

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Acoustical units.
 - 2. Metal ceiling suspension system for acoustical ceilings.
 - 3. Adhesive application.

1.2 RELATED REQUIREMENTS

- A. Adhesive VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color, pattern, and location of each type of acoustical unit: See drawing Materials Finish Legend.
- C. Ceiling Suspension System: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- D. Lay in gypsum board ceiling panels: Section 09 29 00, GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. A641/A641M-09a(2014) - Zinc-coated (Galvanized) Carbon Steel Wire.
 - 2. A653/A653M-15e1 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
 - 3. C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 4. C634-13 - Terminology Relating to Environmental Acoustics.
 - 5. C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 6. C636/C636M-13 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 7. D1779-98(2011) - Adhesive for Acoustical Materials.
 - 8. E84-15b - Surface Burning Characteristics of Building Materials.
 - 9. E119-16 - Fire Tests of Building Construction and Materials.
 - 10. E413-16 - Classification for Rating Sound Insulation.
 - 11. E1264-14 - Classification for Acoustical Ceiling Products.
- C. International Organization for Standardization (ISO):
 - 1. ISO 14644-1 - Classification of Air Cleanliness.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Ceiling suspension system indicating manufacturer recommendation for each application.
 - 3. Installation instructions.
 - 4. Warranty.
- D. Samples:
 - 1. Acoustical units, 150 mm (6 inches) in size, each type.
 - a. Submit quantity required to show full color and texture range.
 - 2. Suspension system, trim and molding, 300 mm (12 inches) long.
 - 3. Colored markers for access service.
 - 4. Approved samples may be incorporated into work.
- E. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 - 2. Biobased Content:
 - a. Show type and quantity for each product.
 - b. Show volatile organic compound types and quantities.
- F. Certificates: Certify each product complies with specifications.
 - 1. Acoustical units, each type.
- G. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer.
- H. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.

- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 - 2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
 - 3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Ceiling System: Acoustical ceilings units on concealed grid suspension systems.

2.2 SYSTEM PERFORMANCE

- A. Design product complying with specified performance:
 - 1. Maximum Deflection: 1/360 of span, maximum.
- B. Fire Resistance: ASTM E119; as component of 1 hour rated floor-ceiling assembly.
- C. Surface Burning Characteristics: When tested according to ASTM E84.
 - 1. Flame Spread Rating: 25 maximum.
 - 2. Smoke Developed Rating: 450 maximum.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: See drawing Materials Finish Legend or equal.

BRAND NAME OR EQUAL PRODUCTS

In accordance with VAAR 811.104-71 (b), based on the inclusion of VAAR 811.104-71, Brand Name or Equal, bidders proposing to furnish an "equal product other than referenced in the solicitation, shall insert the following description for each equal product (See also VAAR 852.211-73 (c)(1) and (c)(2)).

Bidding on:

Manufacturer's Name: _____

Brand: _____

No.: _____

- B. Provide acoustical units from one manufacturer.
 - 1. Provide each product exposed to view from one production run.
- C. Provide suspension system from same manufacturer.
- D. Sustainable Construction Requirements:
 - 1. Mineral Base Recycled Content: Select products with recycled content to achieve overall Project recycled content requirement.
 - 2. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 3. Aluminum Recycled Content: 50 percent total recycled content, minimum.
 - 4. Biobased Content: 37 percent by weight biobased material, minimum.
 - 5. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.

2.4 ACOUSTICAL UNITS

- A. General:
 - 1. Ceiling Panel and Tile: ASTM E1264, bio-based content according to USDA Bio-Preferred Product requirements.
 - a. Mineral Fiber: 3.6 kg/sq. m (3/4 psf) weight, minimum.
 - 2. Classification: Provide type and form as follows:
 - a. Type III Units - Mineral base with water-based painted finish maximum 10 g/l VOC; Form 2 - Water felted, minimum 16 mm (5/8 inch) thick.

- b. Type IV Units - Mineral base with membrane-faced overlay, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Apply poly (vinyl) chloride over paint coat.
- c. Type V Units - Perforated steel facing (pan) with mineral or glass fiber base backing.
 - 1) Steel: Galvanized steel, ASTM A653, with G30 coating. minimum 0.38 mm (0.015 inch) thick.
 - 2) Bonderize both sides. Apply two coats of baked-on enamel finish on surfaces exposed to view and one coat on concealed surfaces.
- d. Type VI Units - Perforated stainless steel facing (pan) with mineral or glass fiber base backing.
- e. Type VII Units - Perforated aluminum facing (pan) with mineral or glass fiber base backing.
 - 1) Aluminum sheets, minimum 0.635 mm (0.025 inch) thick.
 - 2) Apply two coats of baked-on enamel finish, free from gloss or sheen, on face and flanges.
- f. NRC (Noise Reduction Coefficient): ASTM C423, minimum 0.55.
- g. CAC (Ceiling Attenuation Class): ASTM E413, 40-44 range.
- h. LR (Light Reflectance): Minimum 0.75.
- 3. Lay-in panels: Sizes as indicated on Drawings, with reveal edges.
 - a. Sizes:
 - 1) Concealed Grid Upward Access System: 300 by 600 mm (12 by 24 inch).
 - 2) Cross Score: 300 by 600 mm (12 by 24 inch) tile to simulate 300 by 300 mm (12 by 12 inch) tile edges.
 - 3) Edge and Joint Detail: Beveled edges and joints as required to suit suspension and access system.
- 4. Perforated Metal Facing (Pan):
 - a. Tiles Size: Optional 300 by 300 (12 by 12), 300 by 600 (12 by 24), 300 by 900 (12 by 36), and 300 by 1200 mm (12 by 48 inches).
 - 1) Cross Score Units: Larger than 300 by 300 mm (12 by 12 inches) to simulate 300 by 300 mm (12 by 12 inch) units.
 - 2) Edge and Joint Detail: Beveled edge, joints for snap-in attachment to suspension system.
 - b. Panels: Sizes as indicated on Drawings with recessed reveal edges.

- c. Sound Absorbent Element: Non-sifting mineral wool or glass fiber (formaldehyde-free). Density and thickness to provide specified noise reduction coefficient. Enclose sound absorbent elements within plastic envelopes.
 - d. Support sound absorbent elements on wire spacer nominal 6 mm (1/4 inch) high. Fit sound absorbent element and the spacer into the unit.
5. Adhesive Applied Tile:
- a. Size: 300 by 300 mm (12 by 12 inch) size.
 - b. Edges: Beveled.

2.5 METAL SUSPENSION SYSTEM

- A. General: ASTM C635, heavy-duty system, except as otherwise specified.
 - 1. Suspension System: Provide the following:
 - a. Galvanized cold-rolled steel, bonderized.
 - b. Extruded aluminum.
 - c. Fire resistant plastic (glass fiber).
 - 2. Main and Cross Runner: Use same construction Do not use lighter-duty sections for cross runners.
- B. Exposed Grid Suspension System: Support of lay-in panels.
 - 1. Grid Width: 22 mm (7/8 inch) minimum with 8 mm (5/16 inch) minimum panel bearing surface.
 - 2. Molding: Fabricate from the same material with same exposed width and finish.
 - 3. Finish: Baked-on enamel flat texture finish.
 - a. Color: See drawing Materials Finish Legend.
- C. Concealed Grid Suspension System: Mineral base acoustical tile support.
 - 1. Concealed grid upward access suspension system initial opening, 300 mm by 600 mm (12 by 24 inches).
 - 2. Flange Width: 22 mm (7/8 inch) minimum except:
 - a. Access Hook and Angle: 11 mm (7/16 inch) minimum.
- D. Suspension System Support of Metal Type V, VI, and VII Tiles: Concealed grid type with runners for snap-in attachment of metal tile (pans).
- E. Carrying Channels Secondary Framing: Cold-rolled or hot-rolled steel, black asphaltic paint finish, rust free.
 - 1. Weight per 300 m (per thousand linear feet), minimum:

Size	Cold-rolled	Hot-rolled
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mm	inches	kg	pound	kg	pound
38	1-1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

F. Anchors and Inserts: Provide anchors or inserts to support twice the loads imposed by hangers.

1. Hanger Inserts: Steel, zinc-coated (galvanized after fabrication).

a. Nailing type option for wood forms:

- 1) Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
- 2) Lower portion provided with minimum 8 mm (5/16 inch) hole to permit attachment of hangers.

b. Flush ceiling insert type:

- 1) Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
- 2) Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
- 3) Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.

G. Clips: Galvanized steel, designed to secure framing member in place.

H. Tile Splines: ASTM C635.

I. Wire: ASTM A641.

1. Size:

- a. Wire Hangers: Minimum diameter 2.68 mm (0.1055 inch).
- b. Bracing Wires: Minimum diameter 3.43 mm (0.1350 inch).

2.6 ACCESSORIES

A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

B. Perimeter Seal: Vinyl, polyethylene or polyurethane open cell sponge material, density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.

1. Thickness: As required to fill voids between back of wall molding and finish wall.

2. Size: Minimum 9 mm (3/8 inch) wide strip.

C. Access Identification Markers: Colored markers with pressure sensitive adhesive on one side, paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) diameter.

1. Color Code: Provide the following color markers for service identification:

Color	Service
Red	Sprinkler System: Valves and Controls
Green	Domestic Water: Valves and Controls
Yellow	Chilled Water and Heating Water
Orange	Ductwork: Fire Dampers
Blue	Ductwork: Dampers and Controls
Black	Gas: Laboratory, Medical, Air and Vacuum

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 ACOUSTICAL UNIT INSTALLATION

- A. Applications:
 1. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Layout acoustical unit symmetrically, with minimum number of joints.
- C. Installation:
 1. Install acoustic tiles after wet finishes have been installed and solvents have cured.
 2. Install lay-in acoustic panels in exposed grid with minimum 6 mm (1/4 inch) bearing at edges on supports.
 - a. Install tile to lay level and in full contact with exposed grid.
 - b. Replace cracked, broken, stained, dirty, or tile.
 3. Tile in concealed grid upward access suspension system:

- a. Install acoustical tile with joints close, straight and true to line, and with exposed surfaces level and flush at joints.
 - b. Make corners and arises full, and without worn or broken places.
 - c. Locate acoustical units providing access to service systems.
- 4. Adhesive applied tile:
 - a. Condition of surface according to ASTM D1779, Note 1, Cleanliness of Surface, and Note 4, Rigidity of Base Surface.
 - b. Size or seal surface as recommended by manufacturer of adhesive and allow to dry before installing units.
- 5. Markers:
 - a. Install color coded markers to identify the various concealed piping, mechanical, and plumbing systems.
 - b. Attach colored markers to exposed grid on opposite sides of the units providing access.
 - c. Attach marker on exposed ceiling surface of upward access acoustical unit.
- D. Touch up damaged factory finishes.
 - 1. Repair painted surfaces with touch up primer.

3.4 CEILING SUSPENSION SYSTEM INSTALLATION

- A. General: Install according to ASTM C636.
 - 1. Use direct or indirect hung suspension system or combination of both.
 - 2. Support a maximum area of 1.48 sq. m (16 sq. ft.) of ceiling per hanger.
 - 3. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
 - 4. Provide additional hangers located at each corner of support components.
 - 5. Provide minimum 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown.
 - 6. Provide main runners minimum 1200 mm (48 inches) in length.
 - 7. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.
- B. Direct Hung Suspension System: ASTM C635.

1. Support main runners by hanger wires attached directly to the structure overhead.
 2. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.
- C. Anchorage to Structure:
1. Concrete:
 - a. Install hanger inserts and wire loops required for support of hanger and bracing wire. Install hanger wires with looped ends through steel deck when steel deck does not have attachment device.
 - b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.
 2. Steel:
 - a. Install carrying channels for attachment of hanger wires.
 - 1) Size and space carrying channels to support load within performance limit.
 - 2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
 - b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fireproofing is installed. Weld or use steel clips for beam attachment.
 - c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.
- D. Indirect Hung Suspension System: ASTM C635.
1. Space carrying channels for indirect hung suspension system maximum 1200 mm (4 feet) on center. Space hangers for carrying channels maximum 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) on center so as to insure that specified requirements are not exceeded.

2. Support main runners by specially designed clips attached to carrying channels.

3.5 CEILING TREATMENT

A. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

B. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

C. Fire-Rated System:

1. Total assembly, consisting of the ceiling suspension system, acoustical units, penetrations, structural components and floor or roof construction above, shall have a 1 hour fire rating based on tests conducted in conformance with ASTM E119.
2. Provide concealed fire protection around penetrations in ceilings for electric and mechanical work, and other penetrations as required to maintain the integrity of the fire-rated assembly.
3. Install fire rated ceiling systems to conform to tested assembly.

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.

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