DIVISION 26 - ELECTRICAL

Contents

26 05 00 Common Work Results of Electrical

Design Standards

1. Design for a complete electrical system with specifications and drawings that show floor plans, riser diagrams, schedules, all power, lighting, and communication plans, including any necessary details to accurately depict the scope of work included in the project. Design must include all conductors, raceways, fittings, circuit protection devices, wiring devices, fixtures, panel boards, boxes, supports, meters, switches, and other electrical equipment necessary to furnish a complete electrical system for the facility.

2. Clearly specify that the products to be provided for installation under this Division are in strict accordance with the Product and Material listing for this Division.

3. Design must specify the necessary testing of the system prior to being put into service.

4. Coordinate the installation of electrical equipment that is specified in other divisions.

26 05 19 Low-Voltage Electrical Power Conductors and Cables

1. Specify that all building power wiring shall be copper of 12 AWG or larger, rated at 600V minimum, type THWN-2, THHN, or XHHW-2, and have a 90 °C (194 °F) minimum temperature rating for both dry and wet applications.

2. Nonmetallic-sheathed Cable (Romex) is not allowed in any circumstance.

3. Conductors pulled inside Electrical Metallic Tubing (EMT) is the preferred construction method for low voltage pathways (under 600V) in all cases except those listed below:

    - Rigid Metal Conduit (RMC) is to be used in areas likely to see impact or damage as well as for exposed interior pathways above the finished floor to a height of 7’-0”.

    - Flexible conduit is to be used for final connections to light fixtures in drop ceilings. The maximum length of flexible conduit or cable shall be 6 feet.

    - Flexible conduit or cable is to be used for all connections to vibrating equipment such as motors, air compressors, etc. The maximum length of flexible conduit shall be 6 feet.

4. Metal Clad (MC) cabling containing a dedicated insulated ground conductor may be substituted for conductors pulled inside EMT only in the following limited situations:

    - Raised computer floors where utilized as air plenums, overhead airspace above drop ceilings or other locations with ready access for maintenance

    - Final flexible connections to lighting fixtures, fire alarm devices, etc. with readily available service access. These connections must be 6 feet or less.

- Locations where EMT presents constructability concerns or is technically infeasible. Approval for these locations will be considered on a case-by-case basis.

- The support system must facilitate easy maintenance and replacement of individual cables.

5. See information in Division 33 for instructions regarding cable installation for delivery of electrical service to the facility service point.

26 05 26 Grounding and Bonding

1. Specify that all ground connections are to be of a type which will ensure against corrosion and electrolysis. Bolted connections are to be used for connections to removable equipment.

2. Specify that all neutral circuit conductors beyond the service entrance switch shall be insulated in all cases. Service entrance cable without individual insulation on the ground circuit conductor shall not be used beyond the service entrance.

3. Specify that ground connections for all panelboards, cabinets, wiring gutters, or troughs are to be by means of bonding the enclosure to the separate grounding conductors, and that an appropriately sized green colored insulation grounding conductor is to be installed in all raceways.

26 05 29 Hangers and Supports for Electrical Systems

1. Specify that firm, workman-like supports are to be provided for all electrical equipment. All supports exposed to the weather are to be hot-dip galvanized.

2. Specify that conduit hangers for banked conduit runs are to be made of steel angle, channel iron, or light steel framing, of adequate size and supported by steel all-thread rods from ceiling inserts or building structure and not attached to other mechanical equipment. Specify that single conduits are to be supported by means of clamps to the building structure or pipe hangers supported by steel all-thread rods from ceiling inserts or building structure. Do not allow the use of wire supports or perforated steel straps.

26 05 33 Raceways and Boxes

1. Specify that raceways for all conductors and cables have a minimum ¾” conduit, and a pull wire be installed in all empty conduits.

2. All raceways are to be installed in straight lines, parallel and/or perpendicular to building lines.

3. Conduit shall be installed with no more than 360 degrees of bend and 100’ of length between pull boxes.

4. The design must provide for two conduits (one used and one spare) for each service entrance to the facility.

5. Specify that Galvanized Rigid Conduit (GRC) or Intermediate Grade Metallic Conduit (IMC) is to be used for Service Entrance and Feeders.

6. Specify that raceways installed below grade and indoors for grounding conductors be PVC Schedule 40.

7. Specify that raceways installed outdoors, and Branch circuit raceways exposed to weather be installed in Galvanized Rigid Conduit (GRC) or Intermediate Grade Metallic Conduit (IMC).

8. Specify the installation of proper fire-stopping material where conduits pass though rated wall or ceiling assemblies. See Section 07 84 00.

9. The installation of "back-to-back" boxes in walls and partitions is not allowed.

10. Specify that all junction boxes shall be installed with a screw attached cover plate.

26 05 53 Identification for Electrical Systems

1. Specify that each major piece of equipment, electric starter, motor panel, and control device be provided with name plate attached for identification.

2. Specify that all panels be labeled on outside top of door frame.

3. Specify that all electrical panels shall have a complete and current schedule formatted in accordance with Clemson's Sample Electrical Panel Schedule. Any circuit tracing needed to accomplish this is the responsibility of the designer.

4. Specify that color coding is required for all service, feeder, branch, control, and signaling circuit conductors as follows:

    - 120/240 volt and 120/208 volt systems:
        - Phase A - Black
        - Phase B - Red
        - Phase C - Blue
        - Neutral - White
        - Ground - Green
    - 277/480 volt systems:
        - Phase A - Brown
        - Phase B - Orange
        - Phase C - Yellow
        - Neutral - Gray or White
        - Ground - Green
    - Motor Control Wiring:
        - Start Circuits - Black
        - Stop Circuits - Red
        - Common - Orange

5. Specify that conductors smaller than #6 AWG or smaller are to be color coded with a solid color insulation, and that colored, permanent, non-aging, insulating tape banding at conductor ends may be used on larger sizes. Green colored grounding conductors

are to be installed in all raceways. Require that multi-conductor cables for control, signal, and alarm circuits requiring a ground wire are to be color coded in accordance with the most recent IPCEA Standards, except as noted otherwise.

6. Specify that multi-colored/multi-conductor cord is Type "SO" and contains a green colored grounding conductor.

7. Specify that identifying markers are to name each circuit pathway in full or abbreviated form with black letters on a background color as follows:

   - Power feeders and branch circuits - Orange background with voltage named
   - Lighting feeders and branch circuits - Yellow background with voltage named
   - Emergency feeders and branch circuits – Red background with voltage named

   These markers shall be affixed at every raceway termination or junction for conduit and every 10 feet for any flexible pathways.

8. Specify that the position of markers is to be such that the view of them is unobstructed, preferably placed lengthwise along the raceway, or that the markers be wrapped around the raceway to form a tag.

9. Provide arc-flash hazard warning labels on equipment. Install labels based on the information generated from an arc flash analysis conforming to the specifications linked in Section 26 05 73.19. Labels, at a minimum, shall indicate the available energy, personal protective equipment requirements and approach distances.

26 05 73.19 Arc Flash Hazard Analysis

1. For new construction and renovations, arc flash analysis conforming to the applicable specifications below will be required if either of the flowing conditions are met:

   - Addition or modification of a three-phase circuit over 30 amps as described in applicable specification.

   - Addition or modification of a single phase or phase-to-phase, two pole circuit over 50 Amps as described in the applicable specification.

   Arc Flash Risk Assessment Specifications for New Construction
   Arc Flash Risk Assessment Specifications for Renovations

2. Adding and modifying single phase and phase-to-phase, two pole circuits less than 50 amps, as described in the applicable specification, do not require arc flash analysis.

3. If an arc flash analysis is to be performed independently of any system addition or modification, it is to be done in accordance with the specifications below:

   Arc Flash Risk Assessment Specifications for Existing Systems

4. All Arc Flash analysis is to be done in the latest version on SKM Power Tools, and upon completion of the study, a backup copy of the model generated is to be submitted to Clemson University Facilities.

26 05 83 Wiring Connections

1. All branch circuits must have individual, dedicated neutral conductors. Multiwire branch circuits sharing a neutral conductor shall not be installed as part of permanent building wiring.

26 09 00 Instrumentation and Control of Electrical Systems

26 09 23 Lighting Controls

1. Applicable codes adopted by Chapter 5 of the OSE Manual, govern the required locations and types of intelligent lighting control to be employed in University buildings.
2. When any lighting control is employed other than a mechanical switch or dimmer, it shall meet the following additional requirements:

    - Be designed so that no additional routine maintenance, such as changing batteries, is required.
    - Wireless switching shall be self-powering via kinetic energy recovery or other similarly functioning system.
    - Be well labeled and operate intuitively.

3. Do not install occupancy or vacancy sensors in bedrooms.

26 12 00 Medium Voltage Transformers

1. Clemson prefers loop fed, pad mount transformers for all medium voltage distribution systems.

2. All transformers must shall conform to Clemson's Pad Mount Transformer Specs

3. Provide one spare conduit run from the transformer to the service entrance in addition to those required for connection of electrical service.

26 24 00 Switchboards and Panelboards

26 24 13 Switchboards

1. Specify that safety switches are to be 240 volt, or 600 volt as indicated, with quick-make, quick-break operating mechanism, and that safety switches are to be heavy duty type with full cover interlock and indicator handle.

2. Specify that safety switches are to meet applicable requirements of Federal Specification W-W-865C for heavy switches. They are to be UL listed, and are to meet the applicable requirements of NEMA KS1 for Type HD.

3. Specify the number of poles, ampere rating, whether fusible or non-fusible type of NEMA enclosure, and other data is to be as noted.

4. A Switchboard will be required in lieu of a panelboard for any metered service entrance over 800 amps.

26 24 16 Panelboards

1. Cabinets for all panelboards are to be large enough to provide a minimum wiring gutter space 4" wide by 5" deep on all four sides. Specify that front trim is to be single sheet full-finished, code gauge, sheet steel, and that door opening is to expose only the operating handles of the circuit breakers. The inside of the door shall accommodate a typed directory card, protected by a heavy sheet of unbreakable transparent plastic.

2. Specify that panelboard bus work is to be copper and all branch circuit breakers are to be bolt on type.

3. Specify that all panelboards in existing hallways have the front trim and door given a coat of rust-inhibiting primer, followed by paint to match the adjacent wall surface.

4. The designer shall allow for at least 25% spare breaker space in every lighting and power panelboard.

26 24 19 Motor Control Centers

1. All conventional motor control centers shall conform to the following requirements:

    - Magnetic type motor controllers are to have under voltage protection when used with momentary contact pushbutton stations or switches and are to have under voltage release when used with maintained contact pushbutton stations or switches.

    - All controllers used with pilot devices or maintained contact switch, are to have an integral switching system that allows for manual and automatic motor starting as well as an off position capable of lockout.

    - Details and connections for all pilot devices are to be specified with the piece of equipment served.

    - All enclosures for starters and controllers shall be NEMA 1 per the most recent version of NEMA ICS6, unless otherwise required.

    - All fixed multiple speed motor controllers and reversible motor controllers are to be across the line type, electrically and mechanically interlocked. Multiple speed controllers are to have compelling relays and are to be multiple button station type with pilot lights for each speed. Combination starters are to be provided with integral circuit breakers.

    - All motors and motor controllers-are to be furnished with the driven machine and sized to assure the specified output and operation of the driven equipment without excessive temperature rise, and suitable for their operating environment.

- Unless otherwise specifically indicated, all motors of ½ horsepower or smaller are to be for 120-volt operation, single phase, 60 hertz. Motors of ¾ horsepower and larger are to be for operation on 208 volts, three phase, 60 hertz, or 480 volts, three phase, 60 hertz as required.

- Include a manually operated, non-fused switch which will disconnect the motor from the source of supply is to be placed within sight of the motor location.

- All overload protective devices are to give adequate protection to the motor windings, be of the thermal inverse-time-limit type and include a manual reset type push button on the outside of the motor controller case.

- The cover of a combination motor controller and manual switch or circuit breaker is to be interlocked with the operating handle of the switch or circuit breaker so that the cover cannot be opened unless the handle of the switch or circuit breaker is in the "Off" position.

- Pilot devices are to be rated with contacts designed to handle inrush and continuous currents of the control system and suitably enclosed for the environment and for the type and class of area in which they are installed.

- Control circuits are to be provided with individual control power transformers and adequate over-current and short circuit protection. Unless otherwise required, control circuit voltage is not to exceed 120 volts, 60 hertz.

- All pushbutton stations are to be provided with "start-stop" momentary contacts having one normally open and one normally closed set of contacts and lights indicating motor operation. Specify that stations are to be heavy duty, oil tight, designed for either flush or surface mounting with LED pilot lights

- All motors and motor operated equipment are to be checked for proper rotation, clearance alignment, and lubrication and left in completely satisfactory operation.

- Specify that motors operated by control centers are to be wired using a short section of liquid tight, flexible metal conduit, with an insulated grounding conductor.

- Motor controllers are to be accessibly located, equipped with properly selected overload heater elements, and checked for proper contact alignment and operation.

- All pilot devices, disconnect switches, etc., are to be accessibly mounted and set or adjusted as required.

2. All Variable Frequency Drives shall adhere to the following:

- Clemson University VFD Specifications
- All motors connected to VFD's shall be done so with dedicated drive cable.

26 27 00 Low Voltage Distribution System

26 27 13 Metering

1. Unit substations shall include one main electrical meter in a metering compartment that is isolated from the main bus. The metering compartment shall have a separate hinged cover for easy access. Wiring to the main meter shall include a shunt block for current transformers and finger-safe fusing blocks for voltage connections.

2. New construction and major renovations must include sub-metering of lighting, plug loads, equipment loads, and HVAC loads at the building level. It is expected that this will be accomplished with 10 or fewer submeters. All meters shall be connected through Ethernet to Clemson University's Powerlogics server. Consult with University Utilities for approval of submetering layout and design prior to installation.

3. Consult with University Utilities regarding the type and location of power metering devices. Some buildings such as laboratory or research facilities as well as some utility systems have stringent metering requirements that must be met in order to support the work being performed in the building.

26 27 26 Wiring Devices

1. Do not allow the use of oversized or "jumbo" cover plates except where there is no other reasonable alternative.

2. Specify the installation of duplex outlets in hallways for use by floor cleaning and other housekeeping equipment. Outlets shall be rated as needed for the equipment to be used.

26 32 00 Emergency Power

26 32 13 Engine Generators

1. All Generator Sets and Transfer Switchgear shall be approved by University Utility Services and the University Facilities Maintenance Life Safety Shop prior to purchase and installation.

26 41 00 Facility Lightning Protection

1. All new construction and major renovations affecting more than 50% of the building floor area shall have a Risk Assessment done in accordance with the most recent version of NFPA 780 to determine if a lightning protection system is recommended.

2. Specify any installation of lightning protection systems conform to the requirements of the most recent version of NFPA 780 and Underwriter's Laboratories "Standards for Installation of Lightning Protection Systems (UL96 and 96 A)".

26 51 00 Interior Lighting

1. The use of incandescent and low voltage lighting is not permitted.

2. Indoor lighting levels shall be as recommended by the Illuminating Engineering Society of North America, IESNA. Careful consideration of the end user must be used in classrooms and labs with special needs or multipurpose uses.

3. For general purpose lighting, specify installation of LED fixtures with a minimum advertised service life of 50,000 hours. Areas with drop-in ceiling tile systems shall use either 24”x 24” or 24”x48” fixtures.

4. Fluorescent lighting is to only remain in place if no work is being performed outside of routine maintenance.

5. If existing fluorescent fixtures are to remain in place, they are to be converted to LED function via a retrofitting kit that replaces the ballast with an LED driver, bulbs, and upfits with occupancy sensors as needed.

6. Support for all fixtures must be in accordance with all applicable structural and seismic requirements. Fixtures shall be supported independently of ceiling grids.

7. All exposed fluorescent and tube style LED bulbs shall be protected from breakage caps at time of installation.

8. Specify that any plastic used in the fixtures will carry the correct fire resistance rating for the building and conditions served, and not subject to disintegration or discoloration with age.

9. All fixtures shall comply with applicable requirements of Underwriter’s Laboratories.

10. All lighting fixtures must be accessible using standard vertical devices such as A-frame ladders. Locations unable to be made accessible with standard vertical devices will require supplying necessary equipment such as automatic winches or articulated lifts. These shall be provided as auxiliary building equipment stored in a logical place within the building.

26 52 00 Safety Lighting

26 52 13 Emergency Lighting

1. All exit signs shall have LED backlighting, and the EXIT text shall be green.

26 56 00 Exterior Lighting

1. The University uses several different exterior lighting fixtures and poles, depending on the application and location. Refer to Division 26 Products and Materials for application specific product selections.

2. New exterior lighting shall be laid out and carefully coordinated with existing adjacent surroundings and systems. This includes preserving the functionality of any existing system and providing adequate pathways for any portion of an existing system that must be rerouted.

3. Provide at least 2 spare exterior lighting pathways into buildings during new construction and renovations that include exterior lighting upgrades. These pathways should connect to an electrical panel that is designated for powering lighting.

4. LED fixtures shall be used when appropriate. These fixtures are listed in the Products and Materials section of this Division.

5. All exterior Lighting pole installations shall conform to the Lighting Pole Base Detail

6. Concrete foundations must have a minimum height of 12" above existing grade and are to be placed, with no grass divider, against any adjacent concrete walks, curbs, or paved areas. Concrete foundations are to have a ¾" chamfer on all vertical and horizontal corners. Concrete foundations are to have an 8' ground rod. Concrete foundations exceeding 36" in depth shall be designed by a professional engineer.

7. All exterior pole mounted lighting is to have a watertight LED surge protection module and in-line fuse holders installed in the AC supply for each fixture above the pole foundation and accessible from ground level through a hand hole in the pole or pole base as means of device protection and disconnecting a single light prior to service. In-line fuse and holder assemblies shall meet the following requirements:

    - Have an appropriate voltage and current rating for the device being protected.
    - Provide individual fuse for each leg of supply wiring except for neutral conductors.
    - Have a dielectric strength of at least 600V.
    - Remain watertight unless open for servicing.

PRODUCTS AND MATERIALS – DIVISION 26 – ELECTRICAL

Boxes

- General: Ferrous metal, cadmium or zinc coated, complying with UL 514, as manufactured by Steel City, Thomas & Betts, or Appleton.
    - Lighting Fixtures: 4” octagonal x 1” deep.
    - Switches and Receptacles: 3” x 2” x 2-3/4” with appropriate plaster ring.
    - Telephone/communications: 4” x 4” x 2-1/4”.

Exterior Lighting (Historic District)

- Street Lights and Walk Lights:
    - Fixture: Holophane Granville Classic Standard LED3 or approved equal
        - 120-277 volt compatible
        - 4000K LED Color Temperature
        - Photocell Controlled
        - Bronze Housing Color
        - Type 5 Glass Globe
        - Holophane OTF Top Finial
        - Part Number: GVD3-P2040K-MVOLT-CLF-G5-GVD27BZ-L1H
    - Pole: 10’ Holophane Columbia Series or approved equal
        - Material: Aluminum
        - Color: Bronze
        - Part Number: CLA-10-FTJ-20D-C03-BZ
    - Concrete Base: See Lighting Pole Base Detail
    - LED Retrofit Kit: Beacon LRK-2V/55W/T5/UNV/LSP/GYS or approved equal

Exterior Lighting (Non-Historic District)

- 12’ High Pedestrian Sidewalk LED Lighting
    - Fixture Head: Signify Gardco P26 with Comfort Optics, McGraw-Edison Galleon II or approved equal meeting the following specifications:
        - Head Mounting Style: Side Arm
        - Casing Color: Bronze
        - Lighting Color Temp.: 4000k
        - Dimming Control: 0-10V
        - Operating Voltage:120-277V
        - Signify Gardco Part Number: P26-196L-1150-NW-G2-AR-x-UNV-DD-xxxxx-TLRD7-xx-xx-BZ
        - McGraw-Edison Part Number: GALN-SA1B-740-U-xx-BZ-PR7
    - Pole Type: 12’x4” Aluminum Square Pole from Signify Gardco, KW Industries, or approved equal meeting the following specifications:
        - Wind Rating: 110 MPH 3 Second Gust and 90MPH Sustained

        - Finish/Color: Dark Bronze
        - See Pole Mounted Camera and Wifi Access Point Typical for any attachments made to poles.
        - Signify Gardco Part Number: SSA-CA-4-xx-12-xx-xx-BZ-VDA
        - KW Industries Part Number: SAP12-4.0-11-BRZ-xx-BC

    - Pole Base: Lighting Pole Base Detail

- 20’ High Parking Lot Area LED Lighting
    - Fixture Head: Signify Gardco P26 with Comfort Optics, McGraw-Edison Galleon II or approved equal meeting the following specifications:
        - Head Mounting Style: Side Arm
        - Casing Color: Bronze
        - Lighting Color Temp.: 4000k
        - Dimming Control: 0-10V
        - Operating Voltage:120-277V
        - Signify Gardco Part Number: P26-196L-1150-NW-G2-AR-x-UNV-DD-xxxxx-TLRD7-xx-xx-BZ
        - McGraw-Edison Part Number: GALN-SA1B-740-U-xx-BZ-PR7

    - Pole Type: 20’x5” Aluminum Square Pole from Signify Gardco, KW Industries, or approved equal meeting the following specifications:
        - Wind Rating: 110 MPH 3 Second Gust and 90MPH Sustained
        - Finish/Color: Dark Bronze
        - See Pole Mounted Camera and Wifi Access Point Typical for any attachments made to poles
        - Signify Gardco Part Number: SSA-CA-5-xx-20-xx-xx-BZ-VDA
        - KW Industries Part Number: SAP25-5.0-7-BRZ-xx-BC

    - Pole Base: Lighting Pole Base Detail

- 30’ High Street LED Lighting
    - Fixture Head: Signify Gardco P34 with Comfort Optics, McGraw-Edison Galleon II, or approved equal meeting the following specifications:
        - Head Mounting Style: Side Arm
        - Casing Color: Bronze
        - Lighting Color Temp.: 4000k
        - Dimming Control: 0-10V
        - Operating Voltage:120-277V
        - Signify Gardco Part Number: P34-96L-1050-NW-G2-AR-x-UNV-DD-xxxxx-TLRD7-xx-xx-BZ
        - McGraw-Edison Part Number: GALN-SA6B-740-U-xx-BZ-PR7

    - Pole Type: 30’x6” Aluminum Square Pole from Signify Gardco, KW Industries, or approved equal meeting the following specifications:

- Wind Rating: 110 MPH 3 Second Gust and 90MPH Sustained
- Finish/Color: Dark Bronze
- See Pole Mounted Camera and Wifi Access Point Typical for any attachments made to poles
- Signify Gardco Part Number: SSA-CA6--xx-30-xx-xx-BZ-VDA
- KW Industries Part Number: SAP30-6.0-3-BRZ-xx-BC

  - Pole Base: Lighting Pole Base Detail

- Uplighting for Buildings, Gates, Sculpture, etc:
  - Fixture: BK – KZ-68-BZW-13-C or approved equal
  - Ballast: HP70-120 V, in ground or approved equal
  - Lamp: 70W Par 38, Metal Halide or approved equal

  In projects where area lighting already exists and is not listed above, coordinate with University Planning to determine appropriate fixture type for consistency and compatibility.
- Fuse Holder

  - Bussman HEB and HEX series or approved equal

- LED Lighting Protection Module

  - Littelfuse LSP Series or approved equal

Lighted Exterior Bollards

- Cordia LED Lighted Bollard LBCOR-LED or approved equal with either 3000K or 4000K LED engine as specified.

Site Lighting Conduit

- In-ground rated HDPE conduit, pre-wired or not, can be used for buried power distribution for all exterior site lighting. Conduit shall transition to GRC where exposed from 5ft above grade to 18” below grade.

Generator Sets

- Cummins/Onan
- Caterpillar
- Generac
- Kohler

Hangers and Support Devices

- Support Rods and Straps: Galvanized all-thread rod with applicable connections or heavy duty, zinc-coated conduit hangers or straps of proper size and spacing.
- Ceiling and Wall Anchors: Lead, expansion, lag type suitable to particular location and application.

Identification of Electrical Systems

- Name Plates: Engraved, white on black Bakelite.

Interior Lighting

- Phillips EvoKit Series LED retrofit kit in 2”x2” and 2”x4” or approved equivalent.
- Phillips EvoGrid Series LED fixture in 2”x2” and 2”x4” or approved equivalent.
- Phillips FBX Series Hi-Bay fixture or approved equivalent.
- T-5:228MVPS-A ballast and GE F28W/T5/841/ECO lamps or approved equal
- T-8: GE*32MAX-N-ULTRA ballasts and F28T8/XL/SPX41/ECO lamps or approved equals
- Housing: Ceiling Mount LED: Progress LED Models: P350051-009-30 and P350052-009-30 or approved equals
- Housing: Bathroom Vanity: Lithonia Lighting: Model: FMVTSL 48IN MVOLT 40K 90CRI BN or approved equal

Medium Voltage Distribution

- Switches: G & W or S & C SF6 or approved equal insulated to match existing switches in the system.
- Splice Kits and Terminations: Elastimold, Cooper, or Richards.
- Cabling: Shall conform to Clemson’s Medium Voltage Cable Specs
- Cable Racks: Underground Devices, Inc. Heavy Duty Underground Rack or approved equal
- Grounding Materials: Cadweld or approved equal

Panelboards

- Panelboards and Load Centers: Square D, GE, Siemens, or Cutler Hammer. All panelboards and load centers shall be furnished with lock, all keyed alike with the facility.

Power Meters

- Housing, Classroom, and office Buildings: Schneider Electric METSEPM5560, METSEPM5563RD or approved equal with connectivity to Powerlogics server.
- Laboratory/Research buildings and Critical Utility Equipment: METSEPM8240, METSEPM8244 or approved equal
- See Section 26 20 00 concerning requirements for sub-metering.

Raceways

- Galvanized Rigid Conduit (GRC): UL 6 and ANDI C80.1 with full weight screwed fittings. Bushings shall be malleable iron; bushings 1-1/4” and larger shall have insulated throat and grounding lug.
- Intermediate Grade Metallic Conduit (IMC): UL 1242, galvanized with full weight screwed fittings. Bushings shall be the same as specified for galvanized rigid conduit.
- Electrical Metallic Tubing (EMT): UL 797 and ANSI C80.3, galvanized with compression type fittings. Fittings 1-1/4” and larger shall have nylon insulated throat.

Set screw, indented, or drive-on fittings are not allowed.

- Flexible Steel Conduit: UL 1, with galvanized fittings.
- Liquidtite Flexible Steel Conduit (Sealtite): UL 360 compliant, with compression type fittings.
- Plastic Conduit: Schedule 40, polyvinylchloride (PVC), NEMA Standard TC-2, TC-3, and UL Standards. Conduit, solvent, and fittings shall be supplied by the same manufacturer.
- Cable trays: Cablofil, open ladder, divided type configuration. Minimum size shall be one foot wide and three inches high. Closed cable trays are not allowed.

Wire and Cable

- Conductors: Copper, soft drawn, per ASTM B3. All conductors to be stranded and no solid conductors are allowed.
- Low Voltage Cable (less than 600 volts): See Section 26 05 19
- Medium Voltage Cable: 15kV Shielded Power Cable, type MV-105, copper tape shield, EPR 133%, single copper conductor. Contact University Utilities if additional information is needed.
- Grounding Materials: Cadweld or approved equal

Wiring Devices

- Switches: Hubbell, Pass & Seymour, Leviton; 20 amp, 120/277 volt, side and back wired in color specified. Single or double pole, three or four way as needed.
- Receptacles: Hubbell, Pass & Seymour, Leviton; 15 or 20 amp, 125 volt, three wire grounding, NEMA 5-15R, side and back wired in color specified.
- Ground Fault Interrupter Receptacle (GFI): Hubbell, Pass & Seymour, Leviton; 15 or 20 amp, 125 volt, feed through type, complying with UL 943.
- Cover Plates: Reinforced fiberglass, brushed or polished metal specified to suit installation application.