DATE OF THIS VERSION (new)
December 1, 2013

TITLE OF DOCUMENT (new title if applicable):
Click here to enter text.

DATE OF VERSION BEING SUPERSEDED (old):
October 1, 2010

DESCRIPTION OF DOCUMENT (previous title, number, other identifying data):
Acoustical Ceilings, 09 51 00

SUMMARY OF CHANGES IN THIS VERSION:

1. Publications Updates.
2. Special faced acoustical tile AT(SP) with microbial coated surface for use in surgery/clean areas, kitchens, SPD and wet areas has been added to section at paragraph B under Article 2.7
SECTION 09 51 00
ACOUSTICAL CEILINGS

SPEC WRITER NOTE:
1. Delete between //_____// if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
2. Coordinate with Section 09 06 00, SCHEDULE FOR FINISHES, to define texture, patterns, and colors other than white with locations in the room finish schedule and reflective ceiling plans.
3. Fire rated assemblies: Do not use except with special authorization. Limit use to existing structures where other means to achieve desired fire rating are not practical. This section does not include fire rated assemblies, include applicable UL systems and specify when permitted.
4. Section does not include acoustical plaster, spray or trowel applications and special panels or tile units such as "Structural cement-fiber Units" See UL listings; Units have flame spread of 20 and smoke developed of 0.
5. Do not use glass fiber units for lay-in ceiling applications.
6. Insure the reflective ceiling plans show panel sizes and layouts with unusual conditions and tile ceilings.

PART 1- GENERAL

1.1 DESCRIPTION
A. Metal ceiling suspension system for acoustical ceilings.
B. Acoustical units.
C. Adhesive application.

1.2 RELATED WORK
A. Color, pattern, and location of each type of acoustical unit:
   Section 09 06 00, SCHEDULE FOR FINISHES.
   //B. Linear Metal Ceilings: Section 09 54 23, LINEAR METAL CEILINGS.//
   //C. Access doors in adhesive applied tile: Section 08 31 13, ACCESS DOORS AND FRAMES.//

1.3 SUBMITTAL
A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Samples:
   1. Acoustical units, each type, with label indicating conformance to specification requirements, // including units specified to match existing. //
   2. Colored markers for units providing access.
C. Manufacturer's Literature and Data:
   1. Ceiling suspension system, each type, showing complete details of installation //, including suspension system specified to match existing and upward access system details for concealed grid systems. //
   2. Acoustical units, each type //3. Runners designed for snap-in attachment of metal pans.//
D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.

1.4 DEFINITIONS
A. Standard definitions as defined in ASTM C634.
B. Terminology as defined in ASTM E1264.

SPEC WRITER NOTE: Make material requirements agree with applicable requirements specified in the referenced Applicable Publications. Update and specify only that which applies to the project.

1.5 APPLICABLE PUBLICATIONS
A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
B. American Society for Testing and Materials (ASTM):
   A641/A641M-09 .......... Zinc-coated (Galvanized) Carbon Steel Wire
   A653/A653M-11 .......... Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process
   C423-09 ............... Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
   C634-11 ............... Standard Terminology Relating to Environmental Acoustics
   C635-13 ............... Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
   C636-13 ............... Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
   E84-13 ............... Surface Burning Characteristics of Building Materials

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PART 2- PRODUCTS

SPEC WRITER NOTE:
1. Make material requirements agree with applicable requirements specified in the referenced Applicable Publications.
2. Exposed grid for 600 mm X 1200 mm (2 by 4 feet) lay-in panels is preferred system for economy.
3. Do not use narrow exposed grid face suspension system for lay-in mineral base acoustical units. Minimum width is 22 mm (7/8) inch with 8 mm (5/16 inch) minimum bearing area for panel edge. No exceptions.

2.1 METAL SUSPENSION SYSTEM

A. ASTM C635, heavy-duty system, except as otherwise specified.
   1. Ceiling suspension system members may be fabricated from either of the following unless specified otherwise.
      a. Galvanized cold-rolled steel, bonderized.
      b. Extruded aluminum.
      c. Fire resistant plastic (glass fiber) having a flame spread and smoke developed rating of not more than 25 when tested in accordance with ASTM E84.
   2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.
   3. Use aluminum suspension in kitchens and aluminum or fire resistant plastic in toilets adjacent to shower areas, hydrotherapy, and swimming pools.

B. Exposed grid suspension system for support of lay-in panels:
   1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
   2. Fabricate wall molding and other special molding from the same material with same exposed width and finish as the exposed grid members.
3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

C. Concealed grid suspension system for support of mineral base acoustical tile:
   1. Concealed grid upward access suspension system to provide an initial opening of 300 mm by 600 mm (12 by 24 inches) and for removal of adjacent runners and tile without the use of special tools, and without damage to suspension system and acoustical tile.
   2. Minimum flange width of 22 mm (7/8 inch) except for access hook and angle.
   3. Minimum flange width of 11 mm (7/16 inch) for access hook and angle.

D. Suspension system for support of Metal Type V, VI, and VII tiles:
   Concealed grid type having runners designed for the snap-in attachment of metal tile (pans).

2.2 PERIMETER SEAL
   
   A. Vinyl, polyethylene or polyurethane open cell sponge material having density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
   
   B. Thickness as required to fill voids between back of wall molding and finish wall.
   
   C. Not less than 9 mm (3/8 inch) wide strip.

2.3 WIRE
   
   A. ASTM A641.
   
   B. For wire hangers: Minimum diameter 2.68 mm (0.1055 inch).
   
   C. For bracing wires: Minimum diameter 3.43 mm (0.1350 inch).

2.4 ANCHORS AND INSERTS
   
   A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.
   
   B. Hanger Inserts:
      1. Fabricate inserts from steel, zinc-coated (galvanized after fabrication).
      
      2. Nailing type option for wood forms:
         a. Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
         
         b. Lower portion provided with not less than 8 mm (5/16 inch) hole to permit attachment of hangers.
      
      3. Flush ceiling insert type:
a. Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
b. Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
c. Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.

C. Clips:
1. Galvanized steel.
2. Designed to clamp to steel beam or bar joists, or secure framing member together.
3. Designed to rigidly secure framing members together.
4. Designed to sustain twice the loads imposed by hangers or items supported.

D. Tile Splines: ASTM C635.

2.5 CARRYING CHANNELS FOR SECONDARY FRAMING
A. Fabricate from cold-rolled or hot-rolled steel, black asphaltic paint finish, free of rust.
B. Weighing not less than the following, per 300 m (per thousand linear feet):

<table>
<thead>
<tr>
<th>Size mm</th>
<th>Size Inches</th>
<th>Cold-rolled Kg</th>
<th>Cold-rolled Pound</th>
<th>Hot-rolled Kg</th>
<th>Hot-rolled Pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>1 1/2</td>
<td>215.4</td>
<td>475</td>
<td>508</td>
<td>1120</td>
</tr>
<tr>
<td>50</td>
<td>2</td>
<td>267.6</td>
<td>590</td>
<td>571.5</td>
<td>1260</td>
</tr>
</tbody>
</table>

2.6 ADHESIVE
A. ASTM D1779, having flame spread index of 25 or less when tested in accordance with ASTM E84.
B. Developing minimum strength of 7 kg/m² (one psi) of contact surface 48 hours after installation in temperature of 21 °C (70 °F).

2.7 ACOUSTICAL UNITS
A. General:
1. Ceiling Tile shall meet minimum 37% bio-based content in accordance with USDA Bio-Preferred Product requirements.
2. ASTM E1264, weighing 3.6 kg/m² (3/4 psf) minimum for mineral fiber panels or tile.
3. Class A Flame Spread: ASTM 84
5. Minimum CAC (Ceiling Attenuation Class): 40-44 range unless specified otherwise: ASTM E413.

6. Manufacturers standard finish, minimum Light Reflectance (LR) coefficient of 0.75 on the exposed surfaces, except as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES. // Colored units integrally colored throughout. //

SPEC WRITER NOTE:
1. Acoustical tile or panel layouts and sizes on reflective ceiling plans are required with penetrations shown.
2. In a small project without sufficient penetrations to require a reflective ceiling plan specify tile size for lay-in panels.

7. Lay-in panels: Sizes as shown, with // square edges // reveal edges //.

8. Tile for concealed grid upward access system: Optional 300 by 300 or 300 by 600 mm (12 by 12 or 12 by 24 inch) size.
   a. Cross score 300 by 600 mm (12 by 24 inch) tile to simulate 300 by 300 mm (12 by 12 inch) tile edges.
   b. Provide tile with // beveled // square // edges and joints as required to suit suspension and access system.

9. Perforated metal facing (pan); tile or panels:
   a. Tiles: Size of units optional, 300 by 300, 300 by 600, 300 by 900, and 300 by 1200 mm (12 by 12, 12 by 24, 12 by 36, and 12 by 48 inches). Cross score units larger than 300 by 300 mm (12 by 12 inches) to simulate 300 by 300 mm (12 by 12 inch) units. Use beveled edge units. Design joints for snap-in attachment to suspension system.
   b. Panels: Sizes as shown with // recessed reveal edges // flat panel with square edges to finish flush with exposed grid suspension system. //
   c. Sound absorbent element; either non-sifting mineral wool or glass fiber (free of formaldehyde) of density and thickness to provide specified noise reduction coefficient. Enclosure sound absorbent elements within plastic envelopes.
   d. Support sound absorbent elements on wire spacer about 6 mm (1/4 inch) high. Fit both the sound absorbent element and the spacer into the unit.

10. Adhesive applied tile: 300 by 300 mm (12 by 12 inch) size, having // beveled // square // edges.

B. Special facing acoustical tile units AT(SP) shall be used for surgery/clean areas, kitchens, SPD and wet areas as per referenced in

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PG-18-14, Room Finishes, Door, & Hardware Schedule. AT(Sp) Special faced acoustical tile units shall provide anti-microbial coated surfaces suitable for use in Class 5 Clean Rooms per ISO 14644-1. Special faced acoustical tile units shall meet all general requirements stated in this specification.

C. Type III Units - Mineral base with water-based painted finish less than 10 g/l VOC, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Mineral base to contain minimum 65 percent recycled content.

D. Type IV Units - Mineral base with membrane-faced overlay, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Apply over the paint coat on the face of the unit a poly (vinyl) chloride overspray having a flame spread index of 25 or less when tested in accordance with ASTM E84.

E. Type V Units - Perforated steel facing (pan) with mineral or glass fiber base backing.
   1. Steel ASTM A653, not less than 0.38 mm (0.015 inch) thick, minimum G30 galvanizing.
   2. Bonderize both sides of sheet and apply two coats of baked-on enamel finish, free from gloss or sheen, on surfaces exposed to view and at least one coat on concealed surfaces.

F. Type VI Units - Perforated stainless steel facing (pan) with mineral or glass fiber base backing.

G. Type VII Units - Perforated aluminum facing (pan) with mineral or glass fiber base backing.
   1. Fabricated from aluminum sheets not less than 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.

SPEC WRITER NOTE;
1. If special type acoustical tile is required, include following subparagraphs and provide a detailed description of type of acoustical tile required.
2. Use special units in areas having high humidity conditions such as kitchens and hydrotherapy areas (swimming pools). Consider perforated aluminum facing units or ceramic units.
3. Use special IIIA units in open office spaces with higher NRC range, minimum of 0.75. Do not use glass fiber units. Combination units of glass fiber and mineral board acceptable.

H. Type XX-A Units - Perforated Ceramic Units for Wet Service.
1. Conform to requirements of Part 2 - Article "ACOUSTICAL UNITS," subparagraphs Paragraph A, 1, 2, 3, 4, 5 and 6.
2. Formulated of mineral wool material and fired in a kiln to produce a stable panel which is totally unaffected by moisture even when submerged in water.
3. No damage when subjected to 10 cycles of steam at 135 °C (275 °F) and cooling to 10 °C (50 °F).
4. Minimum of 16 mm (5/8 inch) thick.
5. Not affected when immersed in five percent chlorine solution, except for paint finish.

I. Type III-A Units - Mineral base with painted finish.
   1. Form 1, modular, cast or molded.
   2. Minimum NRC of 0.75.
   3. Minimum thickness of 19 mm (3/4 inch) and weight of 4.9 Kg/sq m (one pound per square foot).
J. Type XX-B Units - Combination mineral base and glass fiber with fabric finish.
   1. Back half of panel: Perforated water felted mineral fiber.
   2. Face half of panel: Glass fiber with glass cloth face.
   3. Minimum NRC of 0.75.
   4. Minimum thickness of 28 mm (1 1/8 inches).

2.9 ACCESS IDENTIFICATION
A. Markers:
   1. Use colored markers with pressure sensitive adhesive on one side.
   2. Make colored markers of paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) in diameter.
B. Use markers of the same diameter throughout building.
C. Color Code: Use 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 CEILING TREATMENT
A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at
changes in ceiling heights unless otherwise shown. Install acoustic tiles after wet finishes have been installed and solvents have cured.

B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.

C. 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.

D. 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.

E. Existing ceiling:
1. Where extension of existing ceilings occur, match existing.
2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

//F. Fire-Rated System:

SPEC WRITE NOTE:
1. Fire-rated ceilings are generally required under bar-joists and other lightweight structural steel framing and under thin concrete rib-slab construction. Check regarding requirements for hourly fire rating of ceiling system including protection for mechanical and electrical fixtures.
2. Do not use fire rated systems in new construction. Use only in existing structures to obtain floor ceiling or roof ceiling fire rating when structural members can not receive sprayed on fire proofing.

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 // 2 hour // 3 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.

3.2 CEILING SUSPENSION SYSTEM INSTALLATION

A. General:
1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636, except as specified otherwise.
2. Use direct or indirect hung suspension system or combination thereof as defined in ASTM C635.
3. Support a maximum area of 1.48 m² (16 sf) of ceiling per hanger.
4. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
5. Provide extra hangers, minimum of one hanger at each corner of each item of mechanical, electrical and miscellaneous equipment supported by ceiling suspension system not having separate support or hangers.
6. Provide not less than 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,
7. Use main runners not less than 1200 mm (48 inches) in length.
8. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.

B. Anchorage to Structure:
1. Concrete:
   a. Install hanger inserts and wire loops required for support of hanger // and bracing // wire in concrete forms before concrete is placed. Install hanger wires with looped ends through steel deck if 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. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels for attachment of hanger wires.
      (1) Size and space carrying channels to insure that the maximum deflection specified will not be exceeded.
(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 fire proofing is installed. Weld or use steel clips to attach to beam to develop full strength of carrying channel.

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.

B. Direct Hung Suspension System:
1. As illustrated in ASTM C635.
2. Support main runners by hanger wires attached directly to the structure overhead.
3. 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. Indirect Hung Suspension System:
1. As illustrated in ASTM C635.
2. Space carrying channels for indirect hung suspension system not more than 1200 mm (4 feet) on center. Space hangers for carrying channels not more than 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) or center so as to insure that specified requirements are not exceeded.
3. Support main runners by specially designed clips attached to carrying channels.

SPEC WRITER NOTE: Ceiling Bracing System is to be used only in structure located in seismic zones. Check drawings for details and verify with Architectural and Structural Engineer. See ASTM E580 for details required.

//D. Seismic Ceiling Bracing System:
1. Construct system is accordance with ASTM E580.
2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner // or carrying channels // of suspended ceiling at bottom. //

3.3 ACOUSTICAL UNIT INSTALLATION

A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.
   1. Install tile to lay level and in full contact with exposed grid.
   2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.

C. Tile in concealed grid upward access suspension system:
   1. Install acoustical tile with joints close, straight and true to line, and with exposed surfaces level and flush at joints.
   2. Make corners and arises full, and without worn or broken places.
   3. Locate acoustical units providing access as specified under Article, ACCESS.

D. Adhesive applied tile:
   1. Condition of surface shall be in accordance with ASTM D1779, Note 1, Cleanliness of Surface, and Note 4, Rigidity of Base Surface.
   2. Size or seal surface as recommended by manufacturer of adhesive and allow to dry before installing units.

E. Markers:
   1. Install markers of color code specified to identify the various concealed piping, mechanical, and plumbing systems.
   2. Attach colored markers to exposed grid on opposite sides of the units providing access.
   3. Attach marker on exposed ceiling surface of upward access acoustical unit.

3.5 CLEAN-UP AND COMPLETION

A. Replace damaged, discolored, dirty, cracked and broken acoustical units.
B. Leave finished work free from defects.

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