

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

- 1.1 Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to the work of this section.
- 1.2 Unless otherwise shown or specified, raceways shall be provided for all conductors, including but not limited to lighting, power, control, fire alarm, communications and telephone. All conduit shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. Reference Section 26 05 00 for acceptable listing and labeling agencies
- 1.3 Raceways shall be installed as a complete system without wires and shall be continuous from outlet to outlet and from fitting to fitting. Raceways shall be mechanically and electrically connected to all boxes and fittings and shall be properly grounded.
- 1.4 The routing and location of all conduits and other raceways shall be coordinated with other trades and with the building construction to avoid conflicts.
- 1.5 Where conduit and other raceway sizes are not specifically shown on the plans, conduits shall be sized in accordance with the requirements of the NEC. No conduit shall be less than 3/4" above grade and 1 1/4 " below grade.

PART 2 - PRODUCTS

- 2.1 Rigid Metal Conduit (RGS) shall be manufactured by Allied, Triangle, Wheatland or approved equal, in accordance with UL 6 and ANSI C80.1. Conduit shall be low carbon, hot-dipped galvanized inside and out, with threaded ends, 3/4" inch minimum size. Fittings shall be cast iron or alloy steel, threaded and galvanized.
- 2.2 Electrical metallic tubing (EMT) shall be as manufactured by Allied, Triangle, Republic, or approved equal, in accordance with UL 797 and ANSI C80.3. EMT shall be high-strength, zinc-coated, 3/4 inch minimum size. EMT shall not be utilized for service entrance conductors. Fittings shall be of same finish and material as tubing. Fittings shall be steel, hexagonal compression type, with insulated throat. Pot-metal, set-screw or indented fittings shall not be utilized.
- 2.3 Flexible metal conduit shall be in accordance with UL 1 and ANSI C33.92. Conduit shall be galvanized. Flexible metal conduit shall be secured to boxes and enclosures with angle saddle type connector with bushings between the conductors and the conduit. Minimum size 3/4" except 1/2 " may be used for lighting whips in lengths less than 6'-0".
- 2.4 Liquidtight flexible metal conduit shall be provided in accordance with UL 360. Conduit shall have galvanized steel core and moisture and oil resistant thermoplastic cover. Minimum size 3/4".

- 2.6 Expansion Joint Fittings: Watertight, permitting two-way movement up to 4 inches, equipped with bonding jumpers around or through each fitting.
- 2.7 Sealing Material for Sealing Fittings: Chico X Fiberdam, and Chico A sealing compound, or Chico A-P interpak by Crouse-Hinds or Apelco sealing cement and fiber filler by Appleton or equal by 3M Corp.
- 2.8 Insulated Bushings: Type B or SBT, as applicable, by O-Z Gedney or series B1900, series BU500 or series TC700, as applicable, by Steel City or equal by T&B.
- 2.9 Pulling in Wire: Provide a 100# nylon pull rope in each row of empty conduit.
- 2.10 Wireways and wiring troughs shall be code gauge galvanized steel, sized as shown, or as required by the NEC. Covers shall be screwed. Where indicated as raintight, wireways shall be galvanized and shall comply with the NEMA requirements.
- 2.11 BOXES, ENCLOSURES, AND CABINETS
 - A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
 - B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
 - C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
 - D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
 - E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - F. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

- 3.1 Rigid steel conduit shall be installed with threaded fittings and couplings. Where conduits terminate in a threadless opening, locknuts shall be provided both inside and outside of the box or enclosure and the conduit end shall be fitted with an insulating bushing. Where bonding is required, the end of the conduit shall be equipped with an insulated metallic grounding and bonding bushing.
- 3.2 Liquidtight flexible metal conduit shall be secured with approved liquidtight fittings with insulated throats.
- 3.3 All metallic couplings, connectors and fittings shall be malleable iron or steel and finished with zinc plating or by galvanizing.
- 3.4 All conduits shall be plugged after installation to prevent the entrance of construction dirt and debris. Conduits shall be clean before wires are pulled.
- 3.5 In wet or damp locations, all fittings shall be installed with suitable watertight gaskets.
- 3.6 Where raceways pass through walls, partitions and floors, seal penetrations to provide a neat installation which will maintain the integrity of the waterproofing or fireproofing, as applicable, of the structure. Coordinate installation requirements with roofing installer where conduits pass through the roof.
- 3.7 Conduit provided outdoors above grade shall be rigid steel conduit.
- 3.8 Conduit located indoors, not in mechanical, electrical or elevator machine rooms or **UNDERSLAB**, may be EMT. All other indoor conduits shall be rigid steel. EMT is not permitted to be installed outdoors.
- 3.10 Flexible metal conduit may be used indoors for connections to lighting fixtures in accordance with the NEC. Liquidtight metal conduit of sufficient length to eliminate vibration shall be used for connections to motors, transformers, and other equipment requiring flexibility.
- 3.11 The use of flexible metal conduit shall be limited in application to the connection of lighting fixtures and miscellaneous equipment, and in lengths not to exceed six feet. Fittings shall be of a type approved for grounding purposes.
- 3.12 Expansion fittings shall be utilized in all cases where conduits pass through or across building expansion joints. Fittings shall be of an approved weatherproof telescopic type permitting a movement of up to four inches and shall be provided with approved bonding jumpers around or through the fitting. Contractor shall review the structural drawings for locations of expansion joints.
- 3.13 All conduits shall be properly supported using galvanized malleable iron conduit clamps for individual runs. Multiple runs shall be supported on channel adequately secured to walls or hung from structure above with conduits fastened to channel with clamps designed for the purpose.
- 3.14 Raceways shall be run at least 6" from hot flues, steam pipes, hot water pipes and other hot surfaces.

- 3.15 All raceways entering a building from underground shall be sealed to prevent water, moisture, gas, or any other foreign matter from entering the building. Conduits shall be sealed in accordance with NFPA 70 Sections 225.27 and 230.8.
- 3.16 No flexible conduits or Condulets shall be used for the telecommunications raceway system. In addition, there shall be no more than a total of 180 degrees of bends in any telecommunications raceway system without the installation of an accessible pullbox.
- 3.17 Connection of Conduit to Sheet Metal Boxes and Enclosures:
- A. Connection to NEMA 1 type boxes and enclosures:
 - 1. Rigid Metal Conduit: Install insulated bushings and double locknuts.
 - 2. EMT: Install compression steel box connectors with insulated throats.
 - B. Connection to NEMA 3R, 4, 4X, and 12 type boxes: Install insulated bushings and sealing locknuts or hubs.
 - C. When conduits enter floor mounted enclosures from below and there is no sheet metal to which to attach; install grounding bushings on the conduit. Bond bushings to ground bus using a conductor the same size as required for an equipment grounding conductor sized for the given circuit.
 - D. Install sealing bushing within all conduits which have entered a building from outside, whether from above or below grade.
- 3.18 BOX INSTALLATION
- A. Pull and junction boxes, where concealed in unplastered masonry, shall be square corner masonry type.
 - B. Boxes for exposed work shall be FS or FD series "Condulets" of a type and size applicable for the intended use at the locations shown on the drawings. SE and SEH Series "Condulets" shall be used for ceiling boxes where round boxes are required. Steel boxes will not be permitted for this purpose. Covers for use with these boxes shall have cadmium plated finish and shall be of rounded-edge design with openings to suit devices. Where the general arrangement and number of conduits prohibit the use of a single box, additional boxes shall be used as junction boxes and they shall be of the same general design as the outlet boxes. Provide weatherproof covers in outdoor areas. Such boxes shall be Crouse-Hinds or equivalent Appleton or Pyle-National.
 - C. Boxes installed in concrete construction shall be galvanized concrete type at all locations, except that cast iron boxes shall be installed for watertight fixtures or devices.
 - D. Boxes installed in unplastered masonry shall have covers of sufficient depth to avoid undue cutting of the masonry units.

- E. Special care shall be exercised in the location of pull and junction boxes in order that access not be obstructed by piping or ductwork installed by other trades. To this end, the work shall be coordinated with representatives of the other trades. Boxes shall be independently and securely supported.
- F. Pull boxes shall be installed at all necessary points, whether indicated on the drawing or not, to prevent injury to the insulation or other damage that might result from pulling resistance or for other reasons necessary to proper installation.
- G. Where boxes are used in exposed conduit runs, plain covers shall be attached to the box with a suitable number of countersunk flathead machine screws or slotted truss head bolts. Flush covers of similar construction shall be used for flush mounted boxes.
- H. ALL Junction and pull boxes for branch circuits, fire alarm or communication systems shall be identified by spray painting the interior and exterior of the box and the cover. In addition, the box cover shall be labeled using a permanent, black marking pen to identify circuits or systems in box. Color code for spray painting of boxes shall be per Section 260553 of the Specifications.
- I. Clean boxes of all foreign matter prior to installation of wiring or devices.

END OF SECTION 260533

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