

SECTION 16130
RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

- 1. Metal conduits, tubing, and fittings.
- 2. Nonmetal conduits, tubing, and fittings.
- 3. Handholes and boxes for exterior underground cabling.

1.03 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. RNC: Rigid non-metallic conduit

1.04 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.05 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.

PART 2 - PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.

3. Anamet Electrical, Inc.
 4. Electri-Flex Company.
 5. O-Z/Gedney.
 6. Picoma Industries.
 7. Republic Conduit.
 8. Robroy Industries.
 9. Southwire Company.
 10. Thomas & Betts Corporation.
 11. Western Tube and Conduit Corporation.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- E. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- F. Joint Compound for, GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements,[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.
 3. Arnco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corporation.
 6. Condux International, Inc.
 7. Electri-Flex Company.
 8. Kraloy.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Niedax-Kleinhuis USA, Inc.
 11. RACO; Hubbell.
 12. Thomas & Betts Corporation.

- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.03 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Christy Concrete Products.
 - 2. Oldcastle Precast Group.
- B. Comply with ASTM C 858 for design and manufacturing processes.
- C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
 - 1. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 - 2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 3. Cover Legend: Molded lettering, "ELECTRIC."
 - 4. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
 - 5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - a. Extension shall provide increased depth of 12 inches (300 mm)
 - 6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
 - 7. Handholes 14 inches wide by 24 inches long (355 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC or PVC-Coated Steel Conduit

2. Concealed Conduit, Aboveground: GRC or PVC-Coated Steel Conduit
 3. Underground Conduit: PVC-Coated Steel Conduit, RNC, Type EPC-40-PVC, Type EPC-80-PVC or concrete encased.
- B. Minimum Raceway Size: 1.5-inch (25-mm)] trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.02 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
1. Units in Roadways, Driveways, Parking Lot and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
 2. Cover design load shall not exceed the design load of the handhole or box.

3.03 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter.
- B. Complete raceway installation before starting conductor installation.
- C. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- D. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed.
- E. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- F. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated

throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

- I. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- J. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- K. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- L. Install pull rope in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- M. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- N. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

3.04 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

- 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Detail A/E4 for pipe less than 6 inches (150 mm) in nominal diameter.
- 2. Install backfill as shown in Detail A/E4.
- 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength.
- 4. Install manufactured rigid steel conduit elbows for stub-ups at equipment and at handholes.
- 5. Underground Warning Tape: Comply with requirements in Section 16075 "Electrical Identification."

3.05 INSTALLATION OF CONCRETE HANDHOLES, AND BOXES

A. Cast-in-Place Manhole Installation:

- 1. Finish interior surfaces with a smooth-troweled finish.
- 2. Comply with requirements in Section 03300 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.

B. Precast Concrete Handhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Support units on a level bed compacted to same density as adjacent undisturbed earth.

C. Elevations:

1. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
2. Where indicated, cast handhole cover frame integrally with handhole structure.

3.06 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION