

**SECTION 09 54 23
LINEAR METAL CEILINGS**

PART 1 - GENERAL**1.1 DESCRIPTION****A. Section Includes:**

1. Suspended metal grid ceiling system including trim.
2. Decorative, linear, formed metal ceiling panels, mechanically mounted on a ceiling suspension system.
3. Accessories:
 - a. Closures, trim, edge molding and all other items required to provide complete installation.

B. Unit size, texture, finish, and color as specified.

C. Location and extent of acoustical treatment as shown.

1.2 RELATED WORK

A. Batt, Blanket and Sound Isolation Insulation: Section 07 21 13, THERMAL INSULATION.

B. Acoustical Ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.

C. Sprinkler System: Section 21 10 00, WATER-BASED FIRE-SUPPRESSION SYSTEMS.

D. Air Outlets and Inlets: Division 22, PLUMBING.

E. Interior Lighting: Section 26 51 00, INTERIOR LIGHTING.

1.3 QUALITY CONTROL**A. Qualifications:**

1. Approval required of products or service of proposed manufacturer, suppliers and installers, and shall be based upon submission by Contractor of certification that:
 - a. Manufacturer regularly and presently, manufactures and installs linear metal ceiling systems and related accessories as one of its principal products and has a record of successful in-service performance.
 - b. Accessories required for linear metal ceiling systems shall be manufacturer's standard or other systems compatible with linear metal ceiling system manufacturer's material. Items shall be of materials and construction which shall provide desired functional service.
2. Installer: Approved in writing by manufacturer.

B. Coordination of Work: Coordinate layout and installation of linear metal ceiling units and suspension system components with other work

supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any):

1. Sprinkler heads and light fixtures: Shall typically penetrate center of a panel width.
2. HVAC Air Outlets and Inlets: Shall be planned to occur within center of panel systems or provide for equal distance on each side parallel to length of panels

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Product Data:
 1. Manufacturer's standard details and fabrication methods.
 2. Data on finishing, hardware, components, and accessories.
 3. Recommendations for maintenance and cleaning of finish surfaces.
- C. Shop Drawings:
 1. Submit complete composite fabrication, and installation shop drawings including associated components.
 2. Identify panel sections, baffles, edge trim, lighting trim, air diffuser sections and trim, sprinkler head locations and trim, other component parts, not included in manufacturer's product data, by name and material and showing design, construction, installation, and anchorage.
 3. Layout and installation details, including relation to adjacent work such as walls and bulkheads.
 4. Composite reflected ceiling plans, at 1:50 (1/4 inch) scale, showing location of all accessories, mechanical and electrical components. Indicate following:
 - a. Joint pattern.
 - b. Ceiling suspension members.
 - c. Method of attaching hangers to building structure.
 - d. Ceiling-mounted items including light fixtures, air outlets and inlets, speakers, sprinkler heads, and access panels. Special moldings at walls, column penetrations, and other junctures with adjoining construction.
 5. Detail sections of typical composite members, at wall surfaces, mechanical diffusers and grilles, sprinkler heads, and light fixtures.

6. Provisions for expansion and contraction.

7. Anchors and reinforcements.

D. Samples:

1. Submit pairs of samples of each specified color and finish on 300 mm (12 inch) long sections of extrusions or formed shapes for following:

- a. Linear metal panel.
- b. Each exposed molding and trim sections.
- c. Suspension system members.
- d. Filler strips.
- e. Insulation.
- f. End cap.

2. Where normal color variations are anticipated, include 2 units in set indicating extreme limits of color variations.

3. Integrally Colored Anodized or Prefinished Aluminum:

- a. Sheet not less than 200 mm by 250 mm (eight inches by ten inches).

E. Certificates:

- 1. Stating that linear metal ceiling system material has been given specified thickness of anodizing or organic coating finish.
- 2. Indicating manufacturer's and installer's meet qualifications as specified.
- 3. Submit list of equivalent size installations which have had satisfactory operation.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Materials: Deliver to site in manufacturer's original unopened containers with brand name and type clearly marked.
- B. Materials: Carefully handle and store in dry, watertight enclosures.
- C. Immediately before installation, linear metal ceiling units shall be stored for not less than 48 hours at same temperature and relative humidity as space where they will be installed to assure temperature and moisture conditions in accordance with manufacturer's recommendations.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referred to in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):

2605-11.....High Performance Organic Coatings on
Architectural Extrusions and Panels.

C. American Society for Testing and Materials (ASTM):

A641/641M-09.....Zinc-coated (Galvanized) Carbon Steel Wire.

A653/A653M-10.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-
Iron Alloy-Coated (Galvannealed) by Hot-Dip
Process.

B209/B209M-07.....Aluminum and Aluminum-Alloy Sheet and Plate.

C635-07.....Manufacture, Performance, and Testing of Metal
Suspension Systems for Acoustical Tile and Lay-
In Panel Ceilings.

C636-08.....Installation of Metal Ceiling Suspension
Systems for Acoustical Tile and Lay-In Panels.

E90-09.....Laboratory Measurement of Airborne Sound
Transmission Loss of Building Partitions.

E580-10.....Application of Ceiling Suspension Systems for
Acoustical Tile and Lay-in Panels in Areas
Requiring Seismic Restraint.

D. National Association of Architectural Metal Manufacturers (NAAMM):
Metal Finishes Manual (2006)

1.7 ENVIRONMENTAL REQUIREMENTS

Uniform temperature of not less than 16 °C, (60 °F) nor more than 27 °C, (80 °F) and a relative humidity of not more than 70 percent shall be maintained for a period of 48 hours before, during, and for 48 hours after installation of linear metal ceiling units. After above period, room temperature shall not fall below 13 °C (55 °F).

1.8 SCHEDULING

Interior finish work such as plastering, gypsum board finishing, painting, concrete and terrazzo work shall be complete and dry before installation. Mechanical, electrical, and other work above ceiling line shall be completed and heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

1.9 WARRANTY

Submit written warranty, in accordance with FAR clause 52.246-21, Warranty of Construction requirements except that warranty period shall be extended to two (2) years.

PART 2 - PRODUCTS**2.1 MATERIALS****A. Linear Metal Ceiling System, General:**

1. Sheet Metal Characteristics: Form metal panels from sheet metal free from surface blemishes where exposed to view in finished unit. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, stains, discolorations, or other imperfections.
2. Fabrication: Die-form linear metal panels into units standard with manufacturer and finished as specified herein.
3. Sound-Absorptive Pads: Width and length to fill completely between carriers, joined at center of a panel, and to provide an STC rating of .90 in accordance with ASTM E90. Refer to Section 07 21 13, THERMAL INSULATION for acoustical insulation sound absorptive pad type and thickness to be used based on STC ratings.

B. Accessories: Stabilizer bars, clips, splices, hold down clips, as required for suspended grid system.**C. Linear Metal Panels:**

1. General: Formed to snap on and be securely retained on carriers without separate fasteners.
2. Aluminum Panels: ASTM B209/B209m, roll-formed sheet, alloy 3005-H26, complying with following requirements:
 - a. Minimum Nominal Thickness: 0.40 mm (0.020 inch)
3. Panel Performance: As follows:
 - a. Light Reflectance Coefficient: LR 0.75.
 - b. Noise Reduction Coefficient: NRC 0.75.

D. Suspension Systems, General:

1. Standard for Metal Suspension Systems: Provide manufacturer's standard types, structural classifications, and finishes indicated that comply with ASTM C635 requirements.
2. Anchors: Type as recommended by manufacturer. Size for five times design load indicated in ASTM C635, Table 1, Direct Hung, unless otherwise indicated.

E. Wire for Carriers, Hangers, and Ties: ASTM A641/A641m, Class 1, zinc coating, soft temper.

1. Gage: Minimum 12 gage. Shall support a minimum of 1330 N, (300 pounds ultimate vertical load without failure of supporting material or attachment.

- F. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.
- G. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint.
- H. Angle Hangers: Angles with legs not less than 22 mm (7/8 inch) wide, formed with 0.82 mm (0.0365 inch) galvanized steel sheet complying with ASTM A653/A653m, Coating Designation G90, with bolted connections and 7.6 mm (5/16 inch) diameter bolts.
- I. Edge Moldings and Trim: Manufacturer's standard molding for edges and penetrations of ceiling.
- J. Carriers: Comply with ASTM A653/A653m, cold-rolled, electro-galvanized, 0.375 mm (0.0209 inch) (25 gage) minimum nominal thickness steel.
- K. Miscellaneous Components and Materials:
 - 1. Access Doors: Refer to Section 08 31 13, ACCESS DOORS AND FRAMES for requirements. Access doors, required for use in linear metal ceiling system, shall match adjacent ceiling panel units and shall be designed and equipped with suitable framing and fastenings for removal and replacement without damage. Provide locking device for this type access door as used in general access doors.
- L. Access Identification: Refer to Section 09 91 00, PAINTING for requirements of identification markers for use, with various mechanical systems above ceiling, under this section.

2.2 FINISHES

- A. Comply with NAAMM "Metal Finishes Manual".
- B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent ceiling units not acceptable. Noticeable variations in same piece not acceptable.
- D. Aluminum Finishes:
 - 1. Lacquered Mill Finish: AA-M10C10R1X.
 - a. Organic Coating: Manufacturer's standard, clear, organic coating.
 - 2. Class II, Clear, Satin-Anodized Finish: AA-M32C12A212. Anodic Coating: protective and decorative, clear film; coating thickness: .0052 mm (0.2 mil minimum).

3. Class II, Clear, Mirror-Anodized Finish: AA-M21C12A212. Anodic Coating: protective and decorative, clear film; coating thickness: .0052 mm (0.2 mil minimum).
4. High-Performance, Organic Coating: Comply with AAMA 605.
5. Color and Gloss: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Ceiling Areas: Conform with details, dimensions and tolerances shown on approved linear metal ceiling system composite reflected ceiling plan shop drawings.
- B. Conditions which may adversely affect linear metal ceiling system installation shall be brought to Contractors attention, for repair, prior to commencement of linear metal ceiling system installation. Do not start ceiling installation until affected area has been repaired to Installer's satisfaction.
- C. Where linear metal ceiling system is installed adjacent to masonry, washdown of adjacent masonry shall be completed prior to erection of ceiling system to prevent damage to material finish by cleaning materials.

3.2 PREPARATION

Measure each ceiling area and establish layout of linear metal panel units to balance border widths at opposite edges of each ceiling. Avoid using units less than half wide at borders.

3.3 INSTALLATION

- A. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C636 and ASTM E580 as applicable to linear metal panel ceiling suspension system.
- B. Suspend ceiling hangers from building structural members and as follows:
 1. Install hangers plumb, free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers where required to avoid obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
 2. 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.
3. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail because of age, corrosion, and elevated temperatures.
 4. Space hangers not more than 1200 mm (48 inches) on center along each member supported directly from hangers, unless otherwise shown.
- C. Install edge moldings at edge of each linear metal ceiling area and at locations where edge of units would otherwise be exposed after completion of Work. Level moldings with ceiling suspension system to level tolerance of 3 mm (1/8 inch) in 3600 mm (12 feet).
1. Masonry and Concrete: Fasten with machine screws into lead-shield-type anchors drilled into construction.
 2. Hollow Masonry or Stud Construction: Fasten with toggle bolts or similar self-expanding screw anchors.
- D. Ceiling Access Doors:
1. Ceiling access doors shall be located directly under items which require access.
- E. Scribe and cut metal panel units 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 exceeding referenced standards for stretcher-leveled metal sheet.
- F. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise-shown.
- G. Install panels with butt joints using internal concealed panel splices and in joint configurations shown in reflected ceiling plan.
- H. Install acoustical insulation blankets at right angle to panels so that they do not hang unsupported.

3.4 CLEANING

Following installation, dirty or discolored surfaces of linear metal ceiling units shall be cleaned, in accordance with manufacturer's written recommendations, and left free from defects. Units that are

damaged or improperly installed shall be removed and new units provided as directed.

3.5 PROTECTION

Protect linear metal ceiling systems from damage until final inspection and acceptance.

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