SECTION 095423 - LINEAR METAL CEILINGS

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

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

1. GENERAL
   * + 1. SUMMARY
          1. Section Includes:

Linear metal ceilings.

* + - 1. COORDINATION
         1. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
      2. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at Project site.

If needed, insert list of conference participants.

<**Insert participant requirements**>.

* + - 1. SUBMITTALS
         1. General: 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.
         5. Sustainable Design Submittals:
         6. Shop Drawings: For linear metal ceilings.

Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:

Linear ceiling patterns and joints.

Ceiling suspension members.

Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.

Ceiling perimeter and penetrations through ceiling; trim and moldings.

Retain "Samples" paragraph below for single-stage Samples, with a subordinate list if applicable. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples.

* + - * 1. Samples: For each exposed product and for each type, color, and finish specified, 12 inches long in size.
        2. Samples for Initial Selection: For units with factory-applied colors and finishes.

Include Samples of accessories involving color and finish selections.

* + - * 1. Samples for Verification: For the following products:

Linear Metal Pans: 12 inches long by full-width Samples of each type, color, and finish and a 12-inch- long spliced section.

Suspension-System Members: 12-inch- long Sample of each type.

Exposed Molding and Trim: 12-inch- long Samples of each type, color, and finish.

Filler Strips: 12-inch- long Samples of each type, color, and finish.

Sound Absorbers: 12 inches long by full width.

End Caps: Full size.

Retain "Delegated Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Delegated Design Submittal: For design of[**seismic restraints and**] attachment devices.

Coordinate "Qualification Data" paragraph below with "Quality Assurance" Article.

* + - * 1. Qualification Data: For testing agency.
        2. Product Test Reports: For each linear metal ceiling, for tests performed by a qualified testing agency.

Retain "Evaluation Reports" paragraph below if required for specific products by authorities having jurisdiction. The ICC Evaluation Service publishes ICC-ES AC368 for suspended ceiling framing systems.

Design Consultant to review code references and verify that the referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

* + - * 1. Evaluation Reports: For linear-metal-ceiling framing systems.

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

Retain the paragraph below only when fastening to concrete decks.

* + - * 1. Field quality-control reports.
      1. CLOSEOUT SUBMITTALS
         1. Maintenance Data: For finishes to include in maintenance manuals.
      2. 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.

Revise "Linear-Metal-Ceiling Components" subparagraph below to suit Project. If preferred, replace percentage with a specific number of metal pans and pieces of each component and their lengths.

Linear-Metal-Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

* + - 1. QUALITY ASSURANCE

Retain "Testing Agency Qualifications" paragraph below if Contractor or manufacturer selects testing agency or if Contractor is required to provide services of a qualified testing agency in "Field Quality Control" Article.

* + - * 1. Testing Agency Qualifications: Accredited by National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.
        2. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

Indicate portions of linear metal ceilings represented by mockups on Drawings or draw mockups as separate element.

Build mockup of each type of linear metal ceiling as shown on Drawings.

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

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

* + - 1. DELIVERY, STORAGE, AND HANDLING
         1. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
         2. Handle ceiling components and accessories in a manner that prevents damage.
      2. PROJECT CONDITIONS

Retain this article for interior installations in conditioned spaces; delete if only exterior installations are specified. Revise to suit Project.

* + - * 1. Environmental Limitations: Do not install interior ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS

Retain "Delegated Design" paragraph below if Contractor is required to assume responsibility for designing ceiling support.

* + - * 1. Delegated Design: Engage a qualified professional engineer, licensed in the State of New York, to design [**seismic restraints and**]attachment devices.

If retaining "Structural Performance" and "Thermal Movements" paragraphs below, verify the suitability of exterior ceiling installations with manufacturers, perform engineering analysis or delegate the responsibility to a qualified professional engineer, and evaluate product materials and finishes.

* + - * 1. Structural Performance: Exterior linear metal ceilings shall withstand exterior exposure, the effects of gravity loads, and the following loads and stresses without showing permanent deformation of ceiling system components, including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling pans; or permanent damage to fasteners and anchors:

Typically, indicate specific wind loads determined by Project's structural engineer on Drawings. Model building codes set criteria for building components and claddings subject to wind loads. Verify requirements of authorities having jurisdiction.

Wind Load: Uniform pressure [**indicated on Drawings**], acting inward or outward.

* + - * 1. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

Differential values in "Temperature Change" subparagraph below (for aluminum in particular) are suitable for most of the United States.

Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

Retain one option in "Seismic Criteria" paragraph below or revise to suit Project. Verify requirements of authorities having jurisdiction.

* + - * 1. Seismic Criteria: Provide linear metal ceilings designed and installed to withstand the effects of earthquake motions in accordance with ASCE/SEI 7 and requirements of authorities having jurisdiction.
      1. LINEAR METAL CEILING <**Insert drawing designation**>

Copy this article and re-edit for each linear-metal-ceiling product.

Insert drawing designation. Use these designations on Drawings to identify locations of each linear metal ceiling.

* + - * 1. Pans and Suspension System:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=13978) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[American Decorative Ceilings (ADC)](http://www.specagent.com/Lookup?uid=123457173873).

[Armstrong Ceiling & Wall Solutions](http://www.specagent.com/Lookup?uid=123457173885).

[Hunter Douglas Architectural Products, Inc](http://www.specagent.com/Lookup?uid=123457173876).

[Rockfon (Rockwool International)](http://www.specagent.com/Lookup?uid=123457173875).

[USG Corporation](http://www.specagent.com/Lookup?uid=123457173878).

Approved equivalent.

Retain one option in "Metal Pans" paragraph below. ASTM E1264 Type XIII units are aluminum or steel strip with mineral- or glass-fiber base backing available in Form 1, Perforated, and Form 2, Non-Perforated. Type XX units are "other types," including nonperforated unbacked units and perforated units backed with acoustical nonwoven material. Type XX units also include custom units made from metals other than aluminum, such as stainless steel.

* + - * 1. Metal Pans: Complying with ASTM E1264 for [**Type XIII**] [**Type XX**] and formed to snap on to carriers securely, without separate fasteners.

Surface-Burning Characteristics: For metal-pan assemblies, including backings, determined by testing in accordance with ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Coordinate values retained or inserted in "Flame-Spread Index" and "Smoke-Developed Index" subparagraphs below with required finishes. Most finishes have a flame-spread index of 25 and a smoke-developed index of 50, except wood-veneer finishes, which generally have a flame-spread index of 25 and a smoke-developed index of 55. See "Fire-Test-Response Characteristics" Article in the Evaluations.

Flame-Spread Index: [**25**] or less.

Smoke-Developed Index: [**50**] [**55**] or less.

Metal used for linear metal ceilings is predominately aluminum sheet; steel sheet is available from limited manufacturers and might be available from other manufacturers for custom orders. Stainless steel pans are available for custom orders from limited manufacturers. If requiring ASTM E1264 Type XX units, revise first four subparagraphs below to suit Project.

Metal: [**Aluminum sheet, ASTM B209, alloy and temper recommended by producer and finisher for type of use and finish indicated**] [**Electrolytic zinc-coated steel sheet, ASTM A879, 04Z coating; surface treatment as recommended by finish manufacturer for type of use and painted finish indicated**].

Form: [**Perforated**] [**Nonperforated**].

Retain "Perforation Pattern" subparagraph below if required.

Perforation Pattern: [**As indicated by manufacturers designation**].

Retain "Noise Reduction Coefficient (NRC) Rating" subparagraph below for perforated pans and coordinate with pattern indicated in "Perforation Pattern" subparagraph above and material indicated in "Backing" subparagraph below.

Noise Reduction Coefficient (NRC) Rating: Not less than [**0.70**] [**0.75**] [**0.85**] [**1.00**] when tested in accordance with ASTM C423.

Retain one option in "Backing" subparagraph below or revise to suit Project. ASTM E1264 Type XIII units have mineral or glass fiber backings; Type XX units can have other types of backings.

Backing: [**Manufacturer's standard to provide NRC rating indicated for perforation pattern indicated**] [**Nonwoven black fabric**] [**Nonwoven black fabric with 1-inch- thick glass fiber, 1 lb/cu. ft. density, enclosed in black polyethylene**] [**1-inch- thick glass fiber, 1 lb/cu. ft. density, enclosed in black polyethylene**].

Pan Thickness: Not less than [**0.020 inch**] [**0.025 inch**] [**0.028 inch**] [**0.040 inch**].

Pan Edge Detail: [**Beveled**] [**Square**] [**Round**] [**Manufacturer's standard**].

Pan Width: [**2-inch module width and 1-1/4-inch face width**] [**4-inch module width and 3-1/4-inch face width**] [**6-inch module width and 5-1/4-inch face width**] [**8-inch module width and 7-1/4-inch face width**] [**As indicated on Drawings**].

Pan Depth: [**5/8 inch**] [**3/4 inch**] [**1 inch**] [**1-1/2 inches**] [**As indicated on Drawings**].

Metal-Pan Finish: Protected on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping and as follows:

Finishes available for manufacturers vary. Retain "Aluminum Anodic Finish," "Color-Coated Finish," "Laminated-Film Finish," or "Wood-Veneer Finish" subparagraph below, or insert other finish requirements to suit Project. Coordinate finish requirements with metal sheet used for pans.

Aluminum Anodic Finish: [**Clear finish, AAMA 611, AMP 500 AA-M12C22A31, Class II, 0.010 mm or thicker**] [**Clear, mirror finish, AMP 500 AA-M21C12A212, 0.005 mm or thicker**].

Color-Coated Finish: Manufacturer's standard[**powder-coat**] baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

Color and Pattern: [**As selected by Director’s Representative from manufacturer's full range**] [**Match Director’s Representative's sample**] [**As indicated by manufacturer's product designation**].

Options in "Light Reflectance (LR) Coefficient" subparagraph below are based on various manufacturers values for white finishes. Revise to suit Project.

Light Reflectance (LR) Coefficient: Not less than [**0.61**] [**0.77**] [**0.81**] LR when tested in accordance with ASTM E1477.

Laminated-Film Finish: Provide [**manufacturer's standard**] [**vinyl**] [**PVC-free**] film permanently bonded to metal pan with adhesive.

Color and Pattern: [**As selected by Director’s Representative from manufacturer's full range**] [**Match Director’s Representative's sample**] [**As indicated by manufacturer's product designation**].

Wood-Veneer Finish: [**Match Director’s Representative's sample**] [**As indicated by manufacturer's product designation**] [**Wood veneer in species and finish selected by Director’s Representative from manufacturer's full range**]; permanently bonded to metal pan with adhesive.

Retain "Finish Bonding Adhesive" subparagraph below for laminated-film or wood-veneer finish.

Finish Bonding Adhesive: Manufacturer's standard that permanently bonds finish to aluminum.

* + - * 1. Pan Splices: Formed for snap fit into butt-cut pans, [**4 inches**] [**8 to 12 inches**] long.

Finish: [**Manufacturer's standard**] [**Matte black**] [**Matching pan**].

* + - * 1. End Caps: Manufacturer's standard material fabricated to fit and conceal exposed ends of pans.

Finish: [**Manufacturer's standard**] [**Matte black**] [**Matching pan**].

* + - * 1. Filler Strips: Manufacturer's standard, fabricated to close voids between pans.

Type: [**Recessed**] [**Flush**] [**Integral extension of pan profile**] [**Expansion, for use with expansion carriers**] [**Slotted, for air diffusion**].

Finish: [**Manufacturer's standard**] [**Matte black**] [**Matching pan**].

* + - * 1. Moldings and Trim: Manufacturer's standard for exposed members, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching linear metal pans or extruded plastic unless otherwise indicated.

For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

* + - * 1. Carrier Suspension System: Manufacturer's standard complying with requirements in ASTM C635 for applications indicated; complete with carriers, splice sections, stabilizing components, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

Retain one option in "Material" subparagraph below or revise to suit Project; coordinate with manufacturers' ceiling assemblies.

Material: [**ASTM A653, hot-dip galvanized, cold-rolled sheet steel, G60 coating designation**] [**ASTM A879, electrolytic zinc-coated, cold-rolled steel, 08Z coating designation**] [**ASTM B209 aluminum**].

Structural Classification: Heavy-duty system.

Verify availability of "Adaptable Carriers," "Flexible Radial Carriers," and "Expansion Carriers" subparagraphs below with manufacturers.

Retain "Adaptable Carriers" subparagraph below if required for an existing suspension system.

Adaptable Carriers: Manufacturer's standard carriers for direct attachment to existing suspended tees.

Retain "Flexible Radial Carriers" subparagraph below for radiused applications.

Flexible Radial Carriers: Manufacturer's standard radial carriers.

Retain "Expansion Carriers" subparagraph below if ceiling size is not dimensioned in standard nominal increments of 4 inches.

Expansion Carriers: Manufacturer's standard carriers allowing for irregularities or other unusual space conditions.

Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers.

Carrier Splices: Same metal, profile, and finish as for carriers.

Retain "Hold-Down Clips" subparagraph below for exterior installations if needed to comply with uplift requirements for wind load. Coordinate with other requirements of manufacturer.

Hold-Down Clips: Manufacturer's standard hold-down clips spaced as standard with manufacturer.

Carrier Finish: Flat black.

* + - 1. CARRIER-SYSTEM HANGERS, BRACES, AND TIES
         1. Attachment Devices: Size for 5 times the design load indicated in ASTM C635, Table 1, Direct Hung, unless otherwise indicated.

"Cast-in-Place and Postinstalled Anchors in Concrete" subparagraph below does not apply to power-actuated fasteners. Retain if this type of anchorage to concrete is required. Verify safety factor with Project's Structural Engineer. Revise testing methods below if required by authorities having jurisdiction.

Cast-in-Place and Postinstalled Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction as determined by testing in accordance with ASTM E488 or ASTM E1512, as applicable, conducted by a qualified testing and inspecting agency.

Retain one option in "Type" subparagraph below; verify suitability with Project's structural engineer.

Type: [**Cast-in-place**] [**Postinstalled expansion**] [**Postinstalled bonded**] anchors.

Corrosion Protection:

Retain one of first three subparagraphs below or, if more than one is required, indicate location of each on Drawings. Zinc plating of class indicated protects against corrosion from an indoor atmosphere subject to rare condensation and minimum wear or abrasion; revise thickness to suit more corrosive conditions, or retain requirements for stainless steel or nickel-copper alloy, depending on conditions. If postinstalled expansion anchors are used to attach nickel-copper-alloy wire hangers and braces, consider retaining nickel-copper anchors after verifying availability with manufacturers.

Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).

Stainless steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchors.

Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.

Retain "Power-Actuated Fasteners in Concrete" subparagraph below if allowed. Verify safety factor with Project's Structural Engineer.

Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction as determined by testing in accordance with ASTM E1190 conducted by a qualified testing and inspecting agency.

* + - * 1. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:

Retain "Zinc-Coated, Carbon-Steel Wire," "Stainless Steel Wire," or "Nickel-Copper-Alloy Wire" subparagraph below unless more than one type of wire is required. If more than one type of wire is required, indicate location of each on Drawings. See the Evaluations for discussion on corrosion resistance of hangers and fasteners. Revise hangers to strap type if required by authorities having jurisdiction or by local union regulations.

Zinc-Coated, Carbon-Steel Wire: ASTM A641, Class 1 zinc coating, soft temper.

Stainless Steel Wire: ASTM A580, Type 304, nonmagnetic.

Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.

Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C635, Table 1, Direct Hung is less than yield stress of wire, but provides not less than 0.106-inch- diameter wire.

If retaining "Hanger Rods" or "Flat Hangers" paragraphs below, insert sizes here or indicate on Drawings.

* + - * 1. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
        2. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

If retaining "Angle Hangers" paragraph below, insert specific sizes here or indicate on Drawings.

* + - * 1. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed from 0.04-inch (20 ga) - thick, galvanized-steel sheet complying with ASTM A653, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

Retain "Seismic Struts" paragraph below if required. Coordinate with manufacturer's requirements and authorities having jurisdiction. Insert descriptions of manufacturers' other, proprietary attachment accessories if required.

* + - * 1. Seismic Struts: Suspension-system manufacturer's standard compression struts designed to accommodate seismic forces.

Retain "Exterior Bracing" paragraph below for exterior installations to comply with lateral bracing requirements for wind load. Coordinate with other requirements of manufacturer.

* + - * 1. Exterior Bracing: Cold-rolled steel channels and angles, hot-dip galvanized to comply with ASTM A653, G60 coating designation; size and profile as required to withstand wind load.
      1. ACCESSORIES
         1. Access Panels: For access at locations indicated, provide door hinge assembly, retainer clip, and retainer bar, assembled with ceiling panels and carrier sections into access doors permitting upward or downward opening.

Size: [**As indicated on Drawings**] [**24 inches square**].

* + - * 1. Air-Distribution Devices: Where indicated on Drawings, provide independently suspended air-distribution devices that are relocatable and adjustable from below finished ceiling, that do not interrupt ceiling components, and that are fully concealed by and integrated with ceiling system.
        2. Miscellaneous Fasteners: Bolts, screws, and other fasteners recommended by suspension system manufacturer and necessary to install the Work.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.
          2. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. PREPARATION
          1. Measure each ceiling area and establish layout of linear metal pans.

Balance border widths at opposite edges of each ceiling.

Avoid using less-than-half-width pans at borders.

* + - 1. INSTALLATION
         1. Comply with ASTM C636 and seismic requirement indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
         2. Suspend ceiling hangers from building's structural members and as follows:

Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

Retain one of first two subparagraphs below unless both types of hangers are required and their locations are indicated on Drawings or by inserts.

Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns in 3 inches. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.

Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that does not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

Retain subparagraphs below that are applicable to construction.

Retain option in first subparagraph below if power-actuated fasteners are allowed.

Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts[**, power-actuated fasteners,**] or postinstalled mechanical or adhesive anchors that extend through forms into concrete.

When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

Do not attach hangers to steel deck tabs.

Retain first subparagraph below unless attaching to the roof deck is permitted by the structural engineer and authorities having jurisdiction. Revise if structural members are spaced too far apart for hangers and another method is required. For alternatives that may need to be detailed on Drawings, consult structural engineer and see CISCA's guidelines.

Do not attach hangers to steel roof deck. Attach hangers to structural members.

Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

* + - * 1. Install edge moldings and trim at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal pans.

Screw attach moldings to substrate at intervals of not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

Retain subparagraph below if exposed fasteners are not allowed; revise to suit Project.

Do not use exposed fasteners, including pop rivets, on moldings and trim.

* + - * 1. Install suspension-system carriers so they are aligned and securely interlocked with one another.

Install stabilizer channels, tees, and bars at regular intervals to stabilize carriers and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated.

Remove and replace dented, bent, or kinked members.

* + - * 1. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness.
        2. Install linear metal pans in coordination with suspension system and exposed moldings and trim.

Revise first subparagraph below if joints are not parallel to room axis.

Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated on Drawings.

Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.

Install pans with butt joints [**aligned**] [**aligned, every other pan length**] [**staggered a minimum of 12 inches**] [**randomly aligned**] [**aligned as indicated on Drawings**] using internal pan splices.

Retain first subparagraph below if applicable. Indicate locations of directionally textured or patterned metal pans and trim on Drawings.

Install directionally textured or patterned metal pans in directions indicated.

Where metal pan ends are visible, install end caps unless trim is indicated.

Retain first subparagraph below if applicable.

Install filler strips where indicated [**on Drawings**] <**Insert requirements**>.

Usually retain subparagraph below if specifying perforated patterns.

Install sound-absorbent pads at right angle to perforated metal pans so pads do not hang unsupported.

* + - * 1. Install hold-down clips where indicated.
      1. FIELD QUALITY CONTROL

Retain this article if applicable. ASCE/SEI 7 requires special inspections for suspended ceiling systems in Seismic Design Categories D, E, and F; verify requirements of authorities having jurisdiction.

Retain first option in "Special Instructions" paragraph below if Director’s Representative engages special inspector. Consider retaining second option if authorities having jurisdiction allow Contractor to engage special inspector. If retaining second option, retain "Field quality-control reports" paragraph in "Informational Submittals" Article.

* + - * 1. Special Inspections: Director’s Representative will engage a qualified special inspector to perform the following special inspections:

Suspended ceiling system.

Hangers, anchors, and fasteners.

Retain the remaining four paragraphs only when fastening to concrete decks.

Retain "Testing Agency" paragraph below, with or without "Special Inspections" paragraph above, to identify who shall perform tests and inspections. If retaining second option in "Testing Agency" paragraph, retain "Field quality-control reports" paragraph in "Informational Submittals" Article.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Testing requirements in "Tests and Inspections" paragraph below are examples and apply only to ceilings with hangers attached to concrete by power-actuated fasteners and postinstalled anchors. Retain or revise to suit Project and requirements of authorities having jurisdiction.

* + - * 1. Tests and Inspections: Testing and inspecting of completed installations of linear metal ceiling hangers, anchors, and fasteners shall take place in successive stages, in test areas and using methods as follows. Do not proceed with installations of linear metal ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.

Test Areas: Test installation of ceiling suspension systems on each floor when installation has reached 20 percent completion but before pans have been installed.

Verify loads in two subparagraphs below, which are based on Division of the State Architect in California's "Interpretation of Regulation IR 25-2.13," with Structural Engineer based on ceiling loads and seismic zone in which Project is located. CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4" requires hanger-wire-attachment devices to be "capable of supporting 100 lbf."

Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.

When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

* + - * 1. Linear metal ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
        2. Prepare test and inspection reports.
      1. CLEANING
         1. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings, after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 095423