

SECTION 26 05 19 - CONDUCTORS AND CABLES

PART I - GENERAL

1.1 RELATED DOCUMENTS

- A. *Section 26 05 33 - Raceways*
- B. *Section 26 05 34 - Low Voltage Raceways*

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Copper Conductors:** All wire and cable shall have copper conductors with minimum of 98 percent conductivity, except for overhead service conductors which operate at less than 600 volts.
- B. **Overhead Service Conductors:** Overhead service conductors operating at less than 600 volts may be appropriately sized aluminum with waterproof connections. Overhead service conductors shall be in a triplex or quadraplex configuration with a messenger of adequate strength for wind loading and span.

2.2 FIRE ALARM CONDUCTORS AND CABLES

- A. **McCulloh Loop Fire Alarm Box Circuits:** For fire alarm master box circuits, cable shall be UF-B, 12 AWG, 2 conductor solid, with ground, and be rated for operation at 600 volts.
- B. **Fire alarm system initiating circuits:** Type TFFN stranded wire at least size 18AWG, but no larger than 14 AWG THHN. Solid wire shall not be permitted.
- C. **Fire alarm system notification appliance circuit (NAC) wiring:** Type THHN stranded wire size 14 AWG. Solid wire shall not be permitted.
- D. **Where approved jacketed cable is used,** conductors shall be stranded and sized in accordance with 2.2(B) and 2.2(C) of this section.

2.3 OUTDOOR CABLE

- A. **Outdoor:** All exterior cable shall be dual rated type RHW-2/USE-2. All conductors shall be installed in conduit or duct. Cable shall be 600 Volt rated. Cable shall comply with U.L. 44 (for Type RHW-2) and U.L. 854 (for Type USE-2). Cables shall be rated for use at 90°C in both wet and dry locations and be suitable for use in conduit, underground service entrance cable and direct burial applications.
- B. **Minimum Size:** Minimum size for all outdoor underground conductors shall be 6AWG stranded.
- C. **Splicing and Terminating:** All outdoor splices and terminations shall be by UL Listed means, rated for wet locations and/or direct-buried use.
- D. **Street Lighting Cables:** For street-lighting only, direct-buried UF-B cable with ground wire can be used. UF-B Cables shall not be direct buried under parking lots.

2.4 INDOOR CABLES AND CONDUCTORS

- A. Indoor Cables and Conductors shall be THHN/THWN-2, or XHHW-2; installed in conduit; for services, feeders, and branch circuits, as specified in the National Electrical Code. Voltage rating for all applications is 600 volts. Temperature rating in wet or dry locations of 90° C.
- B. Minimum size shall be 12AWG.
- C. Conductors that are 10AWG or larger shall be stranded construction.

2.5 SIGNAL CABLE

- A. Campus Signal System: Signal cable is for extension of the campus signal system between buildings and shall not be confused with cables necessary for the Campus Telecommunication system. This multi-paired cable shall be installed in enclosed raceways inside buildings. Wye splices and splices in duct runs are not allowed.
- B. Extensions of the Campus Signal System: Shall be accomplished with telephone type cable rated for installation in underground duct and manholes.
 - A. 25 Twisted Pairs: Cable shall have a minimum of 25 twisted pairs of standard telephone industry color coded conductors, overall shield, solid number 22 AWG copper conductors, minimum insulation rating of 300 volts, and overall PVC proof jacket.
 - B. Through Manholes: Where cable passes through manholes, it shall be placed on racks around the wall of the manhole. Splices shall be located on racks at the top of the manhole. Signal Cable shall be secured to manhole racks with plastic cable ties.

2.6 VARIABLE FREQUENCY DRIVE CABLE

- A. Conductors between a VFD and the motor shall be a Tray Cable rated assembly of 3 phase conductors, 3 symmetrical full-size equipment ground conductors, and an overall spiral copper tape shield providing 100% shielding.
- B. Installation: VFD cable shall be installed in raceway. Proper cable bending radius requirements must be followed to avoid damage to the cable. All cables must be installed and terminated per manufacturer instructions.
- C. Installation of 6' or less: By permission, (from U of I Engineering Quality Assurance Department or the Electrical Inspector), VFD cable runs of 6 feet or less can be run without raceway, if Armored VFD cable is used, with UL listed termination fittings.
- D. Listings. Cable shall meet the following standards:
 - 1. 600V UL 1277 Type TC-ER per 2005 NEC Article 336; 1000V CSA AWM I/II A/B FT4; Bare Copper Conductors; Class B Stranding per ASTM; XLPE Insulation XHHW-2 Rated Circuit Conductors; 90°C Wet/Dry; Class I & II; Division 2 Hazardous Locations; UL 1685 Vertical Tray Flame Test; IEEE 1202/383 Vertical Tray Flame Test; UL Direct Burial; RoHS Compliant; CE Approved
- E. Cables shall be:
 - 1. Belden Basics® VFD Cable

2. Service Wire ServiceDrive® ASD/VFD Shielded Tray Drive Cable

2.7 Building Automation System Conductors

- A. All conductors used in BAS systems for digital inputs, digital outputs, analog inputs, and analog outputs shall be plenum rated (CMP), minimum 18 AWG stranded bare copper conductors, maximum capacitance 70 pF/ft, Low Smoke Polyvinyl Chloride jacket with ripcord, conductors cabled, Overall tape shield and drain wire, sequential footage marking every two feet. Belden 6300FE, Windy City Wire 002320-S, or approved equal. NEC grounded conductor identification color code requirements must be considered when selecting cables.
- B. Any BAS conductors that are considered Class 2 or Class 3 by NEC Article 725 shall be installed with separation from Power conductors per the requirements of NEC Article 725.

PART 3 - EXECUTION

3.1 BUILDING WIRE

- C. Enclosed Raceways: All wiring in buildings shall be installed in metallic enclosed raceways. For remodeling, some types of low voltage wiring may be installed exposed. See *Section 26 05 34 - Low Voltage Raceways* for conditions.
- D. Stranded Conductors: All wire that is 10AWG and larger shall have stranded conductors.
- E. Wire Size: All field installed branch circuit power and lighting wiring shall be 12 AWG minimum. Branch Circuit Conductors shall be sized to maintain no more than 3 percent voltage drop at the farthest outlet. Maximum total voltage drop on both Feeders and Branch Circuits to the farthest outlet shall not exceed 5 percent.
- F. Control Wiring: Field installed control wiring shall be 14 AWG, stranded, 600 volt, with proper size crimp lugs at termination screws.
- G. Connection to Motors: Final wiring connection to all motors shall be with stranded wire. Connection to motors from Variable Frequency Drives shall use the VFD cable in 2.5.
- H. Vertical Raceways: For cables in vertical raceways, appropriate support shall be provided to minimize damage to cable insulation.
- I. Color Code: All branch circuit wiring in a new building shall be in accordance with an established color code. Color Code for a building shall be posted at each panelboard, per NEC Article 210. Wiring installed during remodeling shall be in accordance with the color code established when the building was constructed. Otherwise, the following color code shall be utilized:
 - 1. 120/280V Systems
 - A Phase – Black
 - B Phase – Red
 - C Phase – Blue
 - Neutral – White
 - Ground – Green
 - 2. 277/480V Systems
 - A Phase – Brown

B Phase – Orange
C Phase – Yellow
Neutral – Grey
Ground – Green

END OF SECTION **26** 05 19

This section of the *U of I Facilities Standards* establishes minimum requirements only.
It should not be used as a complete specification.