SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type OFR and Type CR communications raceways and fittings.
2. Cable supports and positioning devices.

B. Related Requirements:

1. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
2. Section 270010 "Supplemental Requirements for Communications" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
3. Section 078413 "Penetration Firestopping" specifies firestopping for communications pathways installed by this Section.
4. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding conductors and connectors for communications pathways installed by this Section.
5. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports for communications pathways installed by this Section.
6. Section 260533.13 "Conduits for Electrical Systems" specifies the following installed by this Section:

    a. Type EMT-A and Type EMT-SS duct raceways and elbows.
    b. Type EMT-S duct raceways and elbows.
    c. Type ENT duct raceways and fittings.
    d. Type HDPE and Type EPEC duct raceways and fittings.
    e. Type ERMC-A and Type ERMC-SS duct raceways, elbows, couplings, and nipples.
    f. Type ERMC-S duct raceways, elbows, couplings, and nipples.
    g. Type FMC-S and Type FMC-A duct raceways.
    h. Type FMT duct raceways.
    i. Type IMC duct raceways.
    j. Type LFMC duct raceways.
    k. Type LFNC duct raceways.
    l. Type PVC duct raceways and fittings.
    m. Type RTRC-AG duct raceways and fittings.
    n. Type RTRC-BG duct raceways and fittings.
    o. Fittings for conduit, tubing, and cable.
    p. Electrically conductive corrosion-resistant compounds for threaded conduit.
    q. Solvent cements.

7. Section 260533.16 "Boxes and Covers for Electrical Systems" specifies the following installed by this Section:

    a. Metallic outlet boxes, device boxes, rings, and covers.
    b. Nonmetallic outlet boxes, device boxes, rings, and covers.
    c. Junction boxes and pull boxes.
    d. Cover plates for device boxes.
    e. Hoods for outlet boxes.

8. Section 260533.23 "Surface Raceways for Electrical Systems" specifies the following installed by this Section:

    a. Surface metal raceways and fittings.
    b. Surface nonmetallic raceways.
    c. Strut-type channel raceways and fittings.
    d. Wireways and auxiliary gutters.

9. Section 260536 "Cable Trays for Electrical Systems" specifies cable trays for communications pathways installed by this Section.
10. Section 260539 "Underfloor Raceways for Electrical Systems" specifies underfloor raceways for communications pathways installed by this Section.
11. Section 260543 "Underground Ducts and Raceways for Electrical Systems" specifies the following installed by this Section:

    a. Duct accessories.
    b. Handholes and boxes for exterior underground wiring.
    c. Manholes for exterior underground wiring.
    d. Utility structure accessories.
    e. Duct sealing.

12. Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling" specifies sleeves and sleeve seals for communications pathways installed by this Section.
13. Section 260553 "Identification for Electrical Systems" specifies labels and warning signs for communications pathways installed by this Section.
14. Section 262716 "Electrical Cabinets and Enclosures" for communications enclosures installed by this Section.
15. Section 262719 "Multi-Outlet Assemblies" specifies the following installed by this Section:

    a. Wall-mounted, surface metal raceway multi-outlet assemblies.
    b. Wall-mounted, surface nonmetallic raceway multi-outlet assemblies.
    c. Floor-mounted, recessed metal raceway multi-outlet assemblies.
    d. Indoor service poles.
    e. Floor-mounted, enclosure multi-outlet assemblies.
    f. Fire-rated, poke-through assemblies.
    g. Above-floor service fittings.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

1) If listed manufacturers differ from selling manufacture, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
3) Product identification in approval letters must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' published instructions submittals.

PART 2 - PRODUCTS

2.1 TYPE OFR AND TYPE CR COMMUNICATIONS RACEWAYS AND FITTINGS

A. Description: This product group covers raceways and fittings for installation of conductive and nonconductive optical-fiber cable, communications cable, power-limited fire-alarm cable, signaling cable, and coaxial cable in accordance with NFPA 70.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria:

a. Optical-Fiber Cable Raceway: UL CCN QAZM; including UL 2024.
b. Communications Cable Raceway: UL CCN QBAA; including UL 2024.

C. UL QAZM - Type OFR-GP General-Purpose Optical-Fiber Raceway:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Panduit Corp

2. Product Characteristics:

    a. Texture: Smooth.
    b. Splicing: Fusion.

3. Required Product Options:

    a. Couplings and Fittings:

        1) Consists of a single manufacturer.

D. UL QAZM - Type OFR-P Plenum Optical-Fiber Raceway:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Atkore
    b. Belden Canada ULC
    c. Carlon; ABB, Electrification Business
    d. Corning Optical Communications; Corning Incorporated
    e. Gravenhurst Plastics Ltd
    f. Premier Conduit Inc.

2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:

    a. Meets UL 2024 test requirements for "PLENUM" marking.
    b. Texture: Smooth.
    c. Splicing: Fusion.

4. Required Product Options:

    a. Couplings and Fittings:

        1) Consistent to one manufacturer.

E. UL QAZM - Type OFR-R Riser Optical-Fiber Raceway:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Belden Canada ULC
    b. Carlon; ABB, Electrification Business
    c. Corning Optical Communications; Corning Incorporated
    d. Dura-Line
    e. Homepath Products LLC
    f. Panduit Corp
    g. Premier Conduit Inc.

2. Source Limitations: Obtain products from single manufacturer.

3. Product Characteristics:

    a. Meets UL 2024 test requirements for "RISER" marking.
    b. Texture: Smooth.
    c. Splicing: Fusion.

F. UL QBAA - Type CR-GP General-Purpose Communications Cable Raceway:

1. Manufacturers: Subject to compliance with requirements:

    a. Panduit Corp

2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:

    a. Texture: Smooth
    b. Splicing: Glue

G. UL QBAA - Type CR-P Plenum Communications Cable Raceway:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. America Fujikura Ltd. (AFL); Fujikura Ltd.
    b. Atkore
    c. Belden Canada ULC
    d. Gravenhurst Plastics Ltd
    e. Premier Conduit Inc.

2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:

    a. Meets UL 2024 test requirements for "PLENUM" marking.
    b. Texture: Smooth
    c. Splicing: Glu

H. UL QBAA - Type CR-R Riser Communications Cable Raceway:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. America Fujikura Ltd. (AFL); Fujikura Ltd.
    b. Belden Canada ULC
    c. Dura-Line
    d. Homepath Products LLC
    e. Panduit Corp
    f. Premier Conduit Inc.

2. Source Limitations: Obtain products from single manufacturer.

3. Product Characteristics:

    a. Meets UL 2024 test requirements for "RISER" marking.
    b. Texture: Smooth
    c. Splicing: Glue

2.2 CABLE SUPPORTS AND POSITIONING DEVICES

A. Description: This category covers straps, hooks, and similar types of hardware for installation and use in communications cabling systems in accordance with NFPA 70 and manufacturer's installation instructions

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

C. UL DWMU - J-Hook or G-Hook Cable Support:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABB Electrification Installations Products
    b. ADI
    c. Cablofil; Legrand North America, LLC
    d. Elite Components Inc.; subsidiary of SIGMA Piping Products (SPP) LLC
    e. Panduit Corp
    f. Southwire Company, LLC

2. Source Limitations: Obtain products from single manufacturer.
3. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
4. Product Characteristics:

    a. Material: Galvanized steel.

D. UL ZODZ - Cable Clamp, Clip, or Mount Positioning Device:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

    a. Panduit Corp

2. Source Limitations: Obtain products from single manufacturer.
3. Product Listing Criteria: UL CCN ZODZ; including UL 1565.
4. Product Characteristics:

    a. Materials: Metallic

5. Required Product Options:

    a. Fixing Device: with mechanical fastener.
    b. Resistant to ultraviolet light.
    c. Resistant to corrosion.

PART 3 - EXECUTION

3.1 SELECTION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.

B. Type OFR and Type CR Communications Raceways: Comply with Table 800.154(b) of NFPA 70.

C. Minimum Pathway Size:

1. For Copper and Aluminum Cables: Metric designator 21 (trade size 1).
2. For Optical-Fiber Cables: Metric designator 25 (trade size 1).

D. Maximum Pathway Length Between Cable Access Points: 75 ft.

E. Temperature Limitations:

1. Type PVC, Type HDPE, Type EPEC, Type OFR, and Type CR: Do not install where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
2. Type RTRC: Do not install where ambient temperature exceeds 230 deg F.

F. Outdoor Pathways:

1. Exposed and Subject to Severe Physical Damage: ERMC.
2. Exposed and Subject to Physical Damage: Corrosion-resistant EMT.

    a. Locations less than 2.5 m (8 ft) above finished floor.

3. Exposed and Not Subject to Physical Damage: Corrosion-resistant EMT.
4. Concealed Aboveground: EMT PVC-40.
5. Direct Buried: PVC-80.
6. Concrete Encased Not in Trench: PVC-80.
7. Concrete Encased in Trench: PVC-80.

G. Indoor Pathways:

1. Hazardous Classified Locations: ERMC.
2. Exposed and Subject to Severe Physical Damage: ERMC. Locations include the

following:

a. Loading docks.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.

3. Exposed and Subject to Physical Damage: EMT. Locations include the following:

a. Locations less than 2.5 m (8 ft) above finished floor.
b. Stub-ups to above suspended ceilings.

4. Exposed and Not Subject to Physical Damage: PVC-80.
5. Concealed above Suspended Ceilings: EMT Cable tray.
6. Concealed in Ceilings and Interior Walls and Partitions: EMT.
7. Damp or Wet Locations: Corrosion-resistant EMT.
8. Exposed to Environmental Air: EMT.
9. In Vertical Runs: EMT.

H. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC and IMC: Provide threaded-type fittings unless otherwise indicated.

I. Surface Raceways: Where indicated on Drawings.

J. Cable Supports and Positioning Devices:

1. Size hooks to allow minimum of 25 percent future capacity without exceeding design capacity limits.
2. Support hooks directly from building structure. Do not use ceiling grid support rods or wires.
3. Hook spacing must allow no more than 6 inches of slack. Lowest point of cables must be no closer than 6 inches to ceiling tiles, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 ft on center.
5. Provide hook at each change in direction.

K. Boxes and Enclosures:

1. Outdoors, Aboveground: UL 50E Type 4.
2. Indoors: UL 50E Type 1, except use Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

L. Identification of Underground Pathways, Handholes, and Structures:

1. Use "SIGNAL" for legend on warning planks, underground warning tape, and covers.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

A. Grounding and Bonding Conductors:

1. Communications Busbar Connections:

a. TBC: Not smaller than 1/0 AWG and no smaller than largest TBB.
b. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
c. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
d. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
e. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
f. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted clamp connectors.

2. Cable Tray Connections:

a. Cable Tray Equipment Grounding Conductor: 6 AWG.
b. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper not smaller than 6 AWG and not longer than 12 inches. If jumper is wire, it must be terminated with lug having one hole and standard barrel for one crimp. If jumper is flexible braid, it must be terminated with one- or two-hole ferrule. Attach with bonding screw or connector provided by cable tray manufacturer.

3. Underground Connections: Not smaller than 3 AWG. Provide welded connectors, except bolted connectors may be used in handholes or manholes and as otherwise indicated on Drawings.

3.3 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:

B. Pipe and Conduit Labeling: Comply with ASME A13.1.

C. Color Coding Scheme for Communications Cable and Terminations: Comply with BICSI N1 and TIA-598.

D. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "SIGNAL."

E. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

F. Locations of Underground Lines: Underground-line warning tape for communication, control wiring, and optical-fiber cable.

G. Communications Vaults, Manholes, Handholes, and Pull and Junction Boxes: For conductors in vaults, pull and junction boxes, manholes, and handholes, use snap-around labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags with conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with conductor designation.

J. Conductors To Be Extended in Future: Attach write-on tags to conductors.

K. Equipment and Cabling Identification for Administrative Records and Labeling: Comply with TIA-606 requirements for Class 2 network administration.

L. Equipment Identification Labels:

1. Black letters on white field.
2. Indoor Equipment: Self-adhesive label.
3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment To Be Labeled:

a. Racks, Frames, and Enclosures: Identify front and rear of each enclosure with self-adhesive labels containing equipment designation.
b. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
c. Communications cabinets.
d. Access doors and panels for concealed communications items.
e. Emergency system boxes and enclosures.
f. Contactors.
g. Remote-controlled switches, dimmer modules, and control devices.
h. Monitoring and control equipment.
i. Security equipment.
j. Life-safety communications equipment.

M. Backbone Cables: Label each cable with a vinyl-wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

N. Horizontal Cables: Label each cable with a vinyl-wraparound label.

O. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Identify cover plate in accordance with TIA-606.

P. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.4 INSTALLATION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

A. Comply with manufacturers' published instructions, including limitations on distance, bends, and bend radius.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Type OFR Optical-Fiber Raceways: Article 800 of NFPA 70 and BICSI N1.
2. Type CR Communications Raceways: Article 800 of NFPA 70 and BICSI N1.
3. Cable Supports and Positioning Devices: Article 800 of NFPA 70 and BICSI N1.
4. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Complete communications raceway installation before starting conductor installation.
2. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
3. Provide hangers and supports for pathways, boxes, and enclosures.
4. Firestop pathway penetrations of fire-rated assemblies.
5. Identification:

    a. Provide colors and labels for pathways, boxes, enclosures, and associated communications equipment as indicated on Drawings.
    b. Provide safety warning signs.
    c. Bury underground warning tape approximately 12 inches above direct-buried conduits, but minimum of 6 inches below grade. Align tape along centerline of conduit.

D. Interfaces with Other Work:

1. Coordinate installation of new communications pathways with existing conditions.

2. Grounding and Bonding: Bond metallic communications boxes and enclosures to metallic pathways. Coordinate with Section 271100 "Communications Equipment Room Fittings" for grounding and bonding of communications pathways to communications equipment room fittings.

3.5 PROTECTION

A. Protect coatings and finishes of pathways, boxes, and enclosures from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528