

SECTION 09 54 23 - LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linear metal ceilings.

B. Related Requirements:

1. Refer to Division 01 Sections for requirements regarding:
 - a. LEED credit achievement goals as summarized by the LEED Scorecard attached to Section 01 81 13 "Sustainable Design Requirements."
 - b. Requirements for documentation of LEED credits.
 - c. Payment application requirements as they relate to LEED documentation requirements.
2. Section 09 51 13 "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.

C. Products furnished, but not installed, under this Section include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include procedure for cutting linear metal ceilings.

B. Sustainable Design Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Section 01 81 13 "Sustainable Design Requirements."
2. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
3. Product Data: For adhesives and sealants, indicating VOC content.
4. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.
6. Environmental Product Declaration: For each product.

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7. Health Product Declaration: For each product.
 8. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
- C. Shop Drawings: For linear metal ceilings.
1. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:
 - a. Linear ceiling patterns and joints.
 - b. Ceiling suspension members.
 - c. 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.
 - d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - e. Ceiling perimeter and penetrations through ceiling; trim and moldings.
- D. Samples for Verification: For the following products:
1. Linear Metal Pans: 12 inches long by full-width Samples of each type, color, and finish and a 12-inch- long spliced section.
 2. Exposed Suspension-System Members: 12-inch- long Sample of each type.
 3. Exposed Molding and Trim: 12-inch- long Samples of each type, color, and finish.
 4. End Caps: Full size.
- E. Delegated Design Submittal: For design of seismic restraints and attachment devices.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each linear metal ceiling, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For linear-metal-ceiling framing systems.
- D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

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1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Linear-Metal-Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by National Voluntary Laboratory Accreditation Program for testing indicated.
- B. Ceiling products shall comply with the requirements of the California Department of Public Health's (CDPH) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers", Standard Method v1.2-2017."
- C. Preinstallation Conference: Conduct conference at Project site.
- D. Sample Installations: Before installing linear metal ceilings, install sample installations, for each type of linear metal ceiling installation required to demonstrate aesthetic effects and qualities of materials and execution. The sample installation shall be complete in every way and include all attachments to structure, suspension system, metal linear ceiling panels, moldings, and trim. Install sample installations to comply with the following requirements, using materials indicated for the completed Work.
 - 1. Size and Location: Provide 250 square foot sample installations in locations as directed by Architect.
 - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 3. Obtain Architect's approval of sample installations before starting work.
 - 4. Maintain sample installations during construction in an undisturbed condition as a standard for judging the completed Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. Handle ceiling components and accessories in a manner that prevents damage.

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1.8 PROJECT CONDITIONS

- A. 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.

1.9 COORDINATION

- A. 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.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard from in which manufacturer and Installer agrees to repair or replace components of linear metal ceiling system that fails in materials or workmanship with specified period.

1. Warranty Period: Two years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements" to design seismic restraints and attachment devices.
- B. Seismic Performance: Acoustical metal pan ceilings shall withstand the effects of earthquake motions determined according to IBC and ASCE/SEI 7 for the geographic location of the site.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 LINEAR METAL CEILING

- A. Pans and Suspension System:

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1. Manufacturers: Subject to compliance with requirements, provide products as indicated on Drawings, or comparable products, acceptable to the Architect, by one of the following :
 - a. American Decorative Ceilings (ADC).
 - b. Armstrong Ceiling & Wall Solutions.
 - c. Hunter Douglas Architectural Products, Inc.
 - d. Rockfon (Rockwool International).
 - e. USG Corporation.

- B. Metal Pans: Complying with ASTM E 1264 for Type XIII or Type XX and formed to snap on to carriers securely, without separate fasteners.
 1. Surface-Burning Characteristics: For metal-pan assemblies, including backings, determined by testing in accordance with ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 55 or less.
 2. Metal: Electrolytic zinc-coated steel sheet, ASTM A 879/A 879M, 04Z coating; surface treatment as recommended by finish manufacturer for type of use and painted finish indicated.
 3. Form: Nonperforated or perforated, and of perforation pattern indicated on Drawings.
 4. Noise Reduction Coefficient (NRC) Rating: Not less than 0.70 when tested in accordance with ASTM C 423.
 5. Backing: Manufacturer's standard to provide NRC rating indicated for perforation pattern indicated.
 6. Pan Thickness: Not less than 0.028 inch.
 7. Pan Edge Detail: Manufacturer's standard.
 8. Pan Width: As indicated on Drawings.
 9. Pan Depth: As indicated on Drawings.
 10. Metal-Pan Finish: Protected on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping and as follows:
 - a. 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.
 - 1) Color and Pattern: As indicated on Drawings.

- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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- D. Pan Splices: Formed for snap fit into butt-cut pans, 8 to 12 inches long with matching pan finish.
- E. End Caps: Manufacturer's standard material fabricated to fit and conceal exposed ends of pans with matching pan finish.
- F. Filler Strips: Manufacturer's standard, fabricated to close voids between pans.
- G. 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.
 - 1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.3 CARRIER-SYSTEM HANGERS, BRACES, AND TIES

- A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C 635/C 635M requirements.
- B. Suspension Systems: Provide systems complete with carriers, splice sections, 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.
- C. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.
 - 1. 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 E 488/E 488M or ASTM E 1512, as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection:
 - 1) Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).

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2. **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 E 1190 conducted by a qualified testing and inspecting agency.
- D. **Wire Hangers, Braces, and Ties:** Provide wire complying with the following requirements:
1. **Zinc-Coated, Carbon-Steel Wire:** ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. **Size:** Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C 635/C 635M, Table 1, Direct Hung is less than yield stress of wire, but provides not less than 0.135-inch- diameter wire.
- E. **Hanger Rods:** Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. **Flat Hangers:** Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. **Angle Hangers:** Angles with legs not less than 7/8 inch wide; formed from 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- H. **Seismic Struts:** Suspension-system manufacturer's standard compression struts designed to accommodate seismic forces.
- I. **Hold-Down Clips:** Manufacturer's standard hold-down clips spaced as standard with manufacturer.
- J. **Edge Moldings and Trim:** Provide exposed members as indicated or required to comply with seismic requirements of authorities having jurisdiction, 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.
1. **For Circular Penetrations of Ceiling:** Fabricate edge moldings to diameter required to fit penetration exactly.

2.4 ACCESSORIES

- A. **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.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of linear metal pans.
 - 1. Balance border widths at opposite edges of each ceiling.
 - 2. Avoid using less-than-half-width pans at borders.

3.3 INSTALLATION

- A. Comply with ASTM C 636/C 636M and seismic requirement indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. 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.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. 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.
 - 4. 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.
 - 5. 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.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.

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8. 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.
 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal pans.
1. 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.
 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system carriers so they are aligned and securely interlocked with one another.
1. 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.
 2. Remove and replace dented, bent, or kinked members.
- E. 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.
- F. Install linear metal pans in coordination with suspension system and exposed moldings and trim.
1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated on Drawings.
 2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
 - a. Install pans with butt joints aligned using internal pan splices.
 3. Install directionally textured or patterned metal pans in directions indicated.
 4. Where metal pan ends are visible, install end caps unless trim is indicated.
 5. Install filler strips where indicated on Drawings.
 6. Install sound-absorbent pads at right angle to perforated metal pans so pads do not hang unsupported.
- G. Install hold-down clips where indicated.

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3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. 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.
 - 1. Test Areas: Test installation of ceiling suspension systems on each floor when installation has reached 20 percent completion but before pans have been installed.
 - a. 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.
 - b. 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.
- C. Linear metal ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 CLEANING

- A. 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 09 54 23