

ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; and wiring connectors and connections.
- B. Related Sections:
 - 1. Division 26 - Identification for Electrical Systems: Product requirements for wire identification.
 - 2. Division 31 - Trenching: Execution requirements for trenching required by this section.
 - 3. Division 31 - Fill: Requirements for backfill to be placed by this section.

1.02 REFERENCES

- A. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
 - 1. ANSI/NFPA 70 - National Electrical Code/California Electrical Code.
 - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- C. Underwriters Laboratories, Inc.:
 - 1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
- D. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown

1.03 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
 - 1. Install products in accordance with manufacturer's instructions.
 - 2. Solid copper conductor for feeders and branch circuits 12 AWG and smaller and stranded copper conductor for #10 AWG and larger.
 - 3. Stranded conductors for control circuits.
 - 4. Conductor not smaller than 12 AWG for power and lighting circuits.
 - 5. Conductor not smaller than 16 AWG for control circuits.
 - 6. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet, minimum for home run.
 - 7. 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet, minimum.
- B. Wiring Methods: Provide the following wiring methods:
 - 1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
 - 2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.

3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation, in raceway.
4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
5. Exterior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
6. Underground Locations: Use only building wire, Type THWN-2 insulation, in raceway.
7. Use wiring method as required to complete the work.
8. All conductors shall be copper. UON.

1.04 DESIGN REQUIREMENTS

- A. Conductor sizes are based on copper.

1.05 SUBMITTALS

- A. Division 01 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Provide for each building wire and each cable assembly type.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements

1.06 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of components and circuits.

1.07 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.
- B. Perform Work in accordance with standard.
- C. Maintain one copy of each document on site.

1.08 QUALIFICATIONS

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

1.09 COORDINATION

- A. Division 01 - Administrative Requirements: Requirements for coordination.
- B. Wire and cable destination is determined by the Design/Builder and routing is not shown. Do not use lengths shown on schedules.
- C. Determine required separation between cable and other work.
- D. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.01 BUILDING WIRE

- A. Conductor: Copper.

- B. Insulation: Voltage Rating: 600 volts.
- C. Insulation Temperature Rating: Minimum 75 degrees C.

2.02 WIRING CONNECTORS

- A. Solderless Pressure Connectors
- B. Spring Wire Connectors
- C. Compression Connectors
- D. Wagos

2.03 TERMINATIONS

- A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.
- B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

2.04 ARMORED CABLE (TYPE AC-HCF)

- A. Manufacturers: AFC, Alflec or Equal.
- B. Description: ANSI/NFPA 70, Type AC. Approved for health care facility use HCF-90.
- C. Conductor: Copper
- D. Insulation Voltage Rating: 600 volts
- E. Insulation Temperature Rating: 90 degrees C

PART 3 EXECUTION

3.01 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify interior of building has been protected from weather.
- C. Verify mechanical work likely to damage wire and cable has been completed.
- D. Verify raceway installation is complete and supported.

3.02 INSTALLATION

- A. Route wire and cable to meet Project conditions.
- B. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- C. Identify and color code wire and cable under provisions of Division 26.
- D. Special Techniques--Building Wire in Raceway:
 - 1. Pull conductors into raceway at same time.

- E. Special Techniques - Cable:
 - 1. Protect exposed cable from damage.
 - 2. Support cables above accessible ceiling, per 26 05 29 Hangers and Supports for Electrical Systems.
 - 3. Use suitable cable fittings and connectors.
- F. Special Techniques - Wiring Connections:
 - 1. Clean conductor surfaces before installing lugs and connectors.
 - 2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
 - 3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
 - 4. Install high compression type split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
 - 5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
 - 6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- G. For stranded conductors of branch circuits. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.
- H. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs for groundbus to copper bus bars.

3.03 HCF CABLE

- A. HCF cable is acceptable for concealed normal power branch circuit only.
- B. Do not use HCF cable in surgery, pre-op, recovery, diagnostic and treatment lab, central sterile, mechanical, electrical rooms and similar areas.

3.04 WIRE COLOR

- A. General:
 - 1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
 - a. Black and red for single phase circuits at 120/240 volts.
 - b. Black, red, and blue for circuits at 120/208 volts single or three phase.
 - c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.
 - 2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
 - a. Black and red for single phase circuits at 120/240 volts.
 - b. Black, red, and blue for circuits at 120/208 volts single or three phase.
 - c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.

- E. Ground Conductors:
 - 1. For 6 AWG and smaller: Green.
 - 2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.05 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION