PHYSICAL FACILITIES
2017 Consultant’s Handbook
Division 26 ELECTRICAL
0519 LOW VOLTAGE CONDUCTORS AND CABLES

1 General
1.1 All conductors shall be of copper material continuous from outlet to outlet.
1.2 Conductors #8 AWG and larger shall be stranded.
1.3 Conductors smaller than #8 shall be either all solid or all stranded (not mixed.)
1.4 Do not allow use of salvaged conductors.
1.5 No material shall be installed that is corrosive, breeds or sustains mold growth, is moisture absorbing or whose properties exceed the following:
   - Flame spread - 25 Max
   - Smoked developed - 50 Max
   - Fuel contributed -50 Max
1.6 Conductor Color Code
1.6.1 For existing construction color coding should be consistent with the system already installed
1.6.2 For new construction color coding shall be as shown in the table below:

<table>
<thead>
<tr>
<th>Item</th>
<th>120/208</th>
<th>277/480</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase A</td>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>Phase B</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>Phase C</td>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>“A” phase neutral</td>
<td>White</td>
<td>Gray with brown tracer</td>
</tr>
<tr>
<td>“B” phase neutral</td>
<td>White with red tracer</td>
<td>Gray with orange tracer</td>
</tr>
<tr>
<td>“C” phase neutral</td>
<td>White with blue tracer</td>
<td>Gray with yellow tracer</td>
</tr>
<tr>
<td>Shared neutral</td>
<td>White with No tracer</td>
<td>Gray with No tracer</td>
</tr>
<tr>
<td>Switch leg return</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Three and four way “travelers”</td>
<td>Orange</td>
<td>Orange</td>
</tr>
<tr>
<td>Mechanical or equipment ground only</td>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

1.7 Colors to be continuous through the insulation and from end to end. Field marking is not acceptable.

2 Conductors
2.1 None shall be smaller than #12, except #14 for motor control, #16 stranded for annunciator wiring and #18 TFFN solid for fixture wiring (ballast to socket).
2.2 Where required by enclosure size, terminal space, etc., provide stranded wiring for temperature control wiring, interlocks, etc.
2.3 Low voltage ballast control wiring may be #16 TFFN

3 Wire Types
3.1 #16 annunciator circuits only
   3.1.1 Type TFF, TFFN, THHN, Stranded
3.2 #14 and larger for general use
   3.2.1 Type THW, THHN/THWN, XHHW, THW-2, THWN-2, XHHW-2.
3.3 #14 for flexible connections and pendants to fixtures only
   3.3.1 Stranded
   3.3.2 For fluorescent fixtures or fixtures labeled not to exceed 90°C use type TFFN or equal.
   3.3.3 For fixtures labeled not to exceed 105°C use a 105°C type THWN, THHN, MTW “trip-rated” wire or an approved equal.
   3.3.4 For incandescent fixtures and/or high intensity discharge light fixtures not to exceed 150°C and other approved applications requiring high temperature insulation use a 150°C Type SFF-2 or equal.
3.4 #14 thru #3 AWG, 75°C wet locations
   3.4.1 Type XHHW (or XHHW-2) or with neoprene jacket to be used below slabs, service entrances and exterior underground work, including campus site lighting.
3.5 #3 AWG or larger, where underground
   3.5.1 Type XHHW or XHHW-2.
3.6 3Wire installed underground to be XHHW or XHHW-2.

4 Branch Circuit Conductors
4.1 Each 120V circuit of a 120/240V, 1PH, 3W system shall have its own 100% neutral.
4.2 Each 120V circuit of a 120/240V, 3PH, 4W system shall have its own 100% neutral.
4.3 Each 120V circuit of a 120/208V, 3PH, 4W system shall have its own 100% neutral.

4.4 Each 277V circuit of a 480/277V, 3PH, 4W system shall have its own 100% neutral.

4.5 When more than one neutral is in a common raceway, junction box, etc. each neutral shall be clearly identified with its associated phase conductor.

4.6 Each branch circuit conduit shall contain a separate green equipment grounding conductor sized per NEC.

5 Conductor Joints and Connections

5.1 In general #10 AWG and smaller conductor joints shall be made using “Scotchlock”, “Wire nut” or equal (copper sleeves are not acceptable).

5.2 Fluorescent Lights: Wiring connections within fluorescent fixture channel, #12AWG wire to #18AWG ballast wire, may be made using Kleinhuis “P-NUT” push-on butt connector, Cat. #2003/2.5/3 (stranded wire must be tinned prior to installation) or vinyl covered spring devices, “Scotchlock”, “Wire nut”, installed per manufacturer’s recommendations, or approved equal.

5.3 Motors (480V or less): For #10 AWG and smaller conductors - provide taped connector eye lug of motor lead to looped input conductors, using machine bolt/nut arrangement to facilitate rapid disconnecting.

5.4 All other connections in fixtures shall be made using vinyl covered spring device, “Scotchlock”, “Wire nut”, installed per manufacturer’s recommendations or an approved equal.

5.5 Connections under screw head terminals; solid conductors shall have formed eyes, stranded conductors shall have an approved nylon compression terminal as T & B “Sta-Kon” or approved equal.

5.6 Connection on receptacles can be back wired if receptacle is provide with a screw and clamp feature.

6 Tape for 600 Volt Insulated Conductors

6.1 Normal temperature installations use Scotch #33, 88.

6.2 For wet locations use self-vulcanizing rubber insulating tape equal to Scotch #2210 with vinyl tape outer coat.