

## **SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

### **PART 1 - GENERAL**

#### **1.1 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.
  - 3. Sleeves and sleeve seals for cables.

#### **1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

#### **1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### **PART 2 - PRODUCTS**

#### **2.1 CONDUCTORS AND CABLES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
  - 1. American Insulated Wire Corp.; a Leviton Company.
  - 2. General Cable Corporation.
  - 3. Senator Wire & Cable Company.
  - 4. Southwire Company.
- B. Conductor Material: Copper complying with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THWN or XHHW. Type THHN for sizes 1/0 and smaller.

- D. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC or metal-clad cable, Type MC with ground wire.

## 2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.

- B. 600 Volt Splices:

1. Solderless type only
2. Preinsulated "twist-on" type permitted on solid conductor size #10 and smaller
3. Hydraulic compression long barrel type with application preformed insulated cover, heat shrinkable tubing or plastic insulated tape for all stranded conductors.
4. Stranded conductors: Terminations designed for use with stranded conductors.
5. Control cable: Splices shall be pre-insulated crimp pigtail or butt splice connectors.

- C. 600V Terminations

1. 2-hole long barrel compression lugs - 250 kcmil and above
2. Single hole compression lug - Below 250 kcmil
3. Conductors #12 and smaller: Provide eye or forked tongue compression lugs at bolted or screw connections; no lugs required for compression style terminal blocks
4. Cable ties: Nylon or equivalent, locking type. Use a torque limiting tool for installation of ties.
5. Control cable: Terminations shall be locking spade, insulated, compression lugs.

## 2.3 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

- C. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
  - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 2. Pressure Plates: Stainless steel. Include two for each sealing element.
  - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

### PART 3 - EXECUTION

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper, stranded, 98% conductivity.
- B. Branch Circuits: Copper, 98% conductivity. #12 AWG minimum. Solid for #10 and #12 AWG lighting and receptacle circuits. Stranded for #8 AWG and larger. Stranded for motor and equipment circuits and where vibration is a consideration.
- C. Control Cable: Copper, stranded, #14 AWG minimum.

#### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- H. Fire Alarm Circuits: Type THHN-THWN, in raceway
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

### 3.3 MC (METAL CLAD) AND AC (ARMORED CABLE) INSTALLATIONS.

- A. Feeders and risers between busways, transformers and distribution boards. MC or AC cable use in the following are locations and conditions of concern and shall only be used with prior coordination and approval from Owner's Representative.
  - 1. Feeders and risers between busways, transformers and distribution boards.
  - 2. Homeruns.
  - 3. In-slab wiring.
  - 4. Underground wiring.
  - 5. Within exposed hallway ceiling spaces.
  - 6. In spaces above hard ceilings.
  - 7. Wiring from surface metal raceways to panelboards.
  - 8. Wiring in atriums and similar areas.

### 3.4 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. 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.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."
- G. 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 and UL 486B.
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.
- J. Provide cable ties (limit torque on ties) in panelboards, cabinets, and other unconfined, spaces. Group and lace wiring neatly, and do not tie to factory-installed wiring in equipment. Bundle and tag multi-pole circuits in laboratory surface metal raceway.

K. Branch circuits:

1. Homeruns greater than 75 feet to first outlet shall be #10 minimum.
2. Use no mechanical means for pulling wires, no lubricant except powdered soapstone or approved substitute.
3. Splices in homeruns are not permitted.
4. Wiring from separate raceway systems shall not be combined unless specifically permitted by the Engineer.

L. Terminate conductors so that conductor information is easily visible on at least one termination per feeder or within panel or switchboard pulling space.

M. Observe cable bend radius limitations and follow lug manufacturer's installation procedure.

N. Remove unterminated wiring unless noted otherwise or specifically approved to remain. Consult with the Engineer for instructions.

### 3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- E. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.
- F. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
- G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- H. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- I. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

- J. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- K. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

### 3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.7 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 Section "Penetration Firestopping."

### 3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports in accordance with Division 26, Section "Electrical Testing".

**END OF SECTION 26 05 19**