

## SECTION 16111

### CONDUIT

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Metal Conduit.
- B. Flexible Metal Conduit.
- C. Liquidtight Flexible Metal Conduit.
- D. Electrical Metallic Tubing (EMT).
- E. Non-Metallic Conduit.
- F. Flexible Nonmetallic Conduit.
- G. Fittings and Conduit Bodies.
- H. Electrical Nonmetallic Tubing (ENT).

##### 1.02 RELATED SECTIONS

- A. Section 16010: Basic Electrical Requirements.

##### 1.03 DESIGN REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 (N.E.C.)
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conduit Size: ANSI/NFPA 70 (N.E.C.) for conductors indicated. Increase size as required to include bonding conductors specified.

##### 1.04 SUBMITTALS

- A. Submit Shop Drawings, Owner's Manuals, and Operating Instructions in accordance with Section 01300 - Submittals.
- B. Include only ENT, nonmetallic conduit (PVC) with associated fittings and describe intended use.
- C. Include expansion fittings for all conduit types used on the project.
- D. Include fire-stop seals and fillers.

##### 1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual routing of conduits larger than 2 inches.

1.06 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.

1.07 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 meet project conditions.
- D. Where conduit routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Except as otherwise specifically noted, all wiring throughout the building, including each of the systems specified, shall be enclosed in minimum size 1/2 inch conduit.
- B. Underground Installations:
  - 1. More than Five Feet from Foundation Wall: Use rigid galvanized steel conduit, intermediate metal conduit, plastic coated steel conduit, thickwall nonmetallic conduit PVC-80, thinwall nonmetallic conduit PVC-40 encased in concrete where indicated.
  - 2. Within Five Feet from Foundation Wall: Use rigid galvanized steel conduit, intermediate metal conduit, plastic coated steel conduit, thickwall nonmetallic conduit PVC-80, thinwall nonmetallic conduit PVC-40 encased in concrete where indicated.
  - 3. In or Under Slab on Grade:
    - a. Use rigid galvanized steel conduit, intermediate metal conduit, plastic coated steel conduit, thickwall nonmetallic conduit PVC-80 and thinwall nonmetallic conduit PVC-40.
    - b. Rise through slab in rigid galvanized steel conduit.
    - c. Conduit larger than 3/4" shall run below slab.
  - 4. Minimum Size: 3/4 inch.
  - 5. Under paved areas: rigid galvanized steel conduit or concrete encased PVC-40.
  - 6. Metallic conduits buried in soil: Coated with Bitumastic #50.
- C. Outdoor Locations, Above Grade: Use rigid galvanized steel and aluminum conduit, intermediate metal conduit.
- D. In Slab Above Grade:
  - 1. Use rigid galvanized steel conduit, intermediate metal conduit, electrical metallic tubing with water tight connectors.
  - 2. Maximum Size Conduit in Slab: 3/4 inch.
  - 3. Rise through slab in rigid galvanized steel conduit.

- E. Interior Wet and Damp Locations: Use rigid galvanized steel and aluminum conduit, intermediate metal conduit.
- F. Dry Locations:
  - 1. Concealed: Use rigid galvanized steel and aluminum conduit, intermediate metal conduit, electrical metallic tubing.
  - 2. Concealed/ Accessible: Use rigid galvanized steel and aluminum conduit, intermediate metal conduit, electrical metallic tubing.
  - 3. Exposed: Use rigid galvanized steel and aluminum conduit, intermediate metal conduit, electrical metallic tubing.
    - a. Exposed conduit: Not allowed in finished areas except as specifically noted.
- G. Garage Exposed Locations:
  - 1. Use PVC-40 conduit and compatible boxes where exposed and mounted up 7'6" or higher.
  - 2. Intent is to use only where not subject to damage.
- H. Panel Feeders: Use rigid galvanized steel and aluminum conduit, intermediate metal conduit, electrical metallic tubing, PVC-40 in accordance with locations herein specified.
- I. Couplings and connectors for electrical metallic tubing up to 2" shall be steel set screw or compression type.
- J. Termination for all conduit and tubing shall have insulated bushings or insulated throat connectors in accordance with code requirements.
- K. Permanent Connection to Motors: Dry locations, use flexible metal conduit. Damp or wet locations, use flexible liquidtight Type UA conduit with approved liquidtight fittings. Maximum length two feet (2').
- L. ENT: Use only where indicated on the Drawings for drops in walls to active and future outlets for TV/Data/Tel/Comm systems. Do not expose above accessible ceiling. Above ceiling, provide long sweep EMT or terminate in metallic J-box.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. In general, all raceways shall be concealed above ceilings and within finished walls - securely supported in accordance with code requirements. Wiring in areas with no finished ceilings (exposed construction) shall be exposed overhead such that all raceways are parallel or perpendicular to joists, columns or beams and all drops to wall devices shall be concealed in walls.
- B. Install exposed only where specifically indicated.
- C. Aluminum conduits shall not be installed below grade or in poured concrete or masonry.
- D. Install conduit in accordance with NECA "Standard of Installation."
- E. Install nonmetallic conduit in accordance with manufacturer's instructions.
- F. Arrange supports to prevent misalignment during wiring installation.
- G. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

- H. Group Related Conduits:
  - 1. Support using conduit rack of Power-Strut, or approved equal.
  - 2. Parallel runs shall be neatly clustered with all bends and offsets of uniform pattern
  - 3. Provide space on each for 25 percent additional conduit.
- I. Substantially support with approved clips or hangers spaced not to exceed ten feet (10') on centers, except 1/2" rigid conduit and 1/2" and 3/4" electrical metallic tubing shall have supports spaced not to exceed six feet (6').
- J. Fasten conduit supports to building structure.
  - 1. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
  - 2. Do not attach conduit to ceiling support wires.
- K. Arrange conduit to maintain headroom and present neat appearance.
- L. Route conduit parallel and perpendicular to walls.
- M. Route conduit in and under slab from point-to-point.
  - 1. Install only where specifically indicated or required.
  - 2. Obtain approval from the Architect before installation.
- N. Do not cross conduits in slab.
- O. Maintain adequate clearance between conduit and piping.
- P. Maintain 6 inch clearance between conduit and surfaces with temperatures exceeding 104°F.
- Q. 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.
- R. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- S. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction. Use factory elbows or hydraulic one-shot bender to fabricate bends in metal conduit 2 inches or larger in size.
- T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.
- V. Provide suitable labeled nylon pull string in each empty conduit.
- W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- X. Use sleeves when passing through floors and walls.
- Y. When serving roof top equipment, conduit shall enter within the weather-proof curbing. Maintain water tight roofing system.
- Z. Ground and bond conduit under provisions of Section 16170.
- AA. Identify conduit under provisions of Section 16195.

- BB. All elbows in concealed nonmetallic conduit runs shall be rigid galvanized steel to eliminate "burn through" when pulling in conductors.

3.02 FIELD QUALITY CONTROL

- A. No wire shall be installed until work which might cause damage to wires or conduits has been completed.
- B. Conduits shall be thoroughly cleaned of water or other foreign matter before wire is installed.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire-resistance rating of partitions and other elements, using approved seals, fillers and materials.

END OF SECTION