AWG and larger, identify with green tape at both ends and all visible points included in all junction boxes.

### 3.5 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4

B. Perform inspections and test listed in NETA ATS, Section 7.3.1.

C. Distribution Conductors 600 Volt Class: All 600 volt class conductors shall be tested to verify that no short circuits or accidental grounds exist. Test shall be made using an instrument which applies a voltage of approximately 1000 volts to provide a direct reading in resistance (Megger).

END OF SECTION