# SECTION 16130

# RACEWAY AND BOXES

## PART 1 - GENERAL

### 1.1 SUMMARY

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

B. RELATED WORK:

1. Section 16132 – Indoor service poles
2. Section 16133 – Cable Trays
3. Section 16134 – Underfloor Raceway Assemblies
4. Section 16141 – Floor Boxes
5. Section 16123 – Building wire and cable.

### 1.2 REFERENCES

A. ANSI C80.1 – Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 – Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.5 – Rigid Aluminum Conduit

D. NECA (National Electrical Contractor's Association) – Standard of Installation

E. NEMA FB 1 (National Electrical Manufacturers Association) – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

F. NEMA OS 1 – Sheet steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

G. NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

H. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

I. NEMA TC 2 – Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

J. NEMA TC 3 – PVC Fittings for use with Rigid PVC Conduit and Tubing.

K. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

## 1.3 SUBMITTALS

A. Product Data: Submit for the following Products.

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. Hand holes

## 1.4 CLOSEOUT SUBMITTALS

A. Section 01700 – Closeout and Turnover Procedures

B. Project Record Documents

1. Record actual routing of conduits larger than 2-inch trade size.

## 1.5 DELIVERY, STORAGE & HANDLING

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

## 1.6 COORDINATION

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

## 1.7 SYSTEM DESCRIPTION

A. Raceway and boxes located as shown on Drawings, and at other locations where required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway as required to complete wiring system. Refer to section 16123 for application of type MC cable.

B. Underground more that 5 feet outside foundation wall: Use rigid steel conduit or thickwall nonmetallic conduit. Use cast metal boxes or nonmetallic hand hole.

C. Underground within 5 feet from foundation wall: Use rigid steel conduit. Use cast metal or nonmetallic boxes.

B. In or under slab on grade: Use rigid steel conduit, heavywall nonmetallic conduit. Use cast or nonmetallic metal boxes.

C. Outdoor locations, above grade: Use rigid steel conduit electrical metallic tubing or thickwall nonmetallic conduit. Use cast metal or nonmetallic outlet, pull, and junction boxes.

D. In slab above grade: Use rigid steel conduit, or heavywall nonmetallic conduit. Use cast or nonmetallic boxes.

E. Wet and damp locations: Use rigid steel conduit, electrical metallic tubing or thick-walled nonmetallic conduit. Use cast metal or nonmetallic outlet, junction, and pull boxes. Use flush mounting outlet box in finished areas.

F. Concealed dry locations: Use rigid steel conduit, electrical metallic tubing, type MC cable or thickwall nonmetallic conduit. Use sheetmetal or nonmetallic outlet, junction and pull boxes. Use flush mounting outlet box in finished areas. Use hinged enclosure for large pullboxes.

G. Exposed dry locations: Use rigid steel conduit, electrical metallic tubing or thickwall nonmetallic conduit. Use sheetmetal or nonmetallic outlet, junction and pull boxes. Use flush mounting outlet box in finished areas. Use screw cover or hinged enclosure for large pullboxes.

H. Minimum raceway size: ½ inch unless noted.

I. Maximum conductor fill: Per NEC table 9F.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1. Finished inside and out by hot dip galvanizing.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Light weight Rigid steel

D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit, all steel fittings to be electroplated.

1. Insulated bushings: Threaded polypropylene or thermo setting phenolic steel body with insulated throat and 'layin'.

2. Insulated grounding bushings: Lug with compression screw.

3. Insulated metallic bushing: Steel body with plastic insulated throat.

### 2.2 FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction fabricated in continuous lengths from galvanized steel strip, spirally wound.

B. Fittings: NEMA FB 1: Screw clamp or screw in variety with cast malleable iron bodies and threaded male hubs with insulated throats or insulated bushings.

### 2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

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

B. Fittings: NEMA FB 1. Cadmium plated cast malleable iron with insulated throat

### 2.4 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing, cold rolled strip steel.

B. Fittings and Conduit Bodies: NEMA FB 1; steel, compression or set screw type.

### 2.5 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 PVC (thick wall) 80 PVC (heavy wall)

B. Fittings and Conduit Bodies: NEMA TC 3.

## 2.6 SURFACE METAL RACEWAY

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

B. Finish: Manufacturer's standard gray.

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

## 2.7 SURFACE NONMETAL RACEWAY

A. Product Description: Plastic or Fiberglass channel with fitted cover, suitable for use as surface raceway.

B. Finish: Ivory or gray

C. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories, finish to match raceway.

## 2.8 WIREWAY

A. Project Specific Items

1. Product Description: General purpose, Oil tight and Dust-tight, Rain tight, type wireway. AS REQUIRED BY THE APPLICATION.

2. Knockouts: Manufacturer's standard

3. Cover: Hinged cover with full gasketing. IF OUTDOOR, screw cover indoor.

4. Connector: Flanged, IF OUTDOOR.

5. Fittings: Lay-in type with drip shield. (IF OUTDOOR)

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

## 2.9 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized. One piece, drawn steel. Minimum size: 4 inch square by 1-1/2 inch deep.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported;

2. Concrete Ceiling Boxes: Concrete type.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

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

D. Wall Plates for Finished Areas: As specified in Section 16140.

E. Wall Plates for Unfinished Areas: Provide gasketed cover.

2.10 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized one piece, drawn steel, 4 inch square by 1-1/2 inch deep where possible, otherwise 16 gauge galvanized sheet metal, NEMA 1, sized to code.

B. Hinged Enclosures: As specified in Section 16131.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4, 4X, or 6; flat-flanged surface mounted junction box.

D. Material: Galvanized cast iron

E. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

F. In-ground Cast Metal Box: NEMA 250, Type 6, inside flanged, recessed cover box for flush mounting.

G. Material: Galvanized cast iron.

H. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.

I. Cover Legend: “ELECTRIC”

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

## 3.2 INSTALLATION

A. Install raceway and boxes in accordance with NECA. "Standard of Installation"

B. Ground and bond raceway and boxes under provisions of Section 16050.

C. Fasten raceway and box supports to structure and finishes under provisions of Section 16050.

D. Identify raceway and boxes under provisions of Section 16050

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

## 3.3 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route as required to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

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

D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 16050.

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

F. Do not attaché raceway to ceiling support wires or other piping systems. Except for fixture whips or manufactured wiring systems as allowed by NEC 300.

G. Construct wireway supports from steel channel specified in Section 16050.

H. Route exposed raceway parallel and perpendicular to walls.

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

J. Route conduit in and under slab from point-to-point

K. Maximum Size Conduit in Slab Above Grade: ¾" inch should be coordinated with the structural engineer. Avoid crossing conduits in slab.

L. Maintain adequate clearance between raceway and piping.

M. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.
O. Bring conduit to shoulder of fittings; fasten securely. In long runs of conduit, pull boxes shall be provided with support structures independent of conduit supports and with spacing not to exceed 100 feet.

P. 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.

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

R. Use conduit bodies to make sharp changes in direction, as around beams.

S. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

T. Provide suitable fittings to accommodate expansion and deflection where raceway crosses seismic expansion joints.

U. Provide suitable pull string or cord in each empty raceway except sleeves and nipples.

V. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

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

X. Close ends and unused openings in wireway.

Y. In office areas install panel homerun conductors in conduits described above. Individual branch circuits may be installed with type MC cable from the junction box fed by the homerun conduit where such MC cable is concealed in walls and above ceilings.

## 3.4 INSTALLATION – BOXES

A. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

B. Adjust box location up to 10 feet prior to rough in if required to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices as specified in Section 16140.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

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

G. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches horizontal separation in acoustic or fire rated walls.

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

I. Use stamped steel bridges to fasten flush mounting outlet box between studs.

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

K. Use adjustable steel channel fasteners for hung ceiling outlet box.

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

M. Support boxes independently of conduit.

N. Use gang box where more than one device is mounted together. Do not use sectional box.

O. Use 4 inch square by 1-1/2 inch deep two gang bo with plaster ring for single device outlets.

P. Boxes instilled in metal stud walls shall be equipped with brackets designed for attaching directly to the studs, or shall be mounted on heavy gauge galvanized steel, snap-in box supports.

Q. Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted to sixteen (16) gauge metal channel bars attached to main ceiling runners.

R. Fixture outlet boxes installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structure above wherever pendent mounted lighting fixtures are installed on the box.

S. Outlet boxes mounted suspended acoustical tile ceilings having concealed suspension systems may be supported from main ceiling runners. Boxes mounted above suspended ceilings having exposed suspension systems shall be supported directly from the structure above, independent of the ceiling suspension system.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07800.

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

C. Locate outlet boxes to allow luminaries positioned as shown on reflected ceiling plan.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.6 ADJUSTING

A. Adjust flush-mounted outlets to make front flush with finished wall material.

B. Install knockout closures in unused openings in boxes.

3.7 CLEANING

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

B. Clean exposed surfaces and restore finish.

3.8 EXISTING WORK

A. Remove exposed abandoned raceway, (including abandoned raceway above accessible ceiling finishes). Cut raceway flush with walls and floors, and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if raceway servicing them is abandoned and removed. Provide blank cover for abandoned outlets, which are not removed.

D. Ensure access to existing boxes and other installations which remain active. Modify installation or provide access panel as appropriate.

E. Extend existing raceway and box installations using materials and methods, compatible with existing electrical installation, or as specified.

F. Clean and repair existing raceway and boxes, which remain or are to be reinstalled.

END OF SECTION