

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**1. GENERAL INFORMATION**

- 1.1 This section applies to all feeders and branch circuits.

2. DESIGN REQUIREMENTS

- 2.1 Above Accessible Ceilings: Use only building wire type “THHN/THWN” or “XHHW” insulation in raceway. Home runs and branch circuits 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 receptacle outlets or switches at a maximum length of 30 feet. MC cable shall not be run from outlet to outlet within walls where the total run would exceed 30 feet from the junction box above the ceiling.
- 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 branch circuits to mechanical equipment.
 - 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.
- 2.5 Use terminal blocks for all control wiring connections, wire nuts are not allowed.
- 2.6 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.

- 2.7 Branch circuits shall not utilize common neutrals. Use dedicated neutral wires for each circuit. Where multiple wire branch circuit serves prewired 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 prewired into the furniture. Provide dedicated neutral conductors for single pole ground fault interrupter circuit breakers.
- 2.8 All feeders containing a neutral shall have full sized neutrals. Reduced neutrals are not acceptable.
- 2.9 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.
- 2.10 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.
- 2.11 Where required by code for emergency, fire pump and/or fire alarm applications, provide approved fire rated cables installed in strict compliant with the manufacturer's requirements.
- 2.12 Color Code
 - a. Wire insulation shall be color-coded by means of factory insulation. Color code shall be as follows, except if existing color code differs, in which case the existing color code shall be utilized:

System Voltage		
Phase	208/120	480/277
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green
Isolated Ground	Green w/tracer	-
GFI Circuit Neutral	White w/tracer	-

3. 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 60 or 75 Degree Celsius rating for conductors as per code.
- 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 Required field tests shall include:
 - a. Continuity tests of all Feeders, Motor Circuits and Branch Circuits.
 - b. Insulation-resistance test (megger test) on each feeder.
 - c. High Potential (hipot) testing for all high voltage (above 600 Volts) feeders.

END OF SECTION