

## SECTION 26 05 33 RACEWAYS AND CONDUIT SYSTEMS

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. Comply with the provisions of Sections 260500.
- B. Provide a complete conduit system with associated couplings, connectors, and fittings.

#### 1.02 RELATED WORK

- A. Section 260529: Hangers and Supports for Electrical Systems

#### 1.03 SUBMITTALS

- A. Submittal of products furnished under this Section is not required.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. EMT, IMC, and Rigid conduit shall be hot dipped, galvanized, or electro galvanized steel by Allied, Republic, LTV, or Wheatland.
- B. PVC conduit shall be Carlon or Cantex, Schedule 80, 90 degrees rated unless noted otherwise.
- C. Surface metal raceways shall be Wiremold.
- D. Fiberglass conduit shall be Champion fiberglass.
- E. Associated couplings, connectors and fittings shall be steel as manufactured by Raco or equivalent. Die cast couplings, connectors and fittings shall not be permitted.
- F. RAC couplings, connectors, and fittings shall be aluminum.
- G. Erickson couplings shall be used where neither length of conduit can be rotated.
- H. EMT couplings and connectors connected inside the building shall be set screw type. Where buried in masonry or concrete, couplings and connectors shall be concrete-tight compression type. Where installed in wet locations, couplings and connectors shall be raintight compression type. Where exposed inside the building, couplings and connectors shall be compression type.
- I. Conduit, connectors, couplings and fittings shall be UL listed and labeled.
- J. Exposed conduit for cooling tower feeders/power to be plasti-bond coated rigid.

#### 2.02 ELECTRICAL METALLIC TUBING (EMT)

- A. Use Electric Metallic Tubing (EMT) where drawings call for conduit to be:
  - 1. Concealed in walls
  - 2. Installed above suspended ceilings
  - 3. Installed exposed, above 6 feet
  - 4. Cast in concrete slabs above ground floor level.

### 2.03 INTERMEDIATE METAL CONDUIT (IMC)

- A. Use Intermediate Metal Conduit (IMC) where drawings call for conduit to be:
  - 1. Installed in hazardous areas
  - 2. Installed in concrete slabs on grade to serve floor boxes, freestanding casework, etc
  - 3. Installed exposed below 6 feet
  - 4. Installed in wet locations

### 2.04 RIGID STEEL CONDUIT (RSC)

- A. Use rigid steel conduit where drawings call for conduit to be:
  - 1. Installed underground
  - 2. Above ground service entrance
  - 3. Medium voltage circuits
  - 4. Where protection from EMI is required
  - 5. Exposed to severe mechanical damage

### 2.05 RIGID ALUMINUM CONDUIT (RAC)

- A. Use rigid aluminum conduit, RAC, where shown on the drawings or for:
  - 1. In coastal areas where saltwater vapor is present
  - 2. As a substitute for rigid steel conduit when approved by engineer

### 2.06 POLYVINYL CHLORIDE (PVC)

- A. Use PVC for:
  - 1. Underground service entrance conduits for power
  - 2. Underground service entrance conduits for telephone
  - 3. Exterior branch circuits installed underground
  - 4. Concrete encased ductbanks

### 2.07 FIBERGLASS

- A. Use fiberglass for:
  - 1. Where corrosive vapors or agents are present
  - 2. In coastal areas where saltwater vapor is present
  - 3. As a substitute for PVC where indicated on drawings

### 2.08 STAINLESS STEEL RIGID CONDUIT

- A. Use stainless steel rigid conduit where shown on drawings or for:
  - 1. Severe corrosive atmospheric conditions
  - 2. In coastal areas where exposed directly to saltwater or severe saltwater vapors

### 2.09 FLEXIBLE METAL CONDUIT

- A. Shall be used for normal distribution only, where specifically permitted in the contract documents:
  - 1. Provide flexible metal conduit for termination at equipment subject to motion and vibration.
  - 2. Provide flexible metal conduit for transformer primary and secondary conductors.
  - 3. Conduit shall be electrically continuous from outlet or conduit end to utilization equipment.
  - 4. Length shall not exceed 6 feet.

5. Maximum length concealed in walls shall be 3 feet.
6. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight.
7. Flexible metal conduit rated for hospital grade use shall be permitted for normal branch power and lighting circuits where the raceway is concealed in walls for vertical runs. This raceway shall provide a redundant grounding path, as defined by NEC Article 250 and required by NEC Article 517. Flexible metal conduit shall not be used for horizontal runs extending beyond the walls of the room where the circuits terminate.

#### 2.10 SURFACE METAL RACEWAYS

- A. Use surface metal raceway systems in areas where multiple outlet assemblies are required by drawings and for extension of circuits along existing walls.
- B. Minimum dimensions shall be 7/8" x 1-1/4", Wiremold #2100.
- C. Provide larger raceways where called for on drawings, Wiremold #G-3000. Systems shall be complete with elbows, fittings, and outlets.
- D. Provide G-4000 surface, metal raceway systems for laboratory and areas as shown on drawings.
  1. Provide Wiremold fitting V4048BF/G4048BF at each duplex receptacle. Provide a blank snap-in plastic cover for data outlet portion when data outlet is to be installed in the future or under a separate contract.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION REQUIREMENTS

- A. Minimum size of conduits shall be 1/2" for power and systems, 1/2" for lighting.
- B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.
- C. Make bends or offsets with standard ells or field bends with an approved bender.
- D. Medium voltage conduits shall use long radius bends and fittings with a minimum radius of at least 12 times the diameter of the installed cables.
- E. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.
- F. Conduit systems shall be electrically continuous.
- G. Secure conduits to boxes and cabinets with double locknuts and bushings so system will be electrically continuous.
- H. For interior locations where NEMA 12 enclosures are used, secure conduits to boxes and cabinets with sealing locknuts and bushing.
- I. For damp or wet locations, indoor or outdoor locations where NEMA 4 or 4X enclosures are used, secure conduits to boxes and cabinets with Myers Scru-Tite hub.
- J. Provide grounding bushings on all feeder conduits in critical care areas in accordance with NEC Article 517.

- K. Cap ends of conduits to prevent entrance of water and other foreign material during construction.
- L. Complete conduit systems before pulling conductors.
- M. Support conduits as specified in Section 26 05 29 and in accordance with National Electrical Code.
- N. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300.
- O. Provide No. 12 AWG copper pull wires or nylon cord in all empty conduits. Provide insulated bushing on both ends of empty conduits.
- P. Conduits which pass through floor slabs (except ground floor) shall be sealed with UL listed fire-stopping materials. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire rated walls. Use U.L. listed materials to prevent passage of smoke or fire. See Division 7 for specific materials required.
- Q. Conduits and bus duct which pass through floor slabs (including ground floor) shall have 4" high concrete curbs built up around penetration and sealed at floor level to prevent water migration.
- R. Conduits which enter crawl spaces, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects or rodents to these spaces from street mains.
- S. When four or more, 2 inch or larger conduits, are banked together below the ground floor slab they shall be supported and separated using Carlon, Snap-Loc type spacers. Backfill below, between, and above ducts in such a manner to prevent erosion and restore sub-grade preparation prior to concrete slab pour.
- T. Conduit not serving elevator equipment shall not be permitted to pass through elevator shafts or elevator equipment rooms.
- U. Where conduit is installed in a cabinet, junction box, pull box or auxiliary gutter, conductors shall be protected by insulated bushings. Locknuts shall be installed on conduit outside and inside enclosure.
- V. Where conduits stub up in conduit space beneath switchboards or switchgear and do not connect directly to equipment enclosures, install malleable iron nylon insulated ground bushing complete with bonding screw and bond to switchboard ground bus.
- W. Install seal-off fittings in conduits entering hazardous areas and conduits entering cold temperature areas, such as freezers and refrigerators.
- X. Install in each seal-off fitting a removable sealing compound that does not harden and that seals off these conduits to prevent the migration of gases and vapors.
- Y. In concrete slabs block up conduit from forms and securely fasten in place. Conduits in ground floor slabs shall have a minimum of 1-1/2" concrete coverage above and below. Stuff boxes with cork fittings to prevent entrance of water.
- Z. Use expansion fittings or flexible conduit, properly bonded, to ensure ground continuity across expansion joints in floors and ceilings.

- AA. Horizontal and vertical runs of alarm and communications systems shall be installed in a 2 hour assembly in accordance with applicable high rise codes. Vertical enclosures shall be aligned and shall be accessible from common or public areas. Main communication risers or interconnections shall be protected in conduit.
  - AB. Terminate conduits for feeders and branch circuits directly into panelboard enclosures from which they are served without the use of pull boxes, junction boxes, wire ways, or auxiliary gutters unless the panelboard enclosure does not provide sufficient surface area for all conduits. Where such cases exist, notify the Architect. In no case shall splices in such boxes and wire ways be permitted.
  - AC. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.
  - AD. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
  - AE. Provide 1/4" nylon pull rope in all primary power and incoming telephone service entrance conduits.
  - AF. No PVC shall emerge from the ground, concrete slab, or concrete encasement. PVC shall convert to galvanized rigid steel conduit at least 6 inches before exiting concrete slab or concrete encasement. Schedule 80 PVC shall be used if shown on drawing.
  - AG. Provide 3/4" conduit minimum for raceway stub-outs for telecom outlets.
  - AH. Install conduits a minimum of 12 inches above the ceiling track where installed above a lay-in ceiling.
  - AI. Provide liquid tight flexible metal conduit (type LFMC) for feeders and branch circuits serving water cooled chillers. Provide LFMC for all feeders and branch circuits serving roof mounted cooling towers and all devices and equipment within 50-feet of the edge of the cooling towers.
  - AJ. Provide insulating bushings at terminations, and on the open end of conduit not terminated in panels, junction boxes, outlets, etc. Provide insulated throats for sizes 1" and smaller. Provide nylon bushings for sizes 1-1/4" and larger.
  - AK. Where feeder or branch conduits enter pull boxes or junction boxes, clearly mark on conduit on the entering and leaving side of each box the panel name and circuit number(s) contained within the conduit using a permanent black marker.
  - AL. Conduits routed horizontally on roof tops shall be supported by 5" high supports as manufactured by Dura Blok, "DB Series" or equal. Supports shall be spaced as required by the NEC. Conduits shall be continuously marked on two sides with a 1" reflective tape as manufactured by Seton, Style No M9562.
- 3.02 PVC
- A. Provide 1/4" nylon pull rope in all primary power and incoming telephone service entrance conduits.

- B. Use rigid, PVC schedule 80, encased in concrete where called for on drawings, for emergency power circuits and normal power circuits not serving patient care areas.
- C. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to penetrating slab or exiting concrete encasement.
- D. Make bends with standard ells or with an approved bender. A blow torch shall not be used.

### 3.03 FLEXIBLE METAL CONDUIT

- A. Conduits shall be 1/2" minimum size for lighting fixtures and 1/2" minimum size for utilization equipment other than lighting fixtures.
- B. Fittings shall be made of either steel or malleable iron only.
- C. A copper ground wire shall be installed as a jumper around flexible conduit. The jumper may be installed inside of flexible conduit or outside of conduit to ensure continuity of ground.
- D. Recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture.
- E. Install liquid tight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.
- F. Allow sufficient slack conduit to reduce the effect of vibration.

### 3.04 SURFACE METAL RACEWAYS

- A. Run surface metal raceways parallel and at right angles to building lines.
- B. Provide separate insulated green grounding conductors in surface metal raceways for receptacles.
- C. Provide Wiremold No. 2127 GA. 15-amp, 125-volt receptacles spaced as shown on drawings for No. 2100 raceway. Provide 15-amp, 125-volt duplex receptacles for G-3000 and G-4000 raceways.
- D. Feed surface metal raceways through a flush or surface outlet box.

END OF SECTION