SECTION 260539 - UNDERFLOOR RACEWAYS FOR ELECTRICAL SYSTEMS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Flat-top, single- or multichannel, underfloor raceways.

Flush, flat-top underfloor raceways.

Cellular metal underfloor raceways.

Trench-type underfloor raceways.

Coordinate first two subparagraphs below with structural deck Drawings and Specifications. Cellular concrete floor decks are specified in Section 034100 "Precast Structural Concrete," and cellular steel floor decks are specified in Section 053100 "Steel Decking."

Electrical connection components for precast cellular concrete floor decks.

Electrical connection components for electrified cellular steel floor decks.

Supports, raceway fittings, and hardware.

Junction boxes.

Service fittings.

Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 034100 "Precast Structural Concrete" for precast concrete units used as cellular concrete floor raceways.

Section 053100 "Steel Decking" for rough-in of underfloor duct distribution system.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

* + - * 1. Activation: Nomenclature used by some manufacturers for a service fitting.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

Include finishes, construction details, material descriptions, dimensions, and profiles for underfloor raceway components, fittings, and accessories.

Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel raceways within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

* + - * 1. Shop Drawings: For underfloor raceways.

Include floor plans, elevations, sections, and details.

Detail fabrication and assembly of underfloor raceways.

Identify components and accessories, such as expansion-joint assemblies, straight raceway lengths, preset and afterset inserts, and service fittings.

Detail preparation and installation methods and instructions.

Provide dimensions locating raceway header and distribution elements. Include spacing between preset inserts and between preset inserts and ends of duct runs, walls, columns, junction boxes, and header duct connections.

Provide raceway fill charts for each duct size provided for each conductor size the duct is identified to accept. Provide separate charts for power and communication conductors and cables.

Show connections between raceway elements and relationships between components and adjacent structural and architectural elements, including slab reinforcement, floor finish work, permanent partitions, expansion joints[**, architectural module lines**][**, and pretensioning or post-tensioning components**].

Indicate height of preset inserts, junction boxes, and raceways coordinated with depth of concrete slab and floor fill.

Indicate thickening of slabs where required for adequate encasement of raceway components.

Document coordination of exposed components with floor-covering materials to ensure that fittings and trim are suitable for indicated floor-covering material.

Revise locations from those indicated in the Contract Documents, as required to suit field conditions and to ensure a functioning layout. Identify proposed deviations from the Contract Documents.

Show details of connections and terminations of underfloor raceways at panelboards and communication terminal equipment in equipment rooms, wire closets, and similar spaces.

Retain subparagraph below if Project includes electrified cellular floor deck.

Identify those cells of cellular floor deck that are to be connected and fitted for the following underfloor distribution:

Retain one or more of six subparagraphs below.

Power.

Voice.

Data.

Signal.

Communications.

<**Insert system**>.

Retain "Samples" paragraph below for single-stage Samples, with a subordinate list if applicable

* + - * 1. Samples: For each underfloor raceway product, in specified finish, including the following:

Retain subparagraphs below required for approval of exposed finishes or other critical features.

Service fittings and flush and recessed outlet and junction-box covers.

A section of each service raceway configuration, with specified preset insert and service fitting installed.

A junction box of each size and type for use with underfloor raceway.

A section of each header raceway configuration, complete with provisions for connection with service raceway.

A section of trench-type raceway, complete with cover and required trim.

A junction box of each size and type for use with trench-type raceway, complete with cover and trim.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

INFORMATIONAL SUBMITTALS

Retain "Field quality-control reports" Paragraphparagraph below if Contractor is responsible for field quality-control testing.

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For underfloor raceways, to include in emergency, operation, and maintenance manuals.

In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

Manufacturer's written instructions for locating preset inserts and for installing afterset inserts.

* + - * 1. Project Record Documents: Submit final as-built Drawings, indicating dimensioned locations for all ducts, junction boxes, and preset inserts. Typical spacing designation shall be accepted only for preset insert spacing along a continuous length of duct.
			1. MAINTENANCE MATERIAL SUBMITTALS
				1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Retain one of two "Afterset Inserts" subparagraphs below. Retain first subparagraph for cellular concrete floor installations; retain second for steel underfloor raceway or cellular steel floor installations.

Afterset Inserts: Furnish quantity equal to [**10**] <**Insert number**> percent of service fittings installed, but no fewer than <**Insert number**> units.

Afterset Inserts: Furnish quantity equal to [**5**] <**Insert number**> percent of each type of preset insert installed, but no fewer than <**Insert number**> units.

Service Fittings: Furnish [**three**] <**Insert number**> of each type of service fitting indicated for each 100 feet (30 m) of distribution raceway or active-floor-cell length.

Outlet Blanking Covers: Furnish quantity equal to [**10**] <**Insert number**> percent of each type of floor opening installed for outlets, but no fewer than <**Insert number**> units.

Retain two paragraphs below to provide tools for Owner's maintenance staff.

* + - * 1. Furnish [**one**] <**Insert number**> electronic instrument(s) and other tools, as recommended by underfloor raceway manufacturer for detecting, locating, and uncovering preset inserts in metal raceway under floor covering and up to 3/8 inch (10 mm) of concrete fill.
				2. Furnish [**one**] <**Insert number**> set(s) of tools needed for installing afterset inserts in underfloor service raceway, including the following:

Electric Drill: Variable speed, 1/2-inch (13-mm) capacity.

Afterset inserts for multiple-system service fittings in multichannel or multicell raceways may require hole saw larger than 2 inches (50 mm). Coordinate with underfloor raceways specified.

Hole Saw: Diamond bit, for dry concrete, [**2-inch (50-mm)**] <**Insert dimension**> size.

Insert installation tool.

<**Insert name of tool**>.

* + - 1. QUALITY ASSURANCE

Retain "Testing Agency Qualifications" Paragraphparagraph below if Contractor selects testing agency or if Contractor is required to provide services of a qualified testing agency in "Field Quality Control" Article. Qualification requirements are in addition to those specified in Section 014000 "Quality Requirements," which also defines "NRTL" (nationally recognized testing laboratory).

* + - * 1. Testing Agency Qualifications: Member company of NETA or an NRTL.

Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

* + - * 1. Comply with UL 884.
				2. Comply with NFPA 70.

Retain "Mockup" Paragraphparagraph below if Project size warrants a mockup. Mockup should be a small area of Project, including products which will be installed.

* + - * 1. Mockup: Install a mockup for evaluation of surface preparation and duct installation techniques and workmanship.

Mockup area shall be designated by Architect.

Do not proceed with remaining work until workmanship, appearance, and performance are approved.

Repair or reinstall mockup area as required to produce acceptable work.

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockups.

Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1. PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Section 016000 "Product Requirements."

* + - 1. SYSTEM DESCRIPTION
				1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
				2. Jacks, Receptacles, and Fittings:

Comply with Section 262726 "Wiring Devices" for power outlets, faceplates, and connectors.

Comply with Section 271513 "Communications Copper Horizontal Cabling" for twisted pair jacks, outlets, assemblies, and faceplates.

Comply with Section 271523 "Communications Optical Fiber Horizontal Cabling" for optical fiber jacks, outlets, assemblies, and faceplates.

Comply with Section 271533 "Communications Coaxial Horizontal Cabling" for coaxial jacks, outlets, assemblies, and faceplates.

Retain one of first four articles below to specify underfloor raceways. Delete all four articles and retain either the fifth or sixth article to specify electrical fittings, accessories, and connection products used to electrify hollow cells of structural precast concrete or steel cellular floor decks that are specified in concrete or metals Specifications, respectively.

* + - 1. FLAT-TOP, STEEL UNDERFLOOR RACEWAYS

Retain this article to specify what are sometimes called "conventional underfloor raceways" or "single-compartment underfloor ducts." Use service raceways with rectangular preset inserts for flush duplex receptacle and dual telecommunication service fittings. Use round preset inserts for projects with flush service fittings limited to either single-power or single-communication connections, and surface-mounted service fittings limited to single-system, pedestal type.

* + - * 1. Description: Steel, rectangular, flat-top, single-channel raceways with premanufactured inserts.
				2. 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:

MonoSystems, Inc.

Schneider Electric USA (Square D).

Walker Systems, Inc.

Or equal.

Indicate sizes, quantity, and arrangement of underfloor raceways on Drawings.

* + - * 1. Source Limitations: Obtain underfloor raceway components for each system through single source from single manufacturer.
				2. Material: One-piece, continuous weld, minimum 0.0598-inch- (1.5-mm-) thick steel, with [**corrosion-resistant**] [**galvanized**] coating inside and out after welding.
				3. Cross-Section Shape: Rectangular, with rounded corners.

Retain "Number of Longitudinal Channels" Paragraphparagraph if multichannel ducts are required. Multichannel ducts may not be available from all listed manufacturers.

* + - * 1. Number of Longitudinal Channels: [**Two**] [**Three**] [**Four**], separated by steel wall(s).

Two-level arrangement in "Number of Levels" Subparagraphsubparagraph below may not be available from all listed manufacturers.

* + - * 1. Number of Levels: [**One**] [**Two**].

Retain "Minimum Bending Radius for Communication Cables" Subparagraphsubparagraph below if fiber-optic or Category 5, 5e, or 6 cables may be installed in communication raceways. Verify capability of achieving minimum bending radius with manufacturers.

* + - * 1. Minimum Bending Radius for Communication Cables: Combination of raceways, fittings, inserts, junction boxes, service fittings, and mounting and connection arrangements for wiring devices and jacks shall provide a [**2-inch- (50-mm-)**] <**Insert dimension**> minimum bending radius for communication cables.
				2. Service Raceways: Fitted with preset inserts.

Nominal Multichannel Underfloor Raceway Dimensions:

Depth: 1-3/8 inches (35 mm).

Overall Width: [**6 inches (150 mm)**] [**10 inches (250 mm)**] [**15 inches (375 mm)**] <**Insert dimension**>.

See Evaluations for retaining dimensions of raceways for underfloor raceway layouts. Retain "Power Service Channel Width" and "Communication Service Channel Width" subparagraphs below if nominal width of raceways is not indicated on Drawings.

Power Service Channel Width: [**3-1/2 inches (88 mm)**] [**4-3/8 inches (110 mm)**] <**Insert dimension**>.

Communication Service Channel Width: [**3-1/2 inches (88 mm)**] [**4 inches (100 mm)**] [**6-1/2 inches (163 mm)**] <**Insert dimension**>.

Nominal Single-Channel Underfloor Raceway Dimensions:

Depth: 1-1/2 inches (38 mm).

Power Service Raceway Width: 3-1/4 inches (81 mm).

Communication Service Raceway Width: [**3-1/4 inches (81 mm)**] [**6 inches (150 mm)**].

Retain "Number of Single-Channel Raceways per Run" Subparagraphsubparagraph below to establish default arrangement of service raceway runs and to establish default configuration of junction boxes. Delete if number of single-channel raceways per run is indicated on Drawings.

Number of Single-Channel Raceways per Run: [**One**] [**Two**] [**Three**] [**Four**] [**Five**] unless otherwise indicated.

Preset Inserts: [**Rectangular**] [**Round**].

Spacing: [**12 inches (300 mm)**] [**24 inches (600 mm)**] o.c.

Retain one of two "Size" subparagraphs below. Retain first subparagraph for rectangular inserts; retain second for round inserts.

Size: Rectangular dimensions as required to accommodate mounting and connection of flush- and surface-mounted, [**single-**][**and multiple-**]outlet service fittings or to connect to wiring extensions for feeding wall outlets for [**power**] [**communications**] [**power and communications**] <**Insert system**>.

Size: [**2 inches (50 mm)**] <**Insert dimension**> in diameter.

Equip each insert with a disposable cover, and select insert height so cover is 1/8 inch (3 mm) below surface of concrete.

Arrange insert for optional attachment of flush-, surface-, or wiring-extension service fitting to replace disposable cover. Arrange brackets, mountings, barriers, and floor access covers to support, isolate, and provide access to [**flush**] [**or**] [**surface**] outlet-mounting connector, jack, and receptacle devices.

Retain "Header Raceways" Paragraphparagraph below if flat-top, single-channel raceway is used as header raceway for either single- or two-level arrangement of raceway. 3-1/2-inch- (88-mm-) wide raceways may be adequate for some power and communication header applications. Indicate header location and arrangements on Drawings.

* + - * 1. Header Raceways: [**Single-**][**Multi**]channel, without preset inserts (blank raceway).

Nominal Raceway Dimensions:

Depth: [**Same as service raceways**] [**2-1/2 inches (63 mm)**] [**2-3/4 inches (69 mm)**] [**3 inches (75 mm)**] [**3-1/2 inches (88 mm)**].

See Evaluations for retaining dimensions of raceways for underfloor raceway layouts. Retain "Power Header Raceway Width" and "Communication Header Raceway Width" subparagraphs below if nominal width of raceways is not indicated on Drawings. If widths of header raceways vary, delete both subparagraphs and indicate widths on Drawings.

Power Header Raceway Width: [**3-1/2 inches (88 mm)**] [**4-3/8 inches (110 mm)**] <**Insert dimension**>.

Communication Header Raceway Width: [**3-1/2 inches (88 mm)**] [**4 inches (100 mm)**] [**6-1/2 inches (163 mm)**].

Retain first option in "Arrangement" Subparagraphsubparagraph below for single-level arrangement.

Arrangement: [**In same plane as**] [**Below**] service raceways.

Connections: Arranged to connect with service raceways at [**single**] [**two**]-level junction boxes.

* + - 1. FLUSH, FLAT-TOP UNDERFLOOR RACEWAYS

See Evaluations for additional application considerations.

Only one manufacturer now catalogs these products, so they may be proprietary.

* + - * 1. Description: [**Single**] [**or**] [**multichannel**] underfloor raceways installed on floor slab with top of raceway flush with concrete topping added hereafter, and then covered with finish material.
				2. 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:

MonoSystems, Inc.

Schneider Electric USA (Square D).

Walker Systems, Inc.

Or equal.

Indicate sizes, quantity and arrangement of underfloor raceways on Drawings.

* + - * 1. Source Limitations: Obtain underfloor raceway components for each system through single source from single manufacturer.
				2. Description:

Material: Steel.

Cross-Section Shape: Rectangular, [**single channel**] [**and**] [**multichannel, separated by steel wall(s)**].

Listed and labeled for installation with top flush with concrete floor.

Number of Levels: One.

* + - * 1. Service Raceways: Fitted with preset inserts.

Retain "Number of Longitudinal Channels per Multichannel Raceway" Subparagraphsubparagraph below for flush, multichannel raceway installations.

Number of Longitudinal Channels per Multichannel Raceway: [**Two**] [**Three**].

Retain "Number of Single-Channel Raceways per Run" Subparagraphsubparagraph below for flush, single-channel raceway installations.

Number of Single-Channel Raceways per Run: [**One**] [**Two**] [**Three**] unless otherwise indicated.

Nominal Channel Dimensions: 3 inches (75 mm) wide by 1-1/4 inches (31 mm) deep.

Preset Inserts: Threaded opening with removable steel plug that is flush with top of raceway when screwed in place.

Spacing: [**12 inches (300 mm)**] [**24 inches (600 mm)**] o.c., full length of each service raceway.

Arrangement: Stagger insert locations on parallel raceways or channels to accommodate placement of adjacent service fittings.

Size: 1-5/8-inch (41-mm) diameter.

* + - * 1. Trench Duct Crossunder: Fitting attached to underside of trench duct.

Nominal Channel Dimensions: Same as service raceways.

Arrangement: Offset by depth of trench duct.

Connections: Arranged to connect trench duct to flush duct through factory-cut, grommeted openings.

* + - * 1. Header Raceways: Raceways same as service raceways, except without preset inserts (blank raceway).

Nominal Channel Dimensions: Same as service raceways.

Arrangement: In same plane as service raceways.

Connections: Arranged to connect with service raceways at junction boxes.

* + - 1. CELLULAR METAL UNDERFLOOR RACEWAYS

Retain this article for longitudinal runs of multichannel underfloor service raceways that have the appearance of three-cell sections cut from sheets of cellular floor decking, and to specify raceway layouts similar to those for flat-top, rectangular, multichannel raceways specified above. Also retain this article for other products required for header and feeder raceways. See Evaluations for application considerations.

* + - * 1. Description: Multichannel, cellular, underfloor service raceways installed on floor slab with top of raceway flush concrete topping added hereafter, and then covered with finish material.
				2. 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:

HH Robertson.

United Steel Deck, Inc.

Walker Systems, Inc.

Or equal.

Indicate sizes, quantity and arrangement of underfloor raceways on Drawings.

* + - * 1. Source Limitations: Obtain underfloor raceway components for each system through single source from single manufacturer.
				2. Material: Galvanized-steel sheet, ASTM A653/A653M, Structural Steel (SS), Grade 33 (230) minimum, [**G60 (Z180)**] [**G90 (Z275)**] zinc coating.
				3. Material: Galvanized- and shop-primed steel sheet, ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; with underside surface cleaned, pretreated, and primed with manufacturer's standard [**gray**] [**white**] baked-on, rust-inhibitive primer.
				4. Number of Longitudinal Cells: Three, separated by steel walls.
				5. Nominal Dimensions of Cells:

Overall Depth: 1-1/4 inches (31 mm) unless otherwise indicated.

Cross-Sectional Area of Cells: Power cells: 5-1/2 sq. in. (34.4 sq. cm); communication system cells: 16 sq. in. (100 sq. cm).

Retain "Minimum Bending Radius for Communication Cables" Subparagraphsubparagraph below if fiber-optic or Category 5, 5e, or 6 cables are to be installed in communication raceways. Verify capability of achieving minimum bending radius with manufacturers.

* + - * 1. Minimum Bending Radius for Communication Cables: Combination of raceways, fittings, inserts, junction boxes, service fittings, and mounting and connection arrangements for wiring devices and jacks shall provide a [**2-inch- (50-mm-)**] <**Insert dimension**> minimum bending radius for communication cables.
				2. Service Raceways: Fitted with preset inserts.

Indicate types and locations of service fittings on Drawings.

Preset Inserts: Rectangular-shaped metal housing assemblies arranged to provide electrical outlet access to each cell of each raceway designated for service raceway use. Inserts shall be provided throughout the entire length of each such raceway.

Spacing: [**12 inches (300 mm)**] [**24 inches (600 mm)**] [**30 inches (750 mm)**] o.c.

Include housing and connecting provisions for a flush or recessed, single-, double-, or triple-outlet service fitting.

Include mounting and connecting provisions for a surface, single- or multiple-outlet service fitting.

Include connecting provisions for a wiring-extension service fitting to feed wall outlets.

Equip each insert with a disposable cover plate arranged for installation with top 1/8 inch (3 mm) below surface of concrete. Arrange insert to receive a flush-, recessed-, or wiring-extension service fitting to replace disposable top.

Retain "Header Assembly" Paragraphparagraph below if trench-type raceway is not used or is not the sole product to be employed as header raceway to feed the cellular service raceways. See Evaluations. Indicate arrangement of header raceways on Drawings.

* + - * 1. Header Assembly: A junction box and raceway arrangement positioned to feed wires and cables to service raceways.

Retain one of two options in first subparagraph below. Indicate location of junction boxes on Drawings.

Three-compartment junction box connecting blank, [**multicell cellular**] [**flat-top, multichannel**] header raceway (no inserts) with cellular service raceways at right angles to header raceway.

Cellular header raceway shall be made of the same material and have the same nominal dimensions as service raceways.

Provide capability for service raceways to be run in both perpendicular directions at the intersection with header raceway.

* + - 1. TRENCH-TYPE UNDERFLOOR RACEWAYS

This product is sometimes also called "trench duct." See Evaluations for application discussion and comparison with alternative types of header raceways.

* + - * 1. Description: Trench-type raceways used as header or feeder raceways to serve service raceways.
				2. 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:

HH Robertson.

Schneider Electric USA (Square D).

Walker Systems, Inc.

Or equal.

Indicate sizes, quantity and arrangement of underfloor raceways on Drawings.

* + - * 1. Source Limitations: Obtain underfloor raceway components for each system through single source from single manufacturer.
				2. Trench: Steel, shop or factory welded and fabricated to indicated sizes. Include the following features:

Slab Depth Adjustment: Minimum of minus 1/8 inch (3 mm) to plus 5/8 inch (17 mm) before and during concrete placement.

Cover Supports: Height adjustable, with leveling screws to rigidly support cover assembly.

Screed Strip: Extruded aluminum along both edges at proper elevation without requiring shim material.

Trim Strip: Select to accommodate floor finish material.

Partitions: Arranged to separate channels and isolate wiring of different systems.

When used with cellular concrete or cellular steel deck, designate active service raceway cells on Drawings to facilitate provision of grommeted openings required in first subparagraph below.

Grommeted openings in active floor cells or service raceways.

Manufacturer's standard corrosion-resistant finish, applied after fabrication.

* + - * 1. Cover Plates: Removable, steel plates, 1/4 inch (6 mm) thick, each weighing 60 lb (27 kg) or less with full gasket attached to side units. Fabricate intermediate supports to limit unsupported spans to [**15 inches (375 mm)**] <**Insert dimension**> or less. Fabricate covers with appropriate depth recess to receive indicated floor finish.
			1. ELECTRICAL CONNECTION COMPONENTS FOR CELLULAR STEEL FLOOR DECK

Retain this article with articles for header and feeder raceways for use with electrified structural cellular steel floor deck specified in Section 053100 "Steel Decking." Coordinate with structural and electrical Drawings.

* + - * 1. Source Limitations for Electrified Cellular Steel Floor-Deck Components: Obtain electrical components, such as preset inserts, afterset inserts, service fittings, header ducts, and trench header ducts, from cellular steel floor-deck manufacturer.
				2. Preset Inserts: Rectangular metal-housing assemblies.

Spacing: [**12 inches (300 mm)**] [**24 inches (600 mm)**] [**30 inches (750 mm)**] o.c.

Size: As required to provide electrical outlet access to each cell of each group of three cells that is designated for electrical service raceway use.

Equip each insert with a disposable cover arranged for installation with top 1/8 inch (3 mm) below surface of concrete. Arrange insert to receive a flush-, recessed-, or wiring-extension service fitting to replace disposable cover.

Retain first or second option in first subparagraph below.

Include housing and connecting provisions for a [**flush or recessed**] [**surface**] service fitting, [**single**] [**double**] [**triple**] outlet.

Include connecting provisions for a wiring-extension service fitting to feed wall outlets.

* + - 1. ELECTRICAL CONNECTION COMPONENTS FOR PRECAST CELLULAR CONCRETE FLOOR DECK

Retain this article with articles for header and feeder raceways for use with electrified structural cellular concrete floor deck specified in Section 034100 "Precast Structural Concrete." Coordinate with structural and electrical Drawings.

* + - * 1. Source Limitations for Electrified Cellular Concrete Floor-Deck Components: Obtain electrical components, such as preset inserts, afterset inserts, service fittings, header ducts, and trench header ducts, from cellular concrete floor-deck manufacturer or from single source from single manufacturer.
				2. Afterset Inserts: Round metal-nipple assembly with internal and external threading, arranged to screw into plug driven into 1-7/8-inch (47-mm) hole drilled through floor fill, where present, and deck-cell wall into floor raceway cell.

Indicate location and type of afterset inserts on Drawings.

Inserts shall be compatible with floor-mounting service fittings.

Inserts shall provide wiring path from cell to [**power**] [**communication**] [**power and communication**] <**Insert system**> [**wall**] [**and**] [**ceiling**] outlets.

Inserts shall provide wiring path from cell to header raceway.

* + - 1. SUPPORTS, RACEWAY FITTINGS, AND HARDWARE
				1. Source Limitations: Obtain underfloor raceway supports, fittings, and hardware components for each system through single source from single manufacturer.
				2. Supports, fittings, and hardware shall be compatible with raceway and outlet system and shall be listed for use with raceway systems and components delivered.
				3. Supports: Adjustable for height and arranged to maintain alignment and spacing of raceways during concrete placement. Include hold-down straps.
				4. Raceway Fittings: Couplings, expansion-joint sleeves, cross-under offsets, vertical and horizontal elbows, grounding screws, adapters, end caps, and other fittings suitable for use with basic components to form a complete installation.
			2. JUNCTION BOXES

Retain this article for all types of underfloor raceways that include junction boxes.

* + - * 1. Description: Raceway manufacturer's standard enclosure for indicated type, quantity, arrangement, and configuration of raceways at each raceway junction, intersection, and access location. Include the following accessories and features:

Mounting brackets.

Escutcheons and holders to accommodate surrounding floor covering.

Means for leveling and height adjustment more than 3/8 inch (10 mm) before and after concrete is placed.

Boxes shall withstand a minimum [**300-lb (136-kg)**] <**Insert value**> concentrated load. Internal supports shall be provided as needed to meet this requirement.

All boxes shall provide 2-inch- (**50**-mm-) minimum bend radius for data and communication cables.

Raceway Openings: For underfloor raceways and conduits arranged to accommodate raceway layout.

Coordinate first subparagraph below with indicated floor finish material.

Covers shall have appropriate depth recess to receive specific floor finish material.

Partitions to separate wiring of different systems.

* + - 1. SERVICE FITTINGS/ACTIVATIONS
				1. Source Limitations: Obtain underfloor raceway service fittings and hardware for each system through single source from single manufacturer.
				2. Exposed Parts Finish: [**Brass**] [**Brushed aluminum**] <**Insert finish**>.

Some types of underfloor raceway will accept more than one type of service fitting. Retain one or more of three paragraphs below appropriate for the underfloor raceway included in Project. If more than one type of underfloor raceway or service fitting is included, indicate type and location on Drawings.

Retain "Flush, Single-System Service Fitting for Round Inserts" Paragraphparagraph below for flush service fittings in flat-top, single-channel, underfloor raceway with round inserts. Indicate type and location on Drawings.

* + - * 1. Flush, Single-System Service Fitting for Round Inserts: Include mounting and cover to support and provide access to single connector, jack, or receptacle device; mounted flush with floor within body of insert.

Connector, Jack, and Receptacle Devices: Single modular type.

Power Receptacle Outlet: Suitable for 20-A, 120-V device.

Retain "Flush, (Single-) (or) (Multiple-) System Service Fitting for Rectangular Inserts" Paragraphparagraph below for flush service fittings in underfloor raceways with rectangular preset inserts, including flat top, single and multichannel; two- and three-cell, cellular metal underfloor raceway; and cellular steel deck. Indicate type and location on Drawings.

* + - * 1. Flush, [**Single-**] [**or**] [**Multiple-**]System Service Fitting for Rectangular Inserts: Include mounting, hinged cover, and trim to support and provide access to connector, jack, or receptacle devices mounted flush with floor within insert.

Connector, Jack, and Receptacle Devices: Modular type.

Power Receptacle Rating: 20 A, 120 V unless otherwise indicated.

Retain "Recess-Mounted Service Fitting" Subparagraphsubparagraph below for recessed service fittings in three-cell, cellular underfloor raceway and cellular steel deck.

Recess-Mounted Service Fitting: Modular fittings compatible with preset inserts. Include device plates for indicated systems and provisions for receptacles, jacks, and connectors. Include hinged flush covers with recessed depth to match thickness of floor finish material. Provide for internally mounted receptacle- and communication-jack and connector assemblies.

Indicate types and locations of devices on Drawings.

Duplex receptacle.

Duplex data jacks.

Double duplex receptacles.

Duplex receptacle and duplex data jacks.

Fiber-optic cable connector.

* + - * 1. Surface-Mounted Service Fitting: Modular pedestal type, with locking attachment matched to insert floor opening.

Indicate types and locations of fittings on Drawings.

Power-outlet, double-faced, surface-mounted unit for duplex receptacle on both sides.

Power-outlet, single-faced, surface-mounted unit for duplex receptacle on one side.

Communication-outlet, double-faced, surface-mounted unit.

Retain one of first three subparagraphs below to describe provisions for terminating cable from communication equipment at surface-mounted outlets.

Include bushed openings on both sides; 1-inch (25-mm) minimum diameter; insulated with nonconducting material.

Include provisions for modular dual fiber-optic connector assembly on both sides.

Include provisions for modular dual jack-connector assembly, rated for [**Category 5**] [**Category 5e**] [**Category 6**] on both sides.

Communication-outlet, single-faced, surface-mounted unit with bushed opening on one side; 1-inch (25-mm) minimum diameter; insulated with nonconducting material.

Combination surface-mounted unit for duplex receptacle on one side and with communication cable connection provision on opposite side.

Retain one of three "Communication Side" subparagraphs below to describe provisions for terminating cable from communication equipment at these outlets.

Communication Side: Include bushed opening; 1-inch (25-mm) minimum diameter; insulated with nonconducting material.

Communication Side: Include provisions for modular dual fiber-optic connector assembly.

Communication Side: Include provisions for modular dual jack-connector assembly, rated for [**Category 5**] [**Category 5e**] [**Category 6**].

Flush service-fitting types described in "Flush-Mounted Service Fittings" Subparagraphsubparagraph below are used with flat-top, multichannel, underfloor raceway and three-cell, cellular underfloor raceway and cellular steel deck.

Flush-Mounted Service Fittings: Modular fittings compatible with preset inserts and shall include covers, provisions for receptacles jacks and connector assemblies and wiring extensions to wall-mounted outlets, and associated device plates for indicated systems. Include flush covers, recessed to suit floor finish material.

Indicate types and locations of devices on Drawings.

Duplex convenience receptacle.

Duplex data outlets.

Double duplex convenience receptacles.

Duplex convenience receptacle and duplex data outlets.

Double duplex data outlets.

Duplex fiber-optic communication connector.

Indicate locations for wiring-extension service fittings on Drawings.

Wiring-Extension Service Fittings: Arrangement of brackets and mountings to support and provide access to wiring or cabling of a cell, and to connect the cable or raceway that extends the system to an individual wall outlet. Provide for connection of [**RMC**] [**FMC**] [**ENT**] [**Type MC cable**] for power extensions, and [**RMC**] [**FMC**] [**ENT**] [**optical fiber/communication cable raceway**] for communication system extensions.

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION
				1. Install raceways aligned and leveled and, unless otherwise indicated, parallel or perpendicular to floor supports.
				2. Maintain arrangement of conductor services throughout the raceway system.

Retain first paragraph below if cellular metal raceway is specified but is not to be installed directly on compacted fill or on an existing slab. See Evaluations.

* + - * 1. Install a concrete mud slab for support of cellular metal, flush duct, or trench duct raceway. Construct mud slab with wire mesh in the top 1 inch (25 mm) of concrete.
				2. Install a vapor barrier between the cellular metal raceway and a substrate in contact with earth.
				3. Arrange supports to attain proper elevation, alignment, and spacing of raceways. Fasten supports securely at ends and at intervals not to exceed 60 inches (1500 mm), to prevent movement during concrete pour.
				4. Level raceway components with finished slab and make adjustments in raceway component elevation to accommodate indicated floor finishes.

Retain "Junction Boxes" Paragraphparagraph below if junction boxes are indicated for specified underfloor raceways.

* + - * 1. Junction Boxes: Install tops level and flush with finished floor. Install blank closure plates or plugs to close unused junction-box openings. Grout boxes in place to prevent movement during construction. Place top covers in inverted position during construction to prevent damage to surface of cover. Reinstall covers in proper position prior to final acceptance of the Work.
				2. Install preset inserts per manufacturer's instructions.

Retain first paragraph below, except for flush underfloor raceway assemblies.

* + - * 1. Adjust supports to maintain a 1/8- to 3/8-inch (3.0- to 10-mm) finished concrete cover over preset inserts.
				2. Remove burrs, sharp edges, dents, and mechanical defects.
				3. Cap or plug boxes, insert- and service-fitting openings, and open ends of raceways.
				4. Install expansion fittings with suitable bonding jumper where raceways cross building expansion joints.
				5. Bond underfloor raceway components to create a continuous bonding path.
				6. Seal raceways, cells, junction boxes, and inserts to prevent water, concrete, or foreign matter from entering raceways before and during pouring slab or placing fill. Tape joints or seal with compound, as recommended in writing by underfloor raceway manufacturer.

Retain first paragraph below to define how NFPA 70 requirement to install a suitable marker "at or near the end of each straight run of raceway to locate the last insert" is to be accomplished. Paragraphparagraph also expands the Code requirement to enhance location and identification.

* + - * 1. Install a marker at the center of the last insert of each cell and channel of each straight run of metal underfloor service raceway to locate the insert and identify the system.

Install markers at last inserts on both sides of permanent walls and at first inserts adjacent to each junction box.

Install markers flush at screed line before pouring slab or placing fill. Extend marker with grommeted screw when floor covering is placed. Do not extend through carpet.

Use slotted-head screw to identify electrical power; use Phillips-head screw to identify conventional communications.

Use another distinctive screw head to identify third system, such as special-purpose wiring.

* + - * 1. Protect underfloor raceway system from damage. Do not use the installed duct system as working platforms or walkways. Do not allow equipment or heavy traffic over duct during construction period, without first installing ramps over the duct. Ramps shall be designed so that imposed loads are not transferred to the duct. Components of the system that are damaged during construction shall be replaced.

Install concrete surrounding underfloor raceways according to Section 033000 "Cast-in-Place Concrete."

Retain "Afterset Inserts" paragraph below for cellular concrete deck installations and other projects requiring afterset inserts.

* + - * 1. Afterset Inserts: Cut, hole saw, and drill slab and raceways to allow for installation at locations indicated on plans.

Wiring shall comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and NFPA 70 requirements for wet locations.

* + - * 1. Install wiring from outlet insert toward junction boxes, then to termination at panel.
				2. Splices: All splices and taps shall be made in junction boxes. No splices or taps shall be made in raceways or outlet inserts.
			1. FIELD QUALITY CONTROL

Retain "Testing Agency," "Manufacturer's Field Service," and "Perform the following tests and inspections" paragraphs below to identify who shall perform tests and inspections. If retaining second option in "Testing Agency" Paragraphparagraph or if retaining "Manufacturer's Field Service" or "Perform the following tests and inspections" Paragraphparagraph, retain "Field quality-control reports" Paragraphparagraph in "Informational Submittals" Article.

* + - * 1. Testing Agency: [**Director’s Representative will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Service Advisor factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" Paragraphparagraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections [**with the assistance of a** Company Service Advisor **factory-authorized service representative**]:

Perform visual inspection of interior of each [**junction box**] [**section of trench raceway**] to verify absence of dirt, dust, construction debris, and moisture. Replace damaged and malfunctioning components.

Prior to and after concrete pour, perform point-to-point tests of ground continuity and resistance of ground path between the most remote accessible fitting on each branch of each underfloor raceway system and the main electrical distribution grounding system.

Determine cause and perform correction of any point-to-point resistance value that exceeds 0.05 ohms.

Comply with NETA Acceptance Testing Specification about safety, suitability of test equipment, test instrument calibration, and test report and records.

* + - * 1. Prepare test and inspection reports.
			1. CLEANING
				1. Clean and swab out underfloor raceways, inserts, and junction boxes after finish has been applied to floor slab, and remove foreign material, dirt, and moisture. Leave interiors clean and dry.

END OF SECTION 260539