

SECTION 16110
CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquid tight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Non-metallic conduit.
- F. Fittings and conduit bodies.

1.2 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 - National Electrical Code.
- E. NECA "Standard of Installation."
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel conduit.
- G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- H. Section 02310 – Earthwork, for all underground installations.

1.3 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual routing of empty conduits, exterior underground.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site under provisions of Section 01600.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

- A. Minimum Size: ½" unless otherwise specified. ¾" for home runs and feeders.
- B. Underground Installations:
1. Use rigid galvanized steel conduit (RGS), plastic coated conduit, or thick wall nonmetallic conduit. All metallic conduits and fittings in slabs shall be coated with two (2) coats of bitumastic paint (or equal) prior to installation.
 2. Minimum Size: ¾" for home runs and feeders.
 3. Install conduits outside building line at a minimum of 30" below finished grade (except for conduits for Utility Company's cables.)
 4. Terminate PVC conduits with bell ends or connectors and bushings.
 5. Underground PVC conduits 2" and larger outside of building footprint shall be covered with three inches thick by trench width, 2,500 psi. Concrete.
 6. In areas with muck, conduit shall be supported from structure or slabs.
 7. Duct seal, outdoor conduit termination, and underground conduit entering a building.
 8. All conduit 90 degree bends for conduits 2" and larger shall be rigid galvanized steel conduit.
 9. Install conduits from Utility Company's pole mounted transformer or Utility Company's pad-mounted transformer to the building service entrance equipment at a minimum depth of 36" and covered with three inches thick by trench width, 2,500 psi concrete.
- C. Outdoor and Wet Locations, Above Grade:
1. Use rigid steel conduit (RGC).
 2. PVC schedule 80 is permitted to extend from underground to maximum of 6'-0" above finished grade on vertical conduit runs only.
- D. In Slab Not on Grade:
1. Use rigid steel conduit, electrical metallic tubing and thick wall nonmetallic conduit.
 2. Maximum Size Conduit in Slab: ¾".
- E. Outdoor damp Locations:
1. Rigid steel conduit, Electrical metallic tubing.
 2. PVC schedule 80 is permitted to extend from underground to maximum of 6'-0" above finished grade on vertical conduit runs only.
- F. Dry Locations: Concealed:
1. Use rigid steel conduit, electrical metallic tubing.
 2. PVC conduit is permitted to extend from underground to the first box in interior stud wall, masonry or concrete poured wall.
 3. PVC conduit is permitted to extend from underground through the slab in tilt wall if it changes to EMT or rigid within 2" above tilt wall.
- G. Dry Locations: Exposed:
1. Use rigid steel conduit, electrical metallic tubing.
 2. PVC conduit is permitted to be stubbed up under a floor-mounted switchgear, floor mounted motor control center, and floor mounted transformer.
 3. PVC conduit schedule 80 is permitted to extend from underground to maximum of 6'-0" above finished floor on vertical conduit runs only within electrical, communication and mechanical rooms, terminate in approved fittings.
 4. PVC conduit is permitted to sleeve a grounding electrode conductor or bonding jumper.
- H. Corrosive Areas: PVC externally coated galvanized or thick wall non-metallic conduit.
- I. Subject to Physical Damage: PVC externally coated galvanized or rigid steel conduit.
- J. Flexible conduit: ⅜" steel, maximum 6' long for a single fixture from a junction box.
- K. Steel flexible conduit or liquid tight conduit, ½" (maximum 3' long), to connect equipment where subject to vibration or frequent changing.

2.2 METAL CONDUIT

- A. Rigid Galvanized Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit; all steel fittings. No push-in or snap-in connectors or couplings are permitted.

2.3 PVC COATED METAL CONDUIT

- A. Description: NEMA RN 1, rigid galvanized steel conduit with external PVC coating, 20-mil thick.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit. No push-in or snap-in connectors or couplings are permitted.

2.4 FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction.
- B. Fittings: ANSI/NEMA FB 1. Connectors and/or couplings shall be steel or malleable iron. No push-in or snap-in connectors or couplings are permitted.

2.5 LIQUID TIGHT FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction with PVC jacket.
- B. Fittings: ANSI/NEMA FB 1. Connectors and/or couplings shall be steel or malleable iron. No push-in or snap-in connectors or couplings are permitted.

2.6 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel, compression or setscrew type. No push-in or snap-in connectors or couplings are permitted.

2.7 NONMETALLIC CONDUIT

- A. Description: NEMA TC 2; Schedule 40 PVC, Schedule 80 PVC. No ENT is permitted.
- B. Fittings and Conduit Bodies: NEMA TC 3. No push-in or snap-in connectors or couplings are permitted.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation."
- B. Install nonmetallic conduit in accordance with manufacturer's instructions.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- E. Multiple parallel runs of suspended conduits shall be supported by steel channel and straps.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.
- G. Do not support conduit with perforated pipe straps. Remove wire used for temporary supports.
- H. Steel tie wire may support conduit within interior partitions only.
- I. Arrange conduit to maintain a minimum of 6'-6" of headroom and present neat appearance.
- J. Route exposed conduit parallel and perpendicular to walls. Exposed conduit below 10' above floor in student areas, shall have two-hole straps spaced a maximum of 5'.
- K. Do not route conduits on floors in areas used for access to any equipment.

- L. Route conduit in and under slab from point-to-point.
- M. Use liquid tight flexible metal conduit for connection to all motors 3/4 horsepower or larger.
- N. Maintain adequate clearance between conduit and piping.
- O. Maintain 12" clearance between conduit and surfaces with temperatures exceeding 104°F.
- P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and cast metal boxes.
- T. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 1½" size.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.
- W. Provide a 200-lb. test pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Ground and bond conduit under provisions of Section 16450.
- Z. Identify conduit under provisions of Section 16195.
- AA. New Construction: Conduits run in finished areas shall be concealed.
- BB. No conduits shall be installed on roof surface.
- CC. Do not use "all-thread" conduit nipples.
- DD. Terminate all empty conduits in approved type boxes.
- EE. Provide four-1" spare conduits from recessed and surface panel boards into the closest suspended acoustical ceiling outside the room where panel is located.
- FF. Disconnect switches, magnetic starters, contactors, control cabinets and panel boards shall not be used as raceways.
- GG. Flexible metal conduit and liquid tight flexible metal conduit shall not penetrate walls or ceilings.
- HH. Complete electrical raceway installation before starting the installation of conductors.
- II. Patch around conduits that penetrate wall, ceiling, or floor.
- JJ. Fire alarm, security, A/C, EMS, ITV, intercom, telephone/data systems, and circuits from different panels shall be installed in separate raceway systems.
Exception: May install wiring for sound field enhancement system above the ceiling without raceway. Wiring from the wall junction box to the ceiling space must be in conduit. Sound field enhancement system installation shall meet NEC.
- KK. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07270.
- LL. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.
- MM. Use liquid-tight flexible metal conduit for connection to all motors 3/4 horsepower or larger.
- NN. All locknuts are to be steel or malleable iron.
- OO. Aluminum conduit is allowed only in locations where conduit will have direct contact with aluminum walkway covers and aluminum canopies.
- PP. Pull boxes shall be added, as necessary, to eliminate conduit runs from exceeding 400' in length for systems and 750' in length for power.
- QQ. Support conduit in or on walkways with stainless steel bolts or screws.
- RR. Caulk the penetrations of walkway roofs with silicone caulking.
- SS. Apply two coats of asphaltum paint to all metallic conduit embedded in concrete. Carefully retouch any breaks in the paint and allow to dry before placing concrete. Leave exposed until after Architect/Engineer's inspection. Pittsburg Standard Rob-Kote (or equal) may be used in lieu of painting.

END OF SECTION