

## 26 05 33 - Raceway and Boxes for Electrical Systems

### 1. Introduction

- A. Section includes conduit, surface raceway, wireways, outlet boxes, pull boxes, junction boxes and handholes.

### 1. References

- A. NFPA 70 National Electrical Code
- B. IBC International Building Code

### 2. Design Standards

#### A. General:

- 1. All equipment must be supported directly by structural members with adequate load-bearing capacity and material integrity using appropriate anchoring/connection hardware. Under no circumstances may equipment be supported by connections to finish materials. For example, equipment hung from toggle bolts through plaster-on-lath, gypsum board or ACT ceilings is **not acceptable**.

#### B. Outlet Boxes:

- 1. Outlet and junction boxes shall be a minimum of 4 inches square x 2 1/8 inches deep. Use of round boxes shall be avoided where conduit must enter the box through its side. This would result in a difficult and weak connection with a locknut or bushing on the rounded surface.
- 2. Interior outlet boxes shall be galvanized steel constructed with stamped knockouts in back/sides and with threaded holes with screws for securing box coverplates or wiring devices. Multigang outlet boxes shall be of single-piece construction. No box extensions are allowed.
- 3. For locations exposed to weather or moisture (interior or exterior), weatherproof boxes and accessories shall be provided. Weatherproof boxes shall be cast-type suited to each application. The boxes shall have threaded conduit ends, cast faceplate with spring hinged waterproof cap suitably configured, a gasket and corrosion proof fasteners.
- 4. Pull and junction boxes shall be galvanized sheet steel with screw on covers of the type and size to suit each respective location and installation. Boxes shall have continuously welded seams and shall be equipped with steel nuts, bolts, screws and washers. Provide cast metal, gasketed-type pull boxes for outdoor locations.

5. Floor boxes shall be of brass construction with coverplates. Provide carpet flange for boxes installed in carpeted areas.
6. Where multigang boxes serve normal and emergency power circuits, full length and height barrier plates shall be provided within the box to completely separate normal and emergency circuits. Barrier plates shall also be required where two different 277-volt lighting circuits are present in the same switch box.

C. Conduits:

1. Duct banks for power and telecommunication building services shall be either rigid galvanized conduits or concrete-encased 4 inch Type DB PVC. Each PVC conduit will be supported and completely encased in concrete with a minimum of 3 inches on all sides. The number of bends will be minimized and all bends will be long-radius types. Total bends between pull points shall not exceed 180°. Bell ends shall be installed in the manhole. All duct banks shall be buried no less than 36 inches below finished grade or finished pavement. Conduits shall be left cleaned and with a suitable nylon pull string or pull wire in place. Service conduits shall be slope away from the building to drain back to the manhole.
2. Minimum conduit sizes shall be 3/4 inch (interior) and 1 1/4 inch (exterior). For switch legs, control circuits and signal circuits not exceeding four circuit conductors, 1/2 inch flexible conduit may be used.
3. All conduit shall be GRC unless otherwise permitted.
4. Intermediate metal conduit (IMC) may be used as a substitute for GRC, except for work installed in earth or concrete or where installed exposed less than 6 feet above finished floor and for circuits over 600 volts.
5. Electric metallic tubing (EMT) up to 2 inches for power circuits and up to 4 inches for special system circuits may be used as a substitute for GRC except for work installed in earth, concrete, exterior areas, hazardous areas or where subject to mechanical injury and for circuits over 600 volts. No EMT shall be installed exposed below 6 feet above finished floor unless it enters or exits from the top of a switchboard or panelboard enclosure. EMT fittings shall be steel compression type for sizes 2 inches and less. Steel set-screw type may be used for sizes above 2 inches.
6. Liquid tight flexible metal conduit shall be used for final connection to all motors, transformers, and rotating or vibrating equipment. The maximum length of such conduit shall be 72 inches.
7. Flexible metal conduit shall be used for final connections to lighting fixtures concealed in dry areas only. The maximum length shall be 72 inches.
8. Rigid nonmetallic conduit may be used only for the secondary underground service, the underground telephone service conduit and branch circuits and telephone

- system conduits located below the concrete floor slab-on-grade or buried on the exterior of the building. All PVC shall be Schedule 40 (unless noted otherwise), UL-listed for use with 75°C conductors.
9. All PVC components of the PVC conduit system shall be furnished from the same manufacturer and used specifically for their intended purpose. All field bends shall be made according to the manufacturer's instructions and UL requirements. PVC that has been heated with a torch shall be replaced.
  10. Rigid nonmetallic conduit shall not penetrate slab-on-grade or be installed anywhere above grade except where used as part of the conduit systems concealed within precast or poured-in-place walls. In all other cases, it shall transition to GRC prior to turning up from underground
  11. Condulet type fittings (LBs, LEBs, etc.) shall not be used on any service conductor conduit or on any conduit containing conductors sized #1/0 AWG or larger.
  12. Conduits shall not be installed in concrete floor slabs without prior approval by DUES/FMD.
  13. Conduit penetrations shall be made only at perpendicular angles to the penetrated surfaces unless otherwise specified. Conduit that is run along exterior walls shall not penetrate insulation or vapor barriers.
  14. Suitable expansion fittings shall be provided as required on all conduits that are installed on walls subject to expansion or on conduits that penetrate expansion joints. Expansion fittings shall be as recommended by the conduit manufacturer.
  15. Two coats of asphaltum or bitumastic paint shall be applied to all underground metallic conduits that are not encased in concrete.
  16. 200-pound-test nylon pull cords shall be provided in all empty conduits.
  17. All conduits shall be concealed in finished spaces unless non-concealed conduit is specified for aesthetic effect by the Architect and approved by the Owner. Surface mounted devices are generally not permitted. The presence of pre-existing surface-mounted wiring and conduit does not justify the installation of new surface-mounted devices.
3. Documentation and Review Requirements
- N/A
4. Installation and Performance Requirements
- A. Coordinate all required tie-in points with Duke Utilities and Engineering Services (DUES).

B. Coordinate all commissioning efforts with DUES.

5. As-Built Requirements

A. All underground locations of conduits and boxes.