SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes

1. Raceways, electrical conduits, fittings, boxes, enclosures, power poles, drop reel cords, and cabinets for electrical wiring.

B. Provide electrical raceway work as indicated by drawings and schedules, including:

1. Electrical Metallic Tubing
2. Flexible Metal Conduit
3. Liquid-Tight Flexible Metal Conduit
4. Intermediate Metal Conduit
5. Wireway
6. In Floor Duct System
7. Rigid Non-Metallic Conduit

C. **KROGER DIRECT BUY PROGRAM**: Owner supplied/Contractor installed.

1. The Kroger Company will supply the following items for the Contractor to install:

a. Drop Cord Reels

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. The Owner will provide the submittals for Owner furnished products for the Contractor's review. The Contractor shall review and return submittals as specified in Division 00 Section "General Conditions."

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Electrical Metallic Tubing (EMT): ANSI C80.3 and UL 797, galvanized or zinc coated steel.

1. Fittings: Galvanized or zinc coated steel, set-screw type.

a. Do not use die-cast fittings.

B. Intermediate Metal Conduit (IMC): Heavy wall, full weight, zinc-coated, threaded type (galvanized after cutting/threading) conforming to ANSI C80.1 and UL 6. Provide zinc coating fused to inside and outside walls

1. Threaded Fittings: Galvanized or zinc coated steel.
2. Provide for the following applications:

a. Conduit installed embedded in concrete or masonry.
b. Conduits which turn up from below grade or below slab (including the 90 degree fittings which connect to conduits 24-inches (610-mm) below grade/slab).
c. Other applications as indicated in Contract Documents or as otherwise required for special physical protection (nearby vehicular/equipment traffic, site maintenance equipment, etc.).

2.2 RIGID NONMETALLIC CONDUIT AND DUCTS

A. General:

1. The Owner will only allow limited use of nonmetallic (PVC-Schedule 40) conduit material to underground installations.
2. PVC-Schedule 40 conduit and PVC attachment hardware is required in areas that are exposed to moisture such as coolers, freezers and refrigerated prep areas where conduits cannot be installed in stud wall behind insulated panels. Transition from PVC conduit to EMT conduit upon leaving the cooler/freezer. Provide conduit seal-off at the transition from PVC to EMT to prevent air transfer. Install seal-off no more than 12 inches (305 mm) from freezer/cooler exterior wall.
3. Where underground conduits project out of the concrete slab, change from PVC to IMC at the bottom of the floor slab.
4. Unless noted otherwise in Contract Documents, provide for all horizontal conduit runs below grade and for other applications as indicated in Contract Documents.

B. Underground Plastic Conduits/Ducts: Heavy wall, Schedule 40, PVC, 90 degrees C, conforming to NEMA TC-2, UL listed and labeled for direct burial or concrete encasement and in conformity with NEC Article 354.

1. Basis of Design Product: Carlon Electrical Products; Plus 40, Heavy Wall EPC Type EB-35

C. Nonmetallic Conduit/Duct Accessories

1. General: Provide conduit/duct accessories of types, sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing.

2. Duct Spacers ("Chairs"):

   a. Base Spacers Basis of Design Product: Carlon Electrical Products; #S288*L series.
   b. Intermediate Spacers Basis of Design Product: Carlon Electrical Products; #S289*L series

3. Horizontal Elbows For Service Entrance Conduits:

   a. Bend: Maximum 45 degree,
   b. Radius: Minimum 24-inches (610-mm). Provide larger minimum radius if directed in field.
   c. Provide multiple units as required to obtain required offset (i.e. provide two 45 degree elbows to obtain a 90 degree offset).

4. Other Elbows:

   a. Bend: Maximum 90 degree.
   b. Radius: Minimum 24-inches (610-mm). Provide larger minimum radius if directed in field.

5. Provide all other couplers, adapters, "O" rings, sealing, etc. as required. Provide miscellaneous fittings that have been specifically designed and manufactured for their particular application.

2.3 FLEXIBLE METAL CONDUIT

A. See Division 26 Section “Low Voltage Electric Power Conductors and Cables” for MC Cable for low voltage electric power conductors and cables.

B. General:

1. Comply with FS WW-C-566 and UL 1
2. Form from continuous length of spirally wound, interlocked zinc-coated or galvanized (inside & outside) strip steel.
3. Conduit Fittings: Threadless hinged clamp type and insulated throats.
4. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
5. Do not use 45 degree or 90 degree terminal angle connectors for flexible or water-tight flexible metal conduit in locations which will not be fully accessible after completion of construction.
6. Provide full size insulated green ground wire for all applications, regardless of length.
7. Provide flexible metal conduit for the following applications:

   a. Final 24-inches (610-mm) of connection to motors or control items subject to movement or vibration.
   b. Conduits within movable partitions.

c. See Division 26 Section "Low Voltage Electric Power Conductors and Cables" for fixture whips.

C. Liquid-Tight Flexible Metal Conduit: Single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside.

1. Liquid-Tight Jacket: Flexible polyvinyl chloride (PVC). Provide smooth-wall type jackets (not a corrugated look) for finished area furniture whip (and similar) applications.
2. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat.
3. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
4. Terminal Angle Connectors (45 degree or 90 degree): Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
5. Do not use 45 degree or 90 degree terminal angle connectors for flexible or water-tight flexible metal conduit in locations which will not be fully accessible after completion of construction.
6. Provide full size insulated green ground wire for all applications, regardless of length.
7. Provide liquid-tight flexible metal conduit for final connections to equipment subject to moisture or corrosive conditions.

2.4 RACEWAY ACCESSORIES:

A. Provide conduit joints with standard conduit couplings, (no running-threads) cadmium plated. Schedule 40 PVC conduit is also permitted for use in masonry or concrete.

B. Provide conduit and tubing accessories of types, sizes and materials complying with manufacturer's published product information which mate and match conduit and tubing.

C. Conduit Bodies: Provide galvanized cast metal conduit bodies of types, shapes and sizes as required to fulfill job requirements and NEC requirements. Construct conduit bodies with threaded conduit entrance ends, removable covers, either cast or of galvanized steel and corrosion resistant screws.

D. Conduit Fittings, General:

1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal and ridged outside circumference for proper fastening.
2. Bushings for terminating conduits smaller than 1-1/4-inch (32-mm) are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.
3. Provide insulated type bushings for terminating threaded conduits. Bushings are to have flared bottom and ribbed sides. Provide phenolic insulating ring molded into bushing in upper edge.
4. Bushing of standard or insulated type to have screw type grounding terminal.
5. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings and plugs to be specifically designed for their particular application.

E. Liquid-Tight Flexible Metal Conduit Fittings: Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or non-insulated throat.

F. Conduit Seal Compound:

1. Products

a. OZ-/Gedney Division; General Signal Co.; Neer #DC
b. 3M Corp.; Scotchfill Electrical Insulating Putty.

2.5 METAL WIREWAYS:

A. Provide electrical wireways of types, grades, sizes and number of channels for each type of service as indicated. Provide complete assembly of raceway including, but not limited to, couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps and other components and accessories as required for complete system.

B. Lay-In Wireways: Construct lay-in wireways with covers, in accordance with UL 870 and with components UL listed, including lengths, connectors and fittings.

C. Select units to allow fastening cover closed without use of parts other than standard lengths, fittings connectors. Construct units to be capable of sealing cover in closed position with sealing wire. Provide wireways without knockouts.

D. Connectors: Provide wireway connectors suitable for lay-in conductors, with connector covers permanently attached which removal is not necessary to utilize lay-in feature.

E. Finish: Protect sheet metal parts with rust inhibiting coating and baked enamel finish. Plate finish hardware to prevent corrosion. Protect screws installed toward inside wireway with spring nuts to prevent wire insulation damage.

F. Wireways to be square duct of standard lengths factory finished ANSI-49 gray with hinged cover lengths and removal cover. Metal to be not less than 0.0740-inches (2-mm) thick.

G. Wireways and all fittings to be UL Listed File No. E6625, provided without knockouts and complete with all 2-piece universal hangers and connectors.

2.6 IN-FLOOR RACEWAY SYSTEM:

A. In-Floor Raceway System: (In-floor systems are only used in under shelving units and sometimes at the checklanes. Refer to drawings for exact locations on use.)

1. Basis of Design Product: Walkerduct Systems, Inc. a Wiremold Company; Walkerduct.
2. Provide with "after-set" type method.
3. Fabricate raceway with blank sections, size #4/0.
4. Provide inserts to allow for a minimum 2-1/2-inch to 3-inch (63.5-mm to 76-mm) of concrete floor over under-floor raceway duct.
5. Size junction box per Drawings. Boxes shall be selected per anticipated floor finish conditions.

6. Provide sealing compound for waterproofing joints

2.7 SURFACE RACEWAYS

A. General: Use surface raceways only where indicated on the Drawings or as approved by Kroger Representative.

B. Surface Metal Raceways: Galvanized steel with snap-on covers. Raceway shall be provided with an ivory finish.

1. Manufacturers:

a. Thomas & Betts Corporation.; 800-816-7809
b. Wiremold/Legrand, Walker Systems Division 800-621-0049

2.8 BOXES, ENCLOSURES, AND CABINETS

A. Provide electrical boxes and fittings as required by the National Electric Code (NEC) and as necessary for ease of installation, including

1. Outlet boxes
2. Junction boxes
3. Pull boxes
4. Conduit bodies
5. Bushings
6. Locknuts
7. Seals

B. Low Voltage System (Premise Alarm, Telephone, Fire Alarm, Data.): Provide conduits and outlet boxes for premise alarms indicated on the Drawings or as required.

1. Provide conduit when alarm wiring is to be installed down a column and unfinished walls in backroom areas.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

K. Interior Outlet Boxes: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation.

1. Provide with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.
2. Boxes Recessed in Furred Walls: Not less than 4-inches (102-mm) square minimum.
3. Provide single or double gang plaster cover as required for device.
4. Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes being used and meeting requirements of individual wiring situations. Choice of accessories is installer's option.

L. Interior Outlet Boxes under Cases in Preparation Areas or Other Wet Areas: Provide nonmetallic interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation.

1. Basis of Design Product: Thomas & Betts Corp.; Carlon brand.

M. Surface Mounted and Weatherproof Outlet Boxes: Provide corrosion resistant cast metal outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit ends, face plates suitably configured for each application, including face plate gaskets and corrosion resistant fasteners. In wet locations provide an enclosure that is weatherproof whether or not the plug cap is inserted.

1. Basis of Design Product: TayMac Corp.; MX3200

N. Pull and Junction Boxes: Provide necessary junction and pull boxes, whether shown on drawings or not, which may be required for pulling or splicing cables to make the conduit system practical.

1. Construct boxes of code gage galvanized steel sized to turn or support cables.
2. Provide covers with brass screws.
3. Provide hinged covers on boxes larger than 24-inches by 24-inches (609-mm by 609-mm).

O. Cooler/Freezer Timer Switch Box Extension Adapter: Provide steel, 1-gang, deep flush-type extension adapter to extend flush wall box factory installed in the insulated panel to accommodate timer switch and wiring.

1. Basis of Design Product: Wiremold/Legrand; 500 and 700 Series, Flush-Type Extension, V5751.
2. Depth: 1-3/4 inches (45 mm).
3. Color: Ivory.

2.9 POWER POLES

A. Power Poles Other Than Checklanes:

1. Power and/or data poles shall be provided only where indicated in the construction documents.
2. General Use Tele-Power Poles: Multiple service aluminum modular type, small frame with rounded end panels, number of compartments (2 or 3), etc. as required for each application.

    a. Basis of Design: Wiremold/Legrand; Vista series
    b. Determine specific configurations and applications in field.
    c. Finish Color: As directed by Owner.
    d. Provide factory fittings and accessories as required for a complete bonded installation.
    e. Provide a total of four duplex receptacles as specified under Division 26 Section "Wiring Devices" or furniture feed for powered systems furniture connection. Coordinate requirements with furniture vendor.

2.10 PROMOTIONAL ISLAND ELECTRICAL FEEDS

A. Drop Reel Cords: Refer to Division 01 Section "Vendor Contact List" for information on Owner supplied drop reel cords.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. In addition to other contract document requirements, the following special requirements shall be strictly enforced.

1. Install wiring for systems in conduit sized per NEC, minimum 3/4-inch (19-mm) dia. unless otherwise indicated.
2. Install wiring for different power voltages in raceway systems separate from each other .
3. Install wiring, with the exception of voice and data, for the various electrical systems in raceway systems separate from each other.

    a. Low Voltage Systems:

        1) In stores with ceilings, run free air above the ceiling unless space above ceilings is an air plenum in which case plenum rated cable shall be used.
        2) In stores without ceilings, run in structure with j-hooks or other standard installation methods.

3) Low voltage systems wiring is required to be in conduit stub ups above ceiling or to structure in all cases.

4. Install normal system power feeders and branch circuits in separate raceways from emergency system power.
5. Do not install conduits within slabs.
6. Provide steel conduit and fittings indoors above the slabs.
7. Provide conduit fittings with insulated throats or plastic bushings for conduits 2-inches (51-mm) and larger where insulated throats are not readily available.
8. Provide conduit runs exceeding 100-feet (30.5-m) in length or having in excess of three 90 degree turns with pull boxes.

B. Don not exceed a conduit fill of 40 percent or per NEC, whichever is less.

3.2 RACEWAY APPLICATION

A. Hanger and support devices are specified in Division 20 Section "Hangers and Supports for Facility Services."

B. Use liquid-tight flexible conduit for connection of motors and for other electrical equipment where subject to movement or vibration, and also where subjected to one or more of following conditions:

1. Exterior location.
2. Moist or humid atmosphere where condensate can be expected to accumulate.
3. Corrosive atmosphere.
4. Subjected to water supply.
5. Subjected to dripping oil, grease and/or water.

C. Cut conduits straight, properly ream and cut threads for heavy wall conduit deep and clean.

D. Size conduits to meet NEC, except not conduit smaller than 3/4-inch (19-mm) trade size, except for switch legs or where expressly noted otherwise.

E. Fasten conduit terminations in sheet metal enclosures by two locknuts and terminate with bushing. Install locknuts inside and outside enclosure.

F. Conduits are not to cross pipe shafts or ventilating duct openings.

G. Keep conduits a minimum distance of 6-inches (152-mm) from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.

H. Support riser conduit at each floor level with clamp hangers.

I. Use of running threads at conduit joints and terminations is prohibited. When required, use a 3-piece union or split coupling.

J. Complete electrical raceway installation before starting installing cables/wires within raceways.

K. Concealed Conduits:

1. Conceal conduit in sales area or within customer view to a point 14-ft (4.27-m) above finish floor,above décor height line.
2. Install concealed raceways parallel with or at right angles to ceilings, walls and structural members.
3. Metallic raceways installed underground are to have factory applied epoxy or coal-tar coating. Field paint conduit threads with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure watertightness.
4. For slabs on grade, install conduits minimum of 3-inches (76-mm) below bottom of concrete slabs.
5. Install exterior underground conduits minimum 24-inches (610-mm) below finished grade.
6. Conduits in Concrete Slabs: Do not install conduits within concrete slabs.

L. Exposed Conduits:

1. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.
2. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.
3. Support exposed conduits by use of hanger, clamps or clips. Support conduits on each side of bends within 3-feet (1-m) of connection to junction box, outlet box, cabinet or fitting, and on spacing not to exceed 10-feet (3-m).
4. Above requirements for exposed conduits also apply to conduits installed in space above hung ceilings and in crawl spaces.
5. Provide minimum intermediate metal conduit (IMC) for exposed conduits in the back room or dock area below a height of 15-feet (4.6-m).

M. Non-Metallic Conduits:

1. Install solvent-cemented joints in accordance with recommendations of manufacturer.
2. Install PVC conduits underground or under floor slab only in accordance with local utility practices.

N. Conduit Seals: See manufacturers details for requirements and coordinate with Division 07.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.

   a. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
   b. For stub-ups at equipment not mounted outdoors (i.e. branch circuits), transition from PVC to RMC below grade.

5. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.4 INSTALLATION OF BOXES:

A. Install raceway junction boxes flush with finished concrete floor.

B. Install electrical boxes and fittings where indicated complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

C. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.

D. Provide weatherproof outlets for interior and exterior locations as indicated on Drawings by "WP."

E. Provide weather-resistant outlets for exterior locations as indicated on Drawings by "WR."

F. Provide die cast aluminum junction boxes located under service cases fed by under floor rigid steel or PVC conduit raceway systems. Seal around entire perimeter of box with clear silicone sealant after securing box to floor slab.

G. Provide knockout closures to cap unused knockout holes where blanks have been removed.

H. Install boxes and conduit bodies in those locations to ensure ready accessibility of electrical wiring.

I. Install boxes and conduit bodies in accordance with proper work phasing of the work.

J. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections where fastened with locknut or bushing on rounded surface.

K. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Supports and anchors to be in accordance with Division 20 Section "Hangers and Supports for Facility Services."

L. Install cooler/freezer timer switch box extension adapter on all cooler/freezer panel switch boxes to extend box to accommodate timer switch and wiring.

M. Provide electrical connections for installed boxes.

N. Provide hangers and brackets for junction and pull boxes, and coordinated properly with conduit hangers or fastenings to maintain proper alignment and prevent distortion of box. See Division 20 Section "Hangers and Supports for Facility Services" for supports.

O. The Owner reserves the right to change the location of any outlet a distance of 6-feet (1829-mm) in any direction from plan location before the work is actually roughed in at no additional charge.

3.5 INSTALLATION OF POWER POLES

A. Install per manufacturer's instructions.

B. Mount power poles to structure above with galvanized steel channel and mount to floor or fixture.

1. Provide junction boxes in structure with flexible conduit into pole and down to electronic equipment as required per the Drawings.

3.6 INSTALLATION OF DROP REEL CORDS

A. Mount where indicated to bottom of structural steel beam or joist as recommended by drop reel cord manufacturer.

END OF SECTION 26 05 33