

## Description:

The purpose of the section is to highlight the current applicable UMD Design Standards that apply to the basic use of electrical materials and installation methods including, but not limited, to the following items:

- Basic Materials
- Connection of Utilization equipment
- Supports
- Identification
- Conduit and fittings
- Wireway
- Surface raceway system
- Electrical boxes, cabinets and enclosures
- Wire and Cable
- Wiring Devices
- Service Fittings

## Related Sections:

- TBD

## Effective Date:

January 1, 2023

## Applicable Standards:

- All materials and installation methods shall comply with NFPA
- UL – Underwriter Laboratories
- OSHA
- NEMA

## General Requirements:

### Products

- **Basic Materials**
  - All products shall be UL (Underwriters Laboratories) listed.
  - Nameplates: Engraved, Phenolic laminated plastic, 0.125 inch thick, black background with white core, with beveled edges. ALL LETTERING SHALL BE UPPERCASE. Shall be attached using self-tapping screws.
  - Nameplate shall be installed on all equipment items. Use ¼" high engravings.
  - Nameplates shall be installed on all feeder circuits and all outdoor circuits.
    - Attach nameplates to each cable or wire located in pull boxes and at each splice and termination. Use ¼" letters. Cable nameplates shall be secured in place with ¼" cable ties. Nameplates shall indicate which panel and circuit breaker the feeder or circuits is fed from.
  - Phases of all 600V wire shall be identified at all splice and termination points using colored tape. Colors shall be black, red, and blue for 208 volt phase conductors, white for neutrals, and green for ground conductors. Utilize orange, brown, and yellow for 480 volt phase conductors, gray for neutrals, and green for ground conductors.
  - Warning Signs: Provide warning signs for electrical equipment per OSHA and NFPA.
  - Label junction boxes with panel #, and circuit breaker # of where circuits originate – use permanent marker.
  - Steel – all steel products shall be galvanized or treated for corrosion.
  - Conduit and fittings.
    - Use only specified raceway in the following indoor and outdoor locations:
      - Installation in or under concrete slab shall be; galvanized steel (EMT) or schedule 40 PVC. Stub-ups out of concrete shall be galvanized steel (EMT). Applicable for branch circuits and service entrance feeder only.
      - Exposed outdoor locations: Only rigid galvanized steel conduit shall be used.

- Concealed dry interior locations: Electrical metallic tubing or MC cable as allowed below.
- Exposed dry interior locations: EMT or rigid steel in areas with motorized vehicles.
- Connections to vibration producing equipment or motors shall be liquid tight flexible metallic conduit.
- New Construction: raceway/conduit in finished areas shall be concealed by architectural surfaces.
- Electrical Feeder Distribution conduits within a building shall not be in the concrete slab or underground.
- Electrical service entrance conductor from the pad mounted transformer to the building shall be copper. Aluminum is not an acceptable material to be installed for this application and should not be considered a valued engineered (VE) substitute.
- Use of the following types of conduits and fittings shall not be permitted in any application for this project:
  - "Die-cast metal" conduit fittings.
  - Aluminum Conduit, Cable Tray and fittings.
  - PVC Type 'EB'.
- Electrical Boxes
  - Interior – metal only, approved for the specific location and application.
  - Exterior – metal, NEMA approved for outdoor locations.

### Wire and Cable

- Building Wire:
  - Feeders and Branch Circuits Larger than 10 AWG: Copper, stranded conductor, 600 volt insulation, THHN/THWN, rated at 75 degree C.
  - Feeders and Branch Circuits 10 AWG and Smaller: Copper, 600 volt insulation, THHN/THWN solid conductor, rated at 75 degree C. No conductor smaller than #12 AWG is acceptable.
  - Aluminum conductors shall not be utilized unless approved by UMD FM OM&U.
- Forbidden Cables:
  - Use of BX (Armored) Cable, UF, and Romex Cable is not permitted.
- Color coding shall be a permanent part of and uniform throughout the entire length of the jacket material of the cable and shall be used throughout the building for feeder circuits. Color applied to the outer surface only is not acceptable. Taping (6" minimum) at termination points is acceptable. Color coding shall be:

PHASE	Color - 480/277 Volts	Color - 208/120 Volts
A	Orange	Black
B	Brown	Red
C	Yellow	Blue
NEUTRAL	Gray	White
GROUND	Green	Green

### Wiring Devices and Wall Plates

- **Receptacle:**
  - Use specification grade receptacles and switches.
  - GFCI Receptacle: Duplex convenience receptacle with integral ground fault current interrupter, test and reset push buttons.
  - Device plates for interior use on flush-mounted devices shall be satin finish type 302 stainless steel. Any exceptions must receive previous written authorization from UMD.
  - Device plates for interior use on surface-mounted devices shall be galvanized sheet metal with rounded corners.

- **Weatherproof Cover Plate:** Match receptacle configuration provided for equipment connection. Gasketed cast metal with gasketed device covers.
  - A receptacle installed in a wet location where the product intended to be plugged into is not attended while in use (e.g. sprinkler system controller, landscape lighting, holiday lights, etc.) shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.
  - A receptacle installed in a wet location where the product intended to be plugged into is attended while in use (e.g. portable tools, etc.) shall have an enclosure that is weatherproof when the attachment is removed.

#### Installation

- Do not drill structural steel members.
- Install free-standing electrical equipment on 4" concrete pads.
- Arrange conduit to maintain headroom and to present neat appearance.
  - Route exposed raceway parallel and perpendicular to walls and adjacent piping.
  - Maintain minimum 6 inch clearance to heat surfaces such as flues, steam pipes, and heating appliances.
  - Maintain required fire, acoustic, and vapor barrier rating when penetrating walls, floors, and ceilings.
  - Use conduit hangers and clamps; do not fasten with wire or perforated pipe straps.
- Install surface metal raceway and multi-outlet assemblies in accordance with manufacturer's instructions.
  - Use flat-head screws or clips and straps suitable for the purpose, to fasten channel to surfaces. Mount plumb and level.
  - Use suitable insulated bushings and inserts at connections to outlets and corner fittings in metal raceway.
  - Use fittings and accessories designed for use with raceway system.
- Use recessed outlet boxes in finished areas or as required.
  - Secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness.
  - Do not install boxes back-to-back in walls; provide 6 inch separation, minimum. In acoustic-rated walls provide 24 inch separation, minimum.
- Install floor boxes in accordance with manufacturer's instructions.
- Minimum conduit size shall be  $\frac{3}{4}$  inches.
- Install pull strings in all spare raceways. Pull strings shall be multi-strand polypropylene monofilament, with minimum size of 3 strand 3/16 inch diameter and 800 pound breaking strength.

#### Examination and Preparation

- No wiring shall be installed until the building is under roof. Do not install wire in raceways until after concrete work fireproofing or plastering is completed.

#### Wiring Devices

- Install wiring devices in accordance with manufacturer's instructions.
- Install convenience receptacles 18" inches above finished floor with grounding pole on top.
- Install duplex convenience receptacles in corridors at 30 foot maximum intervals.

#### Wiring for Lighting Fixtures, Receptacles:

- MC Cable shall be allowed for connections within a room from a junction box to the lighting fixtures.
- Conduit home runs shall be in EMT.
- MC Cable shall be allowed from a junction box within a room to the receptacles in the same room.
- MC Cable shall not be allowed to cross one room to another room whether the wall between two rooms goes up to slab or not. If the rooms are identified as two separate rooms, MC cable shall not be used between the two rooms.
- MC Cable shall not be used, between two receptacles when they are in two separate rooms, on the same wall.

## Labeling for Lighting and Power Equipment

All electrical equipment shall be labeled as set forth in this section, including but not limited to the following types;

- Switchgear/Switchboards
- Power Distribution Panels/Load Centers
- Lighting/Power Panels
- Disconnect/Safety Switches
- Automatic Transfer Switches (ATS)
- Power Distribution Units (PDU)
- Motor Control Centers (MCC)
- Transformer
- Uninterruptible Power Supply (UPS)

The labeling shall be in the following format;

**Type Volt/Sys Location Item**  
 X X – X X X X – X X X X X – X X

- **TYPE**—First group of two characters describes the type of power equipment;
  - “SE”—Service Entrance Equipment (Switchgear or Switchboard)
  - “DP”—Power Distribution Panel. Panel with a significant majority of “feeder” breakers
  - “PP”—Power Panel. Panel with a significant majority of power “branch” breakers
  - “LP”—Lighting Panel. Panel with a significant majority of lighting “branch” breakers
  - “DS”—Disconnect Switch. Fused or non-fused disconnect switch or circuit breaker
  - “AT”—Automatic Transfer Switch
  - “MC”—Motor Control Center
  - “TX”—Transformer
  - “PD”—Power Distribution Unit
  - “UP”—Uninterruptible Power Supply
- **Volt/Sys**—Second group of two to four characters describe the voltage level and the system providing power.
  - Voltage Designation - 1st character
    - “1”---120/240 volt 1 phase
    - “2”---120/208 volt 3 phase
    - “4”---277/480 volt 3 phase
  - System Power - 2nd and possibly the 3rd and 4th character
    - “N”---Normal Power
    - “E”---Emergency (not segregated into Life Safety, legally required, etc.)
    - “ELS”---Emergency, Life Safety Power
    - “ELR”---Emergency, Legally Required Power
    - “EOP”---Emergency, Optional Standby Power
    - “UPS”---Uninterruptible Power Supply
    - “SL”---Site Lighting (controlled by contactor)
- **Location**—Third group of four (or five) characters describes the location (room number or nearest room number) within the building.
  - Building Floor - 1st characters will indicate the floor of the building
  - Building Wing - 2nd character will indicate the wing
  - Building Room Number - 3rd and 4th character will indicate the room number in that wing
  - Special Notation - 5th character may be an alpha prefix indicating a sub-basement (SB0123), basement (B0123) or mezzanine (M1123), or an alpha suffix indicating a part of a room or space (1123A)

- **ITEM**—Fourth group of two characters
  - 1st character is the sequence number for the same type equipment (same label designation) within the SAME room.
  - 2nd character is the section number for multiple section equipment items.

When replacing “existing” equipment, provide two labels;

- The new label as defined above
  - A second label below the first that provides the “old” designation of the panel/equipment with the words “old label” in front of the old designation. For instance, “old label PP-01N”
- **Additional Label Samples**
    - “SE-4N-1201-1” is Service Entrance equipment, operating on 277/480 volt “normal” power, situated in Room 1201.
    - “DP-4N-2301-2” is a Power Distribution Panel, operating at 77/480 volts “normal” power, situated in Room 2310. This panel is the second or two panels of this type within Room 2310.
    - “DP-2ELS-2310-1” is a Power Distribution Panel, operating at 120/208 volt “Emergency, Life Safety” power, situated in Room 2310.
    - “PP-2N-3224-1” is a “Branch” Power Panel, operating at 120/208 volt “normal” power, situated in Room 3224.
    - “MC-4N-0210-1” is a motor Control Center, operating at 277/480 volt “normal power, situated in Room 0210.