DESIGN REQUIREMENTS

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

GENERAL INFORMATION

1.1 This section applies to all feeders and branch circuits.

DESIGN REQUIREMENTS

2.1 Above Accessible Ceilings: Use only building wire type “THHN/THWN” insulation in raceway. Home runs in conduit (EMT, rigid, galvanized) will be run above ceilings to a junction box. Metal Clad Cable (MC, etc.) will be permitted from the junction box dropped down to the terminal point receptacle outlet or switch at a maximum length of 30 feet.

2.2 There is a great deal of confusion over armor clad and metal clad cable known by many designations and often labeled as simply MC. For our purposes, metal clad or armor clad cable can be used at the University (as defined in the Design portion of this standard) as long as they meet the following requirements:

a. MC cables shall be used only for lighting and receptacle branch circuits and not for home runs, feeders or mechanical equipment. Home runs from the panelboard to the first device on the circuit shall be EMT or RGS.

b. They are approved for use in New York City.

c. Their installation adheres to code and Columbia standards for the space being built.

d. The cable has a separate, insulated and full sized insulated ground conductor. The armor or metal cladding cannot be used as a grounding path.

2.3 Lab areas, areas with emergency power, other research areas and spaces with specific environmental requirements may prohibit metal clad cable installation of any type. Applicable codes, sound engineering judgment and best practices will dictate the electrical design in these cases.

2.4 Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise. Use terminal blocks for all control wiring connections, wire nuts are not allowed. Conductors must be de-rated per code when installed in a common conduit or bundled.

2.5 Control wires for sensors must be home runs to the controllers. If it is not practical to pull home runs, provide junction boxes fitted with terminal blocks mounted on a back plane.
Connections for wire junctions shall be made to the terminal blocks. Each wire will be labeled identifying what terminal it is on such as “TB1-T2” for the terminal block one on terminal two and the device it is coming from as marked on the print such as P-1, pressure sensor one.

2.6 Branch circuits shall not utilize common neutrals. Use dedicated neutral wires for each circuit. Where multi-wire branch circuits serve pre-wired furniture systems that utilize a common neutral, a common neutral for the branch circuit may be used but the neutral size shall be increased to match the neutral wire size in the furniture partition (#10 AWG minimum) and a neutral wire shall be provided for each neutral pre-wired into the furniture. Provide dedicated neutral conductors for single pole ground fault interrupter circuit breakers.

2.7 All feeders containing a neutral shall have full sized neutrals. Reduced neutrals are not acceptable.

2.8 No more than three branch circuits shall be common to a single conduit unless specifically required and where wire ampacity is derated in accordance with Code.

2.9 The Design Professional is responsible for ensuring the design incorporates the adequate wire size, including accommodating voltage drops. This responsibility is not to be passed on to the Contractor.

2.10 Where required by code for emergency, fire pump and/or fire alarm applications, provide MI cable or Type RHW-2 cables installed in strict compliant with the manufacturer’s requirements.

2.11 Color Code

a. Wire insulation shall be color-coded by means of factory insulation or applied electrical tape at every cabinet, junction box or accessible location. Color code shall be as follows, except if existing color code differs, in which case the existing color code shall be utilized:

<table>
<thead>
<tr>
<th>System Voltage</th>
<th>208/120</th>
<th>480/277</th>
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</thead>
<tbody>
<tr>
<td>Phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>B</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>C</td>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
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<td>Gray</td>
</tr>
<tr>
<td>Ground</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Isolated Ground</td>
<td>Green w/tracer</td>
<td>-</td>
</tr>
<tr>
<td>GFI Circuit Neutral</td>
<td>White w/tracer</td>
<td>-</td>
</tr>
</tbody>
</table>
CONSTRUCTION REQUIREMENTS

3.1 All wire shall be high conductivity copper, 600 volt insulated with a 90 Degree Celsius rating for the installed location. Wire allowable ampacity shall be based on the 75 Degree Celsius rating for feeders conductors.

3.2 No branch circuit wire shall be smaller than No. 12 AWG.

3.3 See Specifications Section 23 09 00 “Instrumentation and Control for HVAC” for control wire specifications.

3.4 Do not rest cables, conduits, metal clad cable, raceways or any other electrical system component on ceiling panels unless it is meant to be there (a light fixture for example).

3.5 Circuit work between outlet boxes and each recessed lighting fixture shall be Type “SF-2” Wire.

3.6 Wires shall be factory color-coded.

3.7 Required field tests shall include:

    a. Continuity tests of all Feeders, Motor Circuits and Branch Circuits.
    b. Insulation-resistance test (megger test) on each distribution panel feeder.
    c. High Potential (hipot) testing for all main high voltage (above 600 Volts) feeders.

REFERENCE

4.1 The applicable CSI Specification Section is 260519.