SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

B. Related Sections:

1. Division 26 - Equipment Wiring Connections.
2. Division 26 - Grounding and Bonding for Electrical Systems.
3. Division 26 - Hangers and Supports for Electrical Systems.
4. Division 26 - Floor Boxes for Electrical Systems.
5. Division 26 - Identification for Electrical Systems.
6. Division 26 - Electrical Cabinets and Enclosures.
7. Division 26 - Indoor Service Poles.
8. Division 26 - Wiring Devices.
9. Division 27 - Conduits and Backboxes for Communications Systems.
10. Division 33 - Electrical Underground Ducts and Manholes.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.03 SYSTEM DESCRIPTION

A. Raceway and boxes located as required to complete the work including as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Provide raceway to complete wiring system.

B. Underground or Under Slab: Use rigid steel conduit, intermediate metal conduit, PVC Schedule 40 or as otherwise required to complete the work. Minimum size: 3/4 inch, unless otherwise noted.

C. Conduit shall not be installed in any floor slab.

D. Outdoor Locations, Above Grade: Provide rigid steel conduit or EMT with raintight fitting. Provide cast metal or nonmetallic outlet, pull, and junction boxes.

E. Wet and Damp Locations: Provide rigid steel conduit or EMT with raintight fitting. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

F. Concealed Dry Locations: Provide intermediate metal conduit and electrical metallic tubing not subjected to mechanical stresses for homeruns, essential systems and invasive patient care areas. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide handled enclosure for 36" X 24" or larger pull boxes.

G. Exposed Dry Locations: Provide rigid steel conduit or EMT where permitted by code. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide handled enclosure for large pull boxes.

1.04 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 1/2 inch for above ground installation and 3/4 inch for underground installations, unless otherwise specified.

B. All surface raceway mounted in damp or wet locations or below 8 feet above finished floor shall be RGS, IMC or EMT where allowed by code. All concealed conduit above ground in dry locations shall be EMT. All underground conduits shall be non-metallic conduit.

C. Provide pull strings for all empty conduits.

1.05 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit for the following:

1. Flexible metal conduit.
2. Liquidtight flexible metal conduit.
3. Nonmetallic conduit.
4. Flexible nonmetallic conduit.
5. Raceway fittings.
6. Conduit bodies.
7. Surface raceway.
8. Wireway.
9. Pull and junction boxes.
10. Handholes.

C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.06 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents:

1. Record actual routing of conduits larger than 2 inch.
2. Record actual locations pull and junction boxes.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.08 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Coordinate installation of outlet boxes for equipment connected under Division 26.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 PRODUCTS

2.01 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Metal Conduit (IMC): Rigid steel.

C. Fittings and Conduit Bodies: NEMA FB 1; all steel fittings.

2.02 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron for indoor dry locations. Waterproof compression type for outside installation.

2.04 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.05 SURFACE METAL RACEWAY

A. Product Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

B. Size: As required per program.

C. Finish: per County Representative's standards.

D. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway.

2.06 MULTIOUTLET ASSEMBLY

A. Multioutlet Assembly: Sheet metal channel with fitted cover, with pre-wired receptacles and voice/data outlets, suitable for use as multioutlet assembly.

B. Size: As required per program.

C. Receptacles: Provide covers and accessories to accept convenience receptacles specified in Division 26.

D. Receptacle spacing: 12 inches on center minimum.

E. Receptacle Color: White.

F. Channel Finish: Gray.

G. Fittings: Furnish manufacturer's standard couplings, elbows, outlet and device boxes, and connectors.

2.07 WIREWAY

A. Product Description: General purpose, oil-tight and dust-tight and raintight type wireway.

B. Knockouts: Manufacturer's standard.

C. Cover: Screwed cover with full gaskets for outdoor location.

D. Connector: Slip-in or flanged.

E. Fittings: Lay-in type with removable top, bottom, and side; captive screws, drip shield.

F. Finish: Rust inhibiting primer coating with gray enamel finish.

2.08 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, cast ferroalloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

D. Wall Plates for Finished Areas: As specified in Division 26.

E. Wall Plates for Outdoor Areas: Furnish gasketed cover.

2.10 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Screwed Enclosures: As specified in Division 26.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:

1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Concrete Box: NEMA 250, Type 6, outside and/or inside flanged, recessed cover box for flush mounting:

1. Material: Concrete. Traffic rated where vehicle traffic is possible.
2. Cover: Nonskid cover.
3. Cover Legend: "ELECTRIC".

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify outlet locations, mounting heights and routing and termination locations of raceway prior to rough-in.

3.02 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Division 26.

B. Fasten raceway and box supports to structure and finishes in accordance with Division 26.

C. Identify raceway and boxes in accordance with Division 26.

D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.03 INSTALLATION - RACEWAY

A. Raceway routing is determined by Design/Builder. Route to complete wiring system.

B. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers or approved system.

C. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Division 26.

D. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

E. Do not attach raceway to ceiling support wires or other piping systems.

F. Construct wireway supports from steel channel specified in Division 26.

G. Verify routing and termination locations of conduit prior to rough-in.

H. Route exposed raceway parallel and perpendicular to walls.

I. Route raceway installed above accessible ceilings parallel and perpendicular to walls. U.O.N.

J. Route concealed raceway parallel and perpendicular to walls, unless otherwise noted.

K. Cut conduit square using saw or pipe cutter; de-burr cut ends.

L. Bring conduit to shoulder of fittings; fasten securely.

M. 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 minimum 20 minutes.

N. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

O. Install no more than equivalent of four 90 degree bends between boxes. Install hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.

P. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.

Q. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

R. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

S. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

T. Close ends and unused openings in wireway.

U. Ground and bond conduit under provisions of 26 05 26 Grounding and Bonding for Electrical Systems.

V. Identify conduit under provisions of 26 05 33 Identification for Electrical Systems.

W. Normal and emergency power must be installed in physically separate raceways.

X. Install nonmetallic conduit in accordance with manufacturer's instructions.

Y. Fasten conduit supports to building structure and surfaces.

Z. Do not attach conduit to ceiling support wires.

AA. Arrange conduit in exposed area to maintain headroom and present neat appearance.

BB. Cut conduit square using saw or pipe cutter; de-burr cut ends.

3.04 INSTALLATION - BOXES

A. Orient boxes to accommodate wiring devices oriented as specified in Division 26.

B. Inaccessible Ceiling Areas: Install outlet and junction boxes to provide accessibility from ceiling access panel or from removable recessed luminaire.

C. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

D. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

E. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

F. Install steel channel fasteners for hung ceiling outlet box.

G. Do not fasten boxes to ceiling support wires or other piping systems.

H. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits, both supported within 12 inches of box.

I. Install gang box where more than one device is mounted together.

J. Install gang box with plaster ring for single device outlets.

K. Install electrical boxes and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. U.O.N.

L. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

M. Install pullboxes and junction boxes above accessible ceiling and in unfinished areas only.U.O.N.

N. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Division 7.

O. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

P. Use flush mounting outlet boxes in finished area.

Q. Use cast outlet boxes in exterior locations exposed to the weather and wet locations.

R. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

S. Set floor boxes level and adjacent to connection to vendor furnished furniture devices.

T. Large Pullboxes: Boxes larger than 36 inches in any dimension.

1. Interior Dry Locations: Use handled enclosure under provisions of Division 26.
2. Other Locations: Use surface-mounted cast metal box.

3.05 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Division 07.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

C. Locate outlet boxes to align with luminaire location.

D. Coordinate locations and sizes of required access doors with Division 8.

E. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

3.06 ADJUSTING

A. Division 01 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused openings in boxes.

3.07 CLEANING

A. Division 01 - Execution and Closeout Requirements: Final cleaning.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION