

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1- GENERAL

1.1 DESCRIPTION

- A. Metal ceiling suspension system for acoustical ceilings.
- B. Acoustical units.

1.2 RELATED WORK

- A. Color, pattern, and location of each type of acoustical unit:
FINISH LEGEND (Sheet A-602).

1.3 SUBMITTAL

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Coordination drawings: Submit reflected ceiling plans that are coordinated with mechanical, electrical and security work at acoustical ceilings. Show ceiling suspension members, method of anchorage of hangers and ceiling mounted work including light fixtures and air grilles.
- C. Samples:
 - 1. Acoustical units, each type, with label indicating conformance to specification requirements,.
 - 2. Set of 12-inch-long samples of suspension members.
 - 3. Set of 12-inc-long samples of exposed moldings for each color and system type required.
 - 4. Colored markers for units providing access.
- D. Manufacturer's Literature and Data:
 - 1. Ceiling suspension system, each type, showing complete details of installation.
 - 2. Acoustical units, each type
- E. 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.

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-03.....Zinc-coated (Galvanized) Carbon Steel Wire
A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-
Iron Alloy-coated (Galvannealed) by the Hot-Dip
Process
C423-07.....Sound Absorption and Sound Absorption
Coefficients by the Reverberation Room Method
C634-02 (E2007).....Standard Terminology Relating to Environmental
Acoustics
C635-04.....Metal Suspension Systems for Acoustical Tile and
Lay-in Panel Ceilings
C636-06.....Installation of Metal Ceiling Suspension Systems
for Acoustical Tile and Lay-in Panels
E84-07.....Surface Burning Characteristics of Building
Materials
E119-07.....Fire Tests of Building Construction and
Materials
E413-04.....Classification for Rating Sound Insulation.
E580-06.....Application of Ceiling Suspension Systems for
Acoustical Tile and Lay-in Panels in Areas
Requiring Seismic Restraint
E1264-(R2005).....Classification for Acoustical Ceiling Products

PART 2- PRODUCTS

2.1 METAL SUSPENSION SYSTEM

A. Metal Suspension System for Acoustical Panel Ceiling (AT-1).

1. General: ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish; color: Flat White #050 or as selected from manufacturer's standard colors.
2. Available Products
 - a. Basis of Design: USG Corporation: DONN® DXACE™ 15/16
3. Suspension System Components:
 - a. Fire Rated Main Tees: UL Classified Heavy Duty DXACE26 Classification; double-web design; 1-1/2" high; rectangular top bulb; 15/16" exposed flange with factory applied gasket with roll-formed aluminum cap for Controlled Environment; cross tee holes and hanger wire holes at 6" o.c.; convenience holes at approximately 2" o.c.; integral reversible splices.

b. Cross Tees :

1. 4' cross tees - DXACE424. 1-1/2" high; roll-formed into double-web design with rectangular bulb; 15/16" exposed flange with factory applied gasket with prepainted aluminum cap for Controlled Environment; high tensile steel end clips clenched to web.
2. 2' cross tees - DXACE224. 1-1/2" high; roll-formed into double-web design with rectangular bulb; 15/16" exposed flange with factory applied gasket with prepainted aluminum cap for Controlled Environment; high tensile steel end clips clenched to web.
3. Main tees and cross tees shall be positively locked, yet shall be removable without the use of tools.

4. Accessories:

a. Channel Molding: Type UA25CE: U-shape; 10' x 1-9/16" x 1/2" x 1" with factory applied gasket Aluminum U-Molding for Controlled Environment. Hemmed edges; exposed surfaces pre-finished to match suspension system components.

1. Inside and Outside Corners: Field-mitered joints at wall molding.

b. Hold-Down Clip: Type L-15-CE

c. Wall Spring Clip: Type C-8CE; to be used at the perimeter with type UA25 channel mold.

5. Suspension System Attachment devices:

a. Hanger Wire: Galvanized carbon steel; soft temper; pre-stretched; yield stress load at least three times the design load but not less than 12-gauge.

6. Suspension System Warranty: When used with a USG acoustical ceiling panel, this suspension system has a Lifetime 30 year warranty that it shall be free from the occurrence of 50% red rust. When used without a USG acoustical ceiling panel, the period of warranty is 10 years.

B. Metal Suspension System for Acoustical Panel Ceiling (AT-2).

1. General: ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish; color: Flat White #050 or as selected from manufacturer's standard colors.

2. Available Products

- a. Basis of Design: USG Corporation: DONN®
DX/DXL™ 15/16

3. Suspension System Components:

- c. Fire Rated Main Tees: UL Classified Heavy Duty
DX/DXL24: UL Classified Intermediate Duty
Classification; double-web design; 1-1/2" high;
rectangular top bulb; 15/16" exposed flange with roll-
formed steel cap; cross tee holes and hanger wire
holes at 6" o.c.; convenience holes at approximately
2" o.c.; integral reversible splices.
- d. Cross Tees :
1. 4' cross tees - DX422. 1-1/2" high; roll-formed
into double-web design with rectangular bulb;
15/16" exposed flange with prepainted steel cap;
high tensile steel end clips clenched to web.
 2. 2' cross tees - DX/DXL216. 1" high; roll-formed
into double-web design with rectangular bulb;
15/16" exposed flange with with prepainted steel
cap; high tensile steel end clips clenched to
web.
 3. Main tees and cross tees shall be positively
locked, yet shall be removable without the use
of tools.

4. Accessories:

- a. Wall Molding M7: Angle shape; 7/8" mounting flange by
7/8" face flange. Hemmed edges; exposed surfaces pre-
finished to match suspension system components.
1. Inside Corner: Field-mitered joints at wall
molding.
 2. Inside Corner: Prefabricated corner cap; formed to
90 degree angle; hemmed edge; size and finish to match
wall molding.
 3. Outside Corner: Prefabricated corner cap; formed to
90 degree angle; hemmed edge; size and finish to match
wall molding.
 4. Shadow Molding: Formed Steel section; exposed
surfaces to match suspension system components.

5. Suspension System Attachment devices:

- a. Hanger Wire: Galvanized carbon steel; soft temper; pre-
stretched; yield stress load at least three times the design
load but not less than 12-gauge.

6. Suspension System Warranty: When used with a USG acoustical ceiling panel, this suspension system has a Lifetime 30 year warranty that it shall be free from the occurrence of 50% red rust. When used without a USG acoustical ceiling panel, the period of warranty is 10 years.

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):

Size mm	Size Inches	Cold-rolled		Hot-rolled	
		Kg	Pound	Kg	Pound
38	1 1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

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. AT-1:
 1. Water Felted, Mineral-Base with vinyl-coated aluminum foil surfaced Acoustical Panels for Acoustical Panel Ceiling.
 - a. Basis of Design: USG Corporation: Clean Room ClimaPlus Class 100 Panels - 56099.
 - b. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - a. Type and Form: Type X
 - b. Pattern: Class 100: Pattern G,I / Class 10-100M: Pattern C,G,I
 - c. Surface Burning Characteristics: Class A, Flame Spread: 25, Smoke Developed: 45
 - c. Fire Resistance: Acceptable for use in UL Fire Rated Designs.
 - d. Color: White

- e. Recycled Content: High Recycled Content (HRC) not less than 51%
 - f. LR: Not less than 79.
 - g. NRC: N/A
 - h. CAC: Not less than 35 in accordance with ASTM E1414. Product to have UL acoustical compliance.
 - i. Edge Detail: Reveal sized to fit flange of exposed suspension system members. Square Edge. Cut edges to be painted with white paint to seal.
 - j. Thickness: 5/8"
 - k. Size: 2'x2'
 - l. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.
- B. AT-2 & AT-4:
- 1. Nodular, Mineral-Base with painted finish Acoustical Panels for Acoustical Panel Ceiling.
 - a. Basis of Design: USG Corporation: Mars ClimaPlus Healthcare Panels - 86169
 - b. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - d. Type and Form: Type IV and Form 1 or 2
 - e. Pattern: EG
 - f. Surface Burning Characteristics: Class A, Flame Spread: 25, Smoke Developed: 50
 - m. Fire Resistance: Acceptable for use in UL Fire Rated Designs.
 - n. Color: White
 - o. Recycled Content: not less than 75%
 - p. LR: Not less than .89.
 - q. NRC: Not Less than 0.7
 - r. CAC: Not less than 35 in accordance with ASTM E1414. Product to have UL acoustical compliance.
 - s. Edge Detail: Reveal sized to fit flange of exposed suspension system members. Square Edge.
 - t. Thickness: 3/4"

- u. Size: 2'x2'
 - v. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.
- C. AT-3:
- 1. Water Felted, Mineral-Base with vinyl-coated aluminum foil surfaced Acoustical Panels for Acoustical Panel Ceiling.
 - a. Basis of Design: USG Corporation: Clean Room ClimaPlus Class 100 Panels - 56099.
 - b. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - g. Type and Form: Type X
 - h. Pattern: Class 100: Pattern G,I / Class 10-100M: Pattern C,G,I
 - i. Surface Burning Characteristics: Class A, Flame Spread: 25, Smoke Developed: 45
 - w. Fire Resistance: Acceptable for use in UL Fire Rated Designs.
 - x. Color: White
 - y. Recycled Content: High Recycled Content (HRC) not less than 51%
 - z. LR: Not less than 79.
 - aa. NRC: N/A
 - bb. CAC: Not less than 35 in accordance with ASTM E1414. Product to have UL acoustical compliance.
 - cc. Edge Detail: Reveal sized to fit flange of exposed suspension system members. Square Edge.
 - dd. Thickness: 5/8"
 - ee. Size: 2'x4'
 - ff. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.

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:
 - 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.

3.2 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) on center so as to insure that specified requirements are not exceeded.
 3. Support main runners by specially designed clips attached to carrying channels.

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.
 1. Seal cut edges with white latex paint.
- 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.

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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