

SECTION 26 0519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Sections include the following:
  - 1. Division 27/28 Sections for cabling used for voice and data circuits.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by UL and marked for intended use.
- B. Comply with ASTM.
- C. Comply with UL 44, 83, and 486.
- D. Comply with NFPA 70.
- E. Comply with most current edition of the Northwestern University Design Standards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Include data sheets for the following additional items:
  - 1. Splices and terminations.
  - 2. Pulling compounds.
  - 3. Cable accessories.
- C. Field quality-control test reports.

1.5 PROJECT CONDITIONS (*Delete If Not Required*)

- A. [Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by the University or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify the University Electric Shop no fewer than [two] calendar weeks in advance of proposed interruption of electric service.
  2. Indicate method of providing temporary utilities.
  3. Do not proceed with interruption of electrical service without the University's Chief Electrician's written permission.
  4. University Lock-out/Tag-out procedures shall be used with Contractor controlled locks and tags.
  5. Comply with NFPA 70E.]

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. General Cable Corporation.
  2. Okonite Company.
  3. Southwire Company.
  4. Or equal approved in writing by the University's Chief Electrician.
- B. Copper Conductors: Comply with NEMA WC 70.
1. Aluminum conductors shall not be used under any circumstances.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN, THWN, THWN-2, XHHW-2 and SO.
1. Voltage rating: 600 Volts for 480/277V and 208/120V.
- D. VFD Cable:
1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
  2. Type TC-ER with oversized cross-linked polyethylene insulation, [**spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire**] [**dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires**], and sunlight- and oil-resistant outer PVC jacket.
  3. Comply with UL requirements for cables in [**Class \_ , Division \_ hazardous location**] applications.
- E. Multi-conductor Cable type MC and AC: Use of MC or AC cable is not permitted under any circumstances unless specifically approved in writing by the University's Chief Electrician.
- F. Use of Nonmetallic sheathed (NM) cable is not permitted under any circumstances.

- G. Flat or Under-carpet type cable is not permitted under any circumstances.

## 2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Burndy, Thomas & Betts.
  2. O-Z/Gedney; EGS Electrical Group LLC.
  3. 3M; Electrical Products Division.
  4. IlSCO.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
1. Aboveground Circuits (No. 10 AWG and smaller):
    - a. Connectors: Solderless, screw-on, reusable pressure cable type, rated 600 V, 90° C, with integral insulation, approved for copper conductors.
    - b. The integral insulator shall have a skirt to completely cover the stripped wires.
    - c. The number, size, and combination of conductors, as listed on the manufacturer's packaging, shall be strictly followed.
    - d. Use of "push-in" type splice connectors is not permitted.
  2. Aboveground Circuits (No. 8 AWG and larger):
    - a. Cable termination lugs shall be made of high conductivity and corrosion-resistant material, electro-tin plated, listed for use with copper conductors only, rated for 600 V. Lugs shall be color coded by size.
    - b. Cable termination lugs shall be indent type, long barrel with chamfered entry, 2 – hole, compression type for 250 kcmil and above, 1 – hole for less than 250 kcmil.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Soft annealed Copper stranded, class B compressed.
- B. Branch Circuits: Copper. Stranded for No. 12 AWG and larger.
- C. Minimum Wire Size: #12 awg for power and lighting circuits, #14 awg for control circuits. In the case of "homeruns" over 125 feet in length, no conductor smaller than a No. 10 wire shall be used. The tap conductor from the J-box in the ceiling to the receptacle may be No. 12. Each 120-volt phase conductor shall have a neutral conductor of the same size. The sizing of all wire except remote control wire shall be accomplished in the case of both feeder and branch circuits by conforming to the following provisions. Only lighting circuits may share grounding conductors. All lighting circuits with shared grounding conductors shall be #10 AWG minimum.

### 3.2 CONDUCTOR INSULATION AND MULTI-CONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW, or type THHN/THWN up to and including 600 kcmil, single conductors in conduit.
- B. Exposed Feeders: Type THHN/THWN for all sizes up to and including 600 kcmil, single conductors in conduit.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type XHHW for #2 awg and larger, or type THHN/THWN for all sizes up to and including 600 kcmil, single conductors in conduit.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and underground: Type XHHW for #2 awg and larger, single conductors in conduit.
- E. Exposed Branch Circuits, Including in Crawlspace: Type XHHW, single conductors in conduit.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type XHHW, single conductors in conduit.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type XHHW single conductors in conduit.
- H. VFD Output Circuits: Type TC-ER cable [**with braided shield**] [**with dual tape shield**].
- I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain relief device at terminations to suit application. Service voltage shall not exceed 240 VAC.
- J. Recessed or Semi-recessed Lighting Fixture Whips: Type THHN-THWN (90 deg C), single conductors in FMC in lengths not to exceed six (6) feet.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Splices in feeder circuits shall be avoided unless necessitated by the length of the run more than 500 feet. Locations of all splices shall be approved by the University's Chief Electrician and made in Code sized splice box with the word "SPICE" permanently labeled on cover.
- B. Conductors may be run parallel from sizes 250 kcmil up to and including 600 kcmil provided all paralleled conductors are of the same size, manufacturer, length and type of insulation.
- C. Homeruns may not contain more than three circuits
- D. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- E. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or conduit.
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems" for secondary service, feeders and branch circuits.

- G. (Delete for new buildings) [Existing buildings: all unused or damaged cable/wire shall be removed; cable/wire may not be abandon in place.]**

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet or junction box with at least 6 inches (150 mm) of slack.

### 3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Sections and University Fire Protection Standards.
1. All penetrations shall be under constant visual surveillance until firestopping is applied.
  2. Products: Cooper B –Line, 3m, Hilti, Specified Technologies, Inc.

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.
    - a. Generator, UPS, and Fire Pump.
  2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
1. Test procedures used.
  2. Test results that comply with requirements.
  3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace non-compliant cables or wires and retest as specified above.

**END OF SECTION 26 0519**

NORTHWESTERN UNIVERSITY  
PROJECT NAME \_\_\_\_\_  
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FOR: \_\_\_\_\_  
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