

SECTION 26 12 00 – CONDUCTORS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE

- A. This section includes minimum requirements for the following:
 - 1. Low Voltage Conductors
 - 2. 600 Volt Thermoplastic-Insulated Wires and Cables
 - 3. Type AC Armored Cable
 - 4. Type MC Metal Clad Cable
 - 5. Connectors and Terminations

1.3 SUBMITTALS

- A. Provide five (5) sets or electronic files of product data for the following:
 - 1. Low Voltage Conductors
 - 2. 600 Volt Thermoplastic-Insulated Wires and Cables
 - 3. Type AC Armored Cable
 - 4. Type MC Metal Clad Cable
 - 5. Connectors and Terminations

1.4 QUALITY ASSURANCE

- A. All conductors shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equivalent" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- B. Materials specified herein shall comply with the latest applicable requirements of:
 - 1. The following Articles of the National Electric Code (NFPA 70)
 - a) 300 - Wiring Methods
 - b) 310 - Conductors for General Wiring
 - c) 320 – Type AC Armored Cable
 - d) 330 - MC Metal Clad Cable
 - e) 400 - Flexible Cords and Cables
 - f) 402 - Fixture Wires

2. The following U.L. Standards:
 - a) UL 83 Thermoplastic-Insulated Wires and Cables
 - b) UL 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.
 - c) UL 854 Service Entrance Cable
 - d) UL 6 Rigid Metal Electrical Conduit
 - e) All Other Applicable Standards

PART 2 - PRODUCTS

2.1 LOW VOLTAGE CONDUCTORS

- A. Feeder branch circuit and control wiring:
 1. Annealed Copper, 98% conductivity.
 2. Minimum wire size:
 - a) #12 AWG for branch circuits
 - b) #14 AWG for control and signal circuits
 3. Wire shall be stranded.
 4. 600 volt insulation for all wiring above 50 volts.
 5. 300 volt insulation permitted for all wiring below 50 volts.
 6. Thermal plastic with PVC insulation with nylon jacket, suitable for wet or dry locations, THHN/THWN 90 degree Celsius.
 7. 90 degree C maximum operating temperature rating.
 8. UL 83 Listed
- B. Lighting fixture wire
 1. FREP/CPE coated stranded copper,
 2. Flame retardant EPR Insulation and CPE jacket.
 3. UL 44 listed
- C. Flexible cords and cables shall be Type "SO" or "SJO."

D. Color Coding

1. All circuits shall be color coded according to the following schedule:

<u>Voltage</u>	<u>A PHASE</u>	<u>B PHASE</u>	<u>C PHASE</u>	<u>NEUTRAL</u>
208Y/120V, 3 Phase	Black	Red	Blue	White
480Y/277V, 3 Phase	Brown	Orange	Purple	Gray
240/120V, 1 Phase	Black	Red		White

*ALL GROUNDING CONDUCTORS SHALL BE GREEN

*ALL ISOLATED GROUNDING CONDUCTORS SHALL BE GREEN WITH YELLOW STRIPE

2. #6 AWG and smaller shall have insulation continuously colored as called for above.
3. #4 AWG and larger may be identified using a minimum 3" tape band.
4. Color code all conductors at all pullboxes, enclosures, and terminations.
5. Switched legs shall be identified with the same color insulation as the phase leg.

E. Acceptable manufacturers:

1. Cablec
2. Southwire
3. Okonite
4. Rome Cable
5. Pirelli

2.2 TYPE AC ARMORED CABLE

A. Construction:

1. Stranded or solid copper conductors, each individually insulated, and enclosed in an armor of flexible metal tape.
2. Suitable for dry locations only.
3. Suitable for cable tray installations.
4. Do not install direct buried, in concrete, or in the presence of corrosive vapors.
5. Provide with a copper or aluminum bonding strip in contact with the armor for the entire length.
6. Support every 4½ feet.
7. Manufactured and installed in accordance with NEC Article 320.
8. Make: Same as building wire.

2.3 TYPE MC METAL CLAD CABLE

- A. Construction:
1. Stranded or solid copper conductors, each individually insulated, and enclosed in an armor of flexible metal tape.
 2. Suitable for wet or dry locations.
 3. Suitable for cable tray installations.
 4. Do not install direct buried, in concrete, or in the presence of corrosive vapors.
 5. Provide with separate integral grounding conductor.
 6. Support every 4½ feet.
 7. Manufactured and installed in accordance with NEC Article 330
 8. Make: Same as building wire.

2.4 LOW VOLTAGE CONNECTORS AND TERMINATIONS

- A. Straight Splices, #26 AWG To #10 AWG
1. Nylon Insulated compression butt-splices.
 2. 600 volt, 90 degree C rated.
 3. Make: Burndy "Insulink", T&B "Sta-Kon", or approved equivalent
- B. Straight Splices, #8 AWG and Larger
1. Two way, long barrel, compression type, copper
 2. Provide heat or cold shrink tubing over splice.
 3. 600 volt rated.
 4. Make: Burndy "Hylink", T&B 54800 Series, or approved equivalent.
- C. Pigtail Splices, #26 AWG to #10 AWG
1. Twist type pressure connector.
 2. 600 volt rated, 105 degree C.
 3. Size as required for number and size of conductors used.
 4. Make: T&B Scotchlock, or approved equivalent
- D. Lug Terminations for Control and Signal Wiring.
1. Nylon insulated fork with compression termination of #26 AWG to #10 AWG.
 2. Nylon insulated ring with compression termination for #8 AWG and larger.
 3. 600 volt rated.
 4. Make: Burndy "Insulug", T&B "Sta-Kon", or approved equivalent.

- E. Lug Terminations for Power Wiring
1. Long barrel, compression type, copper body, one hole for #8 AWG and larger to match equipment.
 2. Long barrel, compression type, copper body, two hole, for #2 AWG and larger.
 3. Lug hole quantity shall match equipment termination.
 4. 600 volt rated.
 5. Make:
 - a) One-hole lug: Burndy "Hylug", T&B 54900 Series, or approved equal.
 - b) Two-hole lug: Burndy "Hylug", T&B 54800 Series, or approved equal.

PART 3 - EXECUTION

3.1 LOW VOLTAGE WIRE AND CABLE

- A. GENERAL
1. Install cables in raceway as called for after the entire raceway system has been completed.
 2. Install splices and connections in accessible outlet, pull, and junction boxes.
 3. Insulate all splices and connections with UL Labeled plastic tape, heat shrink tubing, or plastic molded caps.
 4. All wiring systems shall be properly grounded and continuously polarized throughout, following the color coding specified.
 5. Provide insulated green grounding conductor in each raceway, and white insulated neutral conductor for each multi-wire branch circuit.
 6. Provide isolated grounding conductor for multi-wire computer panel "CP" branch circuits and dedicated neutral for each computer panel "CP" branch circuit.
 7. Install a maximum of three phase conductors, one neutral conductor, and one grounding conductor in each $\frac{3}{4}$ " home run. (Obtain engineer's approval for additional conductor fill where field conditions require. Adhere to NEC de-rating requirements.).
 8. Provide stranded wire to motors, transformers, equipment, and vibrating machinery.
 9. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Owner's Representative and receive written approval for splicing prior to installation of feeder(s). Where feeder conductors pass through junction and pull boxes, bind and lace conductors of each feeder together. For

parallel sets of conductors, match lengths of conductors.

10. Where multiple conductors are installed in a common raceway they shall be pulled simultaneously. Use of pulling compound or lubricant shall be avoided unless absolutely necessary. Where pulling lubricant is required, use UL approved compounds approved for cable type. Lubricant shall meet all OSHA and Toxic Control Act standards.

APPLICATION	CABLE TYPES	DESIGN MAKE
General purpose Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon	Ideal - Yellow 77
High Temperature Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Ideal - Yellow 190
Utility construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua-Gell II
Cold Weather Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua-Gel CW

11. Use pulling means including fish tape, cable, rope and basket type grips which will not damage cables or raceways. Use approved mechanical pullers for feeders and branch circuits as required for #6 AWG conductors and larger. Do not use mechanical means to pull conductors No. 8 or smaller.
12. Branch circuit conductors installed in panelboards, and control conductors installed in control cabinets and panels shall be neatly bound together using nylon or plastic wire ties.
13. Reconnect branch circuit wiring at panelboards as required to obtain a balanced three phase load on the feeders.
14. Provide conduit seals in explosion proof areas as called for on the plans and as required by the National Electrical Code.
15. Seal conduits passing from one environmental condition to another as required by the National Electric Code. (Explosion proof seals are not required in non-classified areas).

3.2 TYPE AC ARMORED CABLE

- A. Type AC cable shall be permitted for use in metal stud partitions from junction boxes in the ceiling space to devices or for 6' fixture whips from junction box to fixtures.
- B. Type AC cable shall be used only in areas permitted in the NEC.
- C. Type AC cable may not be used for feeders or branch circuit home runs to panelboards.
- D. Support cable at intervals not exceeding 4½ feet.
- E. Bend radius shall not be less than five times the cable diameter and shall not damage the metal cable sheath.
- F. Provide insulating bushing at all termination points between the armored sheath and outlet or junction box.
- G. Type AC cable shall not be installed exposed with the exception of fixture drops in mechanical or equipment rooms. Secure the cable to fixture hangers using nylon or plastic ties.

3.3 TYPE MC METAL CLAD CABLE

- A. Type MC cable shall be permitted for use in metal stud partitions from junction boxes in the ceiling space to individual devices or for 6' fixture whips from junction box to fixtures. Exposed lengths shall not exceed 6' in total length.
- B. Type MC cable shall be used only in areas permitted in the NEC.
- C. Type MC cable may not be used for feeders or branch circuit home runs to panelboards.
- D. Support cable at intervals not exceeding 4½ feet.
- E. Bending radius shall comply with Article 330 of the NEC.
- F. Provide insulating bushing at all termination points between the metal sheath and outlet or junction box.
- G. Type MC cable shall not be installed exposed with the exception of fixture drops in mechanical or equipment rooms. Secure the cable to fixture hangers using nylon or plastic ties.

3.4 CONNECTORS AND TERMINATIONS

- A. Cover un-insulated splices, joints, and free ends of conductor with PVC electrical tape or plastic insulating caps.

3.5 TESTS

A. Low Voltage Feeders

1. After low voltage feeders are pulled, and before being connected, test feeders with a 1000 volt, 60 Hz insulation tester for one minute to determine that the conductor insulation to ground is greater than that recommended by the manufacturer.

END OF SECTION 26 12 00