

# **DIVISION 26 – ELECTRICAL**

## **26 05 19 Electrical Power Conductors and Cables**

### **PART 1 - GENERAL**

#### 1.01 DESIGN REQUIREMENTS

- A. Scope: Power Conductors and Cables in this section are defined as system voltages above 120V and less than 600V.
- B. System Voltages – Three Phase and Single Phase:
  - 1. 480Y/277 and 208Y/120 Volts, 3-phase 4-wire, are the most commonly used distribution voltages at the University.
  - 2. 120/240V single-phase, 3-wire, is less common but acceptable for lower power applications. Consult with WSU Project Manager and WSU Facilities Engineering prior to specifying.
  - 3. Other system voltages may be approved depending on the application; however, generally avoid other system voltages.
- C. General:
  - 1. All wire and cable shall be installed in non-flexible raceway (minimum  $\frac{3}{4}$ " inside buildings; minimum 1" outside buildings). Free air cable installation is not permitted. Proposed exceptions require the approval of WSU Engineering Services.
    - i. Conduit shall not be mounted on the exterior face of buildings.
  - 2. Flexible raceway systems shall only be permitted only in lengths of six feet or less. Flexible raceway systems are not permitted for branch circuits or feeders within a building. Proposed exceptions require the approval of WSU Engineering Services.

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL

- A. Acceptable Manufacturers:
  - i. General Cable
  - ii. South Wire
  - iii. American
  - iv. Serro

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- B. Branch Circuit Wire and Cable – single conductors in raceway:
  - 1. #12 AWG is the minimum conductor size, solid or stranded.
- C. Control Circuit Conductors:
  - 1. #14 AWG conductors are permitted for control circuits, solid or stranded.
- D. Splices and Terminations:
  - 1. Splices:
    - i. Solderless type only.
    - ii. Preinsulated "twist-on" type permitted on conductor size number 10 and smaller.
    - iii. Hydraulic compression long barrel type with application preformed insulated cover, heat shrinkable tubing or plastic insulated tape for all stranded conductors.
  - 2. Terminations:
    - i. 250 kcmil and above - two hole long barrel compression lugs or equivalent.
    - ii. Below 250 kcmil - single hole compression lug or equivalent.
    - iii. Conductors #12 and smaller: provide eye or forked tongue compression lugs at bolted or screw connections - no lugs required for compression style terminal blocks.
  - 3. Control Cable Splices and Terminations:
    - i. Splices: Pre-insulated crimp pigtail or butt splice connectors.
    - ii. Terminations: Locking spade, insulated, compression lugs.
- E. Service Laterals and Feeders:
  - 1. At a minimum, conductors shall be stranded copper; 98% conductivity, THWN-XHHW single conductors in raceway.
  - 2. When approved by the WSU Project Manager and Engineering Services, aluminum alloy conductors sized 250kCM and larger may be substituted for copper. The following requirements shall be met when aluminum conductors are used.

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- i. Aluminum Alloy Conductors shall be compact stranded conductors recognized by Aluminum Association (AA-8000 Series Aluminum Alloy).
- ii. Only used for 600V rated wire, and ampacity rated at no smaller than 200amps or (250kCM).
- iii. Aluminum Alloy conductors shall only be used for Service Laterals, from building service transformers to main service disconnect, and used for Distribution Feeders of 200 amps and larger.
- iv. Aluminum Alloy conductors shall not be used for wire rated over 600V or medium voltage that is owned and maintained by WSU.
- v. Aluminum Alloy conductors shall not be used for any branch circuit wiring or also known as end of line devices, such as motors or mechanical loads even if branch circuit wire is sized over 200 amps.
- vi. Aluminum Alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy).
- vii. Aluminum alloy shall be equal to (AA-8030) as manufactured by Alcan.

#### **F. General Requirements, Copper and Aluminum Conductors:**

1. Insulation shall be:
  - i. Aluminum wire insulation shall be: Type XHHW-2, temperature rating 90° C and marked "SUN RES".
2. All service lateral (building transformer to main service) terminating connectors shall be long barrel mechanical compression type Connectors, dual rated.
3. Distribution feeder terminating connectors shall be coordinated with the manufacturer of the distribution equipment.
4. Mechanical compression type or mechanical screw type connectors, dual rated.
5. Connectors shall be dual rated (AL7CU or AL9CU) and listed under current, adopted UL 486A for compression termination and current, adopted UL 486B for mechanical set-screw termination for use with

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aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.

6. Approved manufacturers for mechanical compression type connectors:
  - i. Homac
  - ii. IIsco
  - iii. Burndy
  - iv. Thomas and Betts
7. The Electrical Engineer Consultant shall furnish distinct schedules of aluminum and copper conductor sizes and raceway sizes.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL INSTALLATION**

##### **A. Installation:**

1. No more than 7 conductors within a homerun or branch circuit raceway, Three Phases, 3 Neutrals, and 1 insulated equipment-grounding conductor. No shared neutrals shall be permitted.

##### **B. Torque Values:**

1. Mark and record torque values on all terminations 100amp and above. Data on torque values shall be logged in the Operations and Maintenance (O&M) Manuals for each connection. Data shall be organized by Panel, Phase and Circuit. Each data entry shall be provided with space for sign-off by contractor, sign-off by WSU witness, and date. Also provide an entry for Thermographic scan reading and date.

##### **C. Thermographic Scan:**

1. Conduct a Thermographic scan on all connections 100amp and larger. Initial Thermographic scan shall be performed after the building has been occupied during peak demand; time of the Thermographic scan shall be determined by WSU Engineering Services. Provide a second Thermographic scan one year after conducting the initial scan.

#### **3.02 600 VOLT CABLE AND TERMINATIONS**

- A. Unterminated wiring shall be removed unless specifically approved to remain by the WSU Construction Manager.

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**END OF SECTION**