UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09 51 00

ACOUSTICAL CEILINGS

08/20

PART 1 GENERAL

1.1 REFERENCES
1.2 SUBMITTALS
1.3 CERTIFICATIONS
1.3.1 Indoor Air Quality Certifications
1.3.1.1 Ceiling Tiles
1.3.1.2 Adhesives and Sealants
1.4 DELIVERY, STORAGE. AND HANDLING
1.5 ENVIRONMENTAL REQUIREMENTS
1.6 SCHEDULING
1.7 WARRANTY
1.8 EXTRA MATERIALS

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION
2.1.1 Fire Resistive Ceilings
2.1.2 Acoustical Performance
2.1.2.1 Ceiling Sound Transmission
2.1.2.2 Ceiling Sound Absorption
2.1.3 Light Reflectance
2.2 ACOUSTICAL UNITS
2.2.1 Units for Exposed-Grid System [A] [_____]
2.2.1.1 Type
2.2.1.2 Flame Spread
2.2.1.3 Pattern
2.2.1.4 Minimum NRC
2.2.1.5 Minimum Light Reflectance Coefficient
2.2.1.6 Nominal Size
2.2.1.7 Edge Detail
2.2.1.8 Finish
2.2.1.9 Minimum CAC
2.2.2 Units for Concealed-Grid System [A] [_____]

2.2.2.1 Type
2.2.2.2 Flame Spread
2.2.2.3 Pattern
2.2.2.4 Minimum NRC
2.2.2.5 Minimum Light Reflectance Coefficient
2.2.2.6 Nominal Size
2.2.2.7 Edge Detail
2.2.2.8 Joint Detail
2.2.2.9 Finish
2.2.2.10 Minimum CAC
2.2.3 Metal Pans [A] [_____]
2.2.3.1 Type
2.2.3.2 Flame Spread
2.2.3.3 Pattern
2.2.3.4 Minimum NRC
2.2.3.5 Minimum Light Reflectance Coefficient
2.2.3.6 Nominal Size
2.2.3.7 Edge Detail
2.2.3.8 Joint Detail
2.2.3.9 Finish
2.2.3.10 Pads
2.2.4 Impact/Abrasion Resistant Units
2.2.4.1 Type
2.2.4.2 Flame Spread
2.2.4.3 Pattern
2.2.4.4 Minimum NRC
2.2.4.5 Minimum Light Reflectance Coefficient
2.2.4.6 Nominal Size
2.2.4.7 Edge Detail
2.2.4.8 Joint Detail
2.2.4.9 Finish
2.2.5 Humidity Resistant Composition Units
2.2.5.1 Type
2.2.5.2 Flame Spread
2.2.5.3 Pattern
2.2.5.4 Minimum NRC
2.2.5.5 Minimum Light Reflectance Coefficient
2.2.5.6 Nominal Size
2.2.5.7 Edge Detail
2.2.5.8 Finish
2.2.6 Metal Faced Composition Units
2.2.6.1 Type
2.2.6.2 Flame Spread
2.2.6.3 Pattern
2.2.6.4 Minimum (NRC)
2.2.6.5 Minimum Light Reflectance Coefficient
2.2.6.6 Nominal Size
2.2.6.7 Edge Detail
2.2.6.8 Joint Detail
2.2.6.9 Finish
2.2.7 Unit Acoustical Absorbers
2.3 SUSPENSION SYSTEM
2.4 HANGERS
2.4.1 Wires
2.4.2 Straps
2.4.3 Rods
2.4.4 Eyebolts
2.4.5 Masonry Anchorage Devices
2.5 ACCESS PANELS

2.6 ADHESIVE
2.7 FINISHES
2.8 COLORS AND PATTERNS
2.9 ACOUSTICAL SEALANT

PART 3 EXECUTION

3.1 INSTALLATION
3.1.1 Suspension System
3.1.1.1 Plumb Hangers
3.1.1.2 Splayed Hangers
3.1.2 Wall Molding
3.1.3 Acoustical Units
3.1.4 Acoustical Sealant
3.1.5 Adhesive Application
3.2 CEILING ACCESS PANELS
3.3 CLEANING
3.4 RECLAMATION PROCEDURES

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCEC / NASA **UFGS-09 51 00 (August 2020)**

Preparing Activity: USACE **Superseding**
UFGS-09 51 00 (August 2017)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

SECTION 09 51 00

ACOUSTICAL CEILINGS
08/20

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NOTE: This guide specification covers the requirements for conventional and impact/abrasion resistant acoustical ceiling tile and panels, unit acoustical absorbers, hangers, and suspension system grid for installation in commercial-type work.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

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Note: Plaster or gypsum wallboard ceilings, metal faced or ceramic-bonded mineral fiber acoustical ceilings should be used in lieu of mineral fiber, or fiberglass base acoustical ceiling systems, in wet areas such as showers and bathrooms or around grills, in kitchens, and similar facilities where greasy vapors are a problem. Be alert to this fact, however, gypsum board made in other countries may contain asbestos which, of course, is unacceptable.

Drawings should indicate the following:

a. Location of acoustical systems. Arrangement of acoustical units, panels, light fixtures, and diffusers, other penetrations and exposed suspension grids.

b. Location of systems required to have ceiling attenuation class (CAC).

c. Location of continuous or common acoustical ceilings that span or cover more than one room, so adequate detailing can be addressed on the drawings to coordinate requirements between CAC and STC ratings.

d. Location and details of system required to have a fire resistive rating.

e. Location and details and material of fire stops above suspended ceilings.

f. Location and details of access panels and maximum spacing of suspension members for concealed grid suspension systems.

g. Location of each different color and pattern when more than one type acoustical unit is specified for a project. Details of special or patterned panels if necessary to describe adequately. If more than one system is used, key to locations by using symbols.

h. Where acoustical ceilings are provided in conjunction with thermal insulation beneath vented attic spaces, careful attention should be given to furnishing the appropriate type ceiling tile, adequate details on the contract drawings, and to including appropriate sections in the specifications. Details on the drawings will cover such features as support of insulation at flush-mounted light fixtures, conduit, acoustical units, suspension system components, heating and air-conditioning units, and other utilities. Installation of insulation over the suspension systems, light fixtures, and other ceiling penetrations will be coordinated with Sections 06 10 00 ROUGH CARPENTRY and 07 21 13 BOARD AND BLOCK INSULATION, and manufacturer's literature.

****

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A489	(2018; E 2018) Standard Specification for Carbon Steel Eyebolts
ASTM A580/A580M	(2023) Standard Specification for Stainless Steel Wire
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1008/A1008M	(2021a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM B633	(2023) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C423	(2023) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C635/C635M	(2022) Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for

	Acoustical Tile and Lay-In Panels
ASTM C834	(2017; R 2023) Standard Specification for Latex Sealants
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E119	(2022) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E413	(2022) Classification for Rating Sound Insulation
ASTM E580/E580M	(2022) Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions
ASTM E795	(2023) Standard Practices for Mounting Test Specimens During Sound Absorption Tests
ASTM E1111/E1111M	(2014; R 2022) Standard Test Method for Measuring the Interzone Attenuation of Open Office Components
ASTM E1264	(2022) Standard Classification for Acoustical Ceiling Products
ASTM E1414/E1414M	(2021a) Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E1477	(1998; R 2022a) Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01 (2023) Structural Engineering

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings; G[, [_____]]

SD-03 Product Data

Acoustical Ceiling Systems; G[, [_____]]

Fire Resistive Ceilings; G[, [_____]]

[Recycled Content for Type III Ceiling Tiles; S

][Recycled Content for Type IV Ceiling Tiles; S

][Recycled Content for Type IX Ceiling Tiles; S

][Recycled Content for Type XII Ceiling Tiles; S

][Recycled Content for Suspension Systems; S

] Acoustical Performance; G[, [_____]]

SD-04 Samples

Acoustical Units; G[, [_____]]

Acoustical Ceiling Tiles; G[, [_____]]

SD-06 Test Reports

Fire Resistive Ceilings; G[, [_____]]

SD-07 Certificates

[Indoor Air Quality for Type III Ceiling Tiles; S

][Indoor Air Quality for Type IV Ceiling Tiles; S

][Indoor Air Quality for Type V Ceiling Tiles; S

][Indoor Air Quality for Type VI Ceiling Tiles; S

][Indoor Air Quality for Type VII Ceiling Tiles; S

][Indoor Air Quality for Type IX Ceiling Tiles; S

][Indoor Air Quality for Type X Ceiling Tiles; S

][Indoor Air Quality for Type XI Ceiling Tiles; S

][Indoor Air Quality for Type XII Ceiling Tiles; S

][Indoor Air Quality for Impact/Abrasion Resistant Ceiling Tiles; S

][Indoor Air Quality for Humidity Resistant Ceiling Tiles; S

][Indoor Air Quality for Adhesives; S

][Indoor Air Quality for Sealants; S

]1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Ceiling Tiles

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this section. Provide current product certification documentation from certification body.

1.3.1.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited in this Section.

1.4 DELIVERY, STORAGE. AND HANDLING

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than 16 degrees C 60 degrees F nor more than 29 degrees C 85 degrees F and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.6 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.7 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship including but not limited to, sagging and warping of panels and rusting and of grid systems, for a period of [ten years][_____][years] from date of final acceptance of the work.

[1.8 EXTRA MATERIALS

****

NOTE: In order to assure matching acoustical units that may become damaged and require spot replacement, a supply of extra ten percent of units

in the original pattern is recommended in order to prevent later replacement of the ceiling in an entire room because of mismatched units. However, the Government facility should be consulted to ensure that adequate warehousing and protection is available for these extra units.
****

Furnish spare tiles, from the same lot as those installed, of each color at the rate of [_____] [5] tiles for each 1000 tiles installed.

]PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION
****
NOTE: When reflected ceiling plans showing ceiling penetrations are included in the project drawings, it may not be necessary for the Contractor to re-draw and submit as a shop drawing; in such cases, delete the requirement from SD-02. Details not applicable to the project should also be deleted. On simple projects where manufacturer's standard printed data are sufficient, omit this submittal category from SD-03.

Where many different ceiling systems are used, it may be more convenient to schedule acoustical performance ratings, fire ratings, panel and suspension types on the drawings, keyed to finish schedules, rather than to include this data in the specification.
****

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. Provide the unit size, texture, finish, and color as specified.[The Contractor has the option to substitute inch-pound (I-P) Recessed Light Fixtures (RLF) for metric RLF. If the Contractor opts to provide I-P RLF, then provide I-P products for other ceiling elements like acoustical ceiling tiles, air diffusers, air registers and grills.] Coordinate the entire ceiling system with other details, like the location of access panels and ceiling penetrations, for instance, shown on the drawings. Submit drawings showing the the location, extent and details of acoustical treatment including suspension system, method of anchoring and fastening, and reflected ceiling plan.[Coordinate with paragraph RECLAMATION PROCEDURES for reclamation of mineral fiber acoustical ceiling panels to be removed from the job site.]

2.1.1 Fire Resistive Ceilings
****
NOTE: Certified laboratory test reports for fire resistance rating cannot be obtained for ceiling assemblies which are nonstandard with the manufacturer. Therefore, where a fire resistance rating is necessary, do not specify a nonstandard ceiling assembly. Refer to data in the UL Fire Resistance Directory for details.

For Navy projects, delete this paragraph when fire separation is not required by UFC 3-600-01, Fire Protection Engineering for Facilities. Where required, rating applies to total floor-ceiling or roof-ceiling assembly, including mechanical-electrical elements, penetrations, structural system, and deck. If system is required to be fire-endurance rated, show details of recessed fixture enclosures and other penetrations on drawings.

****

Rate acoustical ceiling systems, indicated as fire resistant, for fire endurance as specified when tested in accordance with ASTM E119. Test suspended ceiling with a specimen [roof][floor] assembly representative of the indicated construction, including mechanical and electrical work within ceiling space openings for light fixtures, and air outlets, and access panels. Provide ceiling assembly rating for [[1][1-1/2][2][3][4] hour [concealed grid system][exposed grid system]][as shown on drawings]. Provide acoustical units with a flame spread of 25 or less and smoke development of 50 or less when tested in accordance with ASTM E84.

Submit manufacturer's catalog showing UL classification of fire-rated ceilings giving materials, construction details, types of floor and roof constructions to be protected, and UL design number and fire protection time rating for each required floor or roof construction and acoustic ceiling assembly.

Submit reports by an independent testing laboratory attesting that acoustical ceiling systems meet specified [fire endurance] [and] [sound transmission] requirements. Data attesting to conformance of the proposed system to Underwriters Laboratories requirements for the fire endurance rating listed in UL Fire Resistance may be submitted in lieu of test reports.

2.1.2 Acoustical Performance

2.1.2.1 Ceiling Sound Transmission

****

NOTE: In open spaces without partitions and areas where enclosed rooms have partitions that extend full height to the floor or roof above, Ceiling Attenuation Class (CAC) is not applicable and should not be specified unless required by an acoustician. Where enclosed rooms do not have full-height partitions, the sound transmission path through the plenum could prevent acoustical privacy between rooms. Ensure the CAC rating of the acoustical ceiling system, including all building services components, is equivalent to the STC rating of the partitions. It is ineffective for the acoustical ceiling to have a CAC rating that is lower or higher than the STC rating of the partition. Penetrations through the acoustical ceiling for light fixtures, air terminals, etc. can decrease the CAC rating of the ceiling system below that of the ceiling panel by 10 points. Verify that other specification

sections and the drawings include appropriate noise control measures such as light fixture covers, a ducted return air system, return air grille silencers, etc. so the penetrations do not degrade the CAC rating below the STC rating of the partition. Speech privacy between rooms typically requires partitions with STC ratings of 40-50. Limited acoustical ceiling panels can achieve CAC rating above 40 and these panels often do not comply with the specified sound absorption ratings. Lightweight, acoustic, plenum barriers oriented vertically over the partitions can increase the CAC rating of the acoustical ceiling system from CAC 20-35 to CAC 40-50 so that it matches the acoustical performance of the partition. Expected speech privacy levels with specific constructions: STC/CAC 40 minimal; STC/CAC 45 - acceptable; STC/CAC 50 - optimal. Speech privacy should not be expected for construction below STC/CAC 40. Some highly confidential rooms may require full height walls with STC ratings above 50.

****

Provide ceiling systems with the specified Ceiling Attenuation Class (CAC) ratings as determined in accordance with ASTM E1414/E1414M and ASTM E413. Provide sound attenuators over light fixtures, air terminals and other ceiling penetrations, provide acoustical blanket insulation on top of the ceiling or adjacent to partitions to provide lightweight acoustical plenum barriers above partitions as required to achieve the specified CAC ratings. Provide test ceiling continuous at the partition and assembled in the suspension system in the same manner that the ceiling will be installed on the project.

2.1.2.2 Ceiling Sound Absorption

****

NOTE: Ceiling panel sound absorption can be specified using Noise Reduction Coefficient (NRC) or Attenuation Class (AC). NRC is more common and used when the concern is general reverberation, loud occupant noise levels or speech intelligibility inside enclosed rooms. AC is sometimes used instead of NRC when the concern is speech privacy in mostly open areas, particularly open offices. The two metrics are highly correlated.

Ceilings in rooms and areas that are normally occupied by people should have a minimum NRC of 0.70. This level of absorption is appropriate for enclosed rooms with one person and no (or limited) noisy equipment. Ceilings in enclosed rooms with multiple people or with noisy equipment should have a minimum NRC of 0.80. Ceilings in open areas, especially those with high density occupancy should have a minimum NRC of 0.90 (or AC of 180).

****

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423. Determine Articulation Class (AC) in accordance with

ASTM E1111/E1111M.

2.1.3 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 test method.

2.2 ACOUSTICAL UNITS

****

NOTE: Color, class, pattern, NRC, LR coefficient, CAC, and type of acoustical ceiling units must be shown, as required, on the drawings when more than one type acoustical unit is specified for a project.

Color and pattern must be coordinated with the drawings, and this section when more than one type acoustical unit is specified for a project.

When a specific pattern, as shown in ASTM E1264 is required, specify the applicable one and delete other patterns; otherwise, specify all patterns as Contractor's options. Ascertain that a specific pattern required is commercially available in the type unit specified since some type units are available only in certain patterns. Specialized patterns must be described in detail within the bracketed blank space.

Acoustical units will be limited generally to Types III and IV and Type XX (stone wool, fiberglass). Metal-faced units (Types V, VI, VII, and VIII), and fabric faced overlay (Type XI), because of the higher cost factor, will not normally be considered.

Composition units with paint finish are lowest in cost and available in widest variety of patterns. Types III and IV are available in three forms: Form 1 (nodulated, cast, or molded) is appropriate for high quality areas such as conference rooms, and officers dining facilities. It is more costly than forms 2 (water-felted) and 3 (dry-felted). Type XX is available in a wide price range. All options have smooth, non-fissured surfaces.

Type I - Cellulose composition with standard washable painted finish (not listed as an option in this specification)

Type II - Cellulose composition with plastic membrane-faced overlay (not listed as an option in this specification)

Type III - Mineral composition with standard washable painted finish

Type IV - Mineral composition with plastic membrane-faced overlay

Type V - Steel facings with mineral composition absorbent backing

Type VI - Stainless steel with mineral composition absorbent backing

Type VII - Aluminum with mineral composition absorbent backing

Type VIII - Cellulose composition with scrubbable pigmented or clear finish (not listed as an option in this specification)

Type IX - Mineral composition with scrubbable pigmented or clear finish

Type X - Mineral composition with plastic/aluminum membrane

Type XX - Stone wool or fiberglass composition with membrane-faced overlay and painted finish.

Type XI - Mineral composition with fabric overlay

Type XII - Glass fiber composition with plastic/cloth overlay

Type III or IV units should be used except when any of the following conditions exist, one of the types listed below should be specified:

High Humidity - Aluminum or stainless steel pans with mineral wool pads. Humidity resistant mineral composition units.

Staining or Heavy Soiling - Composition units with plastic film face. Metal pan units. Metal faced composition units.

Impact Abrasion - Metal pan units. Impact resistant composition units. Metal faced composition units.

Metal pan units with pads cannot be used when space above the ceiling is used as an air plenum for heating, ventilating or air conditioning systems.

Pattern -

A. Perforated, regularly spaced large holes perforated
B. Perforated, randomly spaced large holes
C. Perforated, small holes
D. Fissured
E. Lightly textured
F. Heavily textured
G. Smooth
H. Printed
I. Embossed
J. Embossed-in-register

K. Surfaced Scored
L. Random Swirl
M. Other patterns (specify)

Mineral fiber Type III, IV, IX, and XI acoustical ceiling units offer a combination of rated fire resistance, flame spread classification, acoustical performance, and design versatility. Units are available in a variety of configurations ranging from flat panels with simple textured surfaces to panels with detailed edges or carved patterns and motifs. Cost generally increases with the complexity of design and increase of thickness and/or unit weight.

Fiberglass Type XII acoustical ceiling units are available cloth-faced and vinyl-faced. The fiberglass units have high acoustical performance, thermal insulation value, and moisture resistance ratings. The cloth faced units are good for open-office installations and areas such as libraries that require high acoustical absorption. The vinyl-faced fiberglass units, because of their washable vinyl face, are good for use in buildings with supply and return-air ducts in the ceiling.

Light Reflectance - A lower light reflectance may be specified when desired for special architectural or lighting effects. The available LR (light reflection factor) are LR-1 (0.75 minimum), LR-2 (0.70 minimum), LR-3 (0.65 minimum), LR-4 (0.60 minimum).

Edge Detail - Rabbeted edges may be specified to permit face of panels to project below surface of exposed grid system. Strong sidelighting at low angle of incidence in concealed suspension systems will greatly exaggerate surface irregularities; beveled edge tiles are suggested for such locations.

Review manufacturer's literature and edit the following paragraphs.
****

Submit samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color. Conform acoustical units to ASTM E1264, Class A, and the following requirements:

2.2.1 Units for Exposed-Grid System [A] [_____]

****
NOTE: In facilities where several different NRC values are specified, clearly indicate which room or areas should receive lay-in panels of a specific NRC value.
****

2.2.1.1 Type
****

NOTE: Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product recycled content requirements. A resource that can be used to identify products with recycled content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

Where minimums are stated, research shows the product is available among US national manufacturers above the minimum recycled content of the first bracket. Some manufacturers and regions have higher percentages. If desired, insert higher percentages into the second set of brackets.

****

[III (non-asbestos mineral fiber with painted finish).[Provide Type III Acoustical Ceiling Tiles containing a minimum of 30 percent recycled content. Provide data identifying percentage of recycled content for Type III ceiling tiles. Provide certification of indoor air quality for Type III Ceiling Tiles.]]

[IV (non-asbestos mineral fiber with membrane-faced overlay).[Provide Type IV Acoustical Ceiling Tiles containing a minimum of 60 percent recycled content. Provide data identifying percentage of recycled content for Type IV ceiling tiles. Provide certification of indoor air quality for Type IV Ceiling Tiles.]]

[IX (mineral fiber with scrubbable finish).[Provide Type IX Acoustical Ceiling Tiles containing a minimum [50][_____] percent recycled content. Provide data identifying percentage of recycled content for Type IX ceiling tiles. Provide certification of indoor air quality for Type IX Ceiling Tiles.]]

[X (mineral composition with plastic membrane).[Provide certification of indoor air quality for Type X Ceiling Tiles.]]

[XI (mineral fiber with fabric faced overlay).[Provide certification of indoor air quality for Type XI Ceiling Tiles.]]

[XII (fiberglass base with membrane-faced overlay).[Provide Type XII Acoustical Ceiling Tiles containing a minimum of [25][_____] percent recycled content. Provide data identifying percentage of recycled content for Type XII ceiling tiles. Provide certification of indoor air quality for Type XII Ceiling Tiles.]]

2.2.1.2 Flame Spread

Class A, 25 or less

2.2.1.3 Pattern

[A] [B] [C] [D] [E] [F] [G] [I] [J] [K] [_____]

2.2.1.4 Minimum NRC

[_____] when tested on mounting Type E-400 of ASTM E795.

2.2.1.5 Minimum Light Reflectance Coefficient
[LR-1, 0.75 or greater] [_____]

2.2.1.6 Nominal Size

[600 by 1200][600 by 600][_____] mm[24 by 48][24 by 24][_____] inch

2.2.1.7 Edge Detail

[Square] [Reveal] [Trimmed and butt] [Beveled] [Tegular] [_____]

2.2.1.8 Finish

Factory-applied standard finish. See paragraph COLORS AND STANDARDS.

2.2.1.9 Minimum CAC

[_____]

2.2.2 Units for Concealed-Grid System [A] [_____]

2.2.2.1 Type

****

NOTE: Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition (including verification of bracketed percentages included in this guide specification) before specifying product recycled content requirements.

Where minimums are stated, research shows the product is available among US national manufacturers above the minimum recycled content of the first bracket. Some manufacturers and regions have higher percentages. If desired, insert higher percentages into the second set of brackets.

****

[III (non-asbestos mineral fiber with painted finish).[Provide Type III Acoustical Ceiling Tiles containing a minimum of 30 percent recycled content. Provide data identifying percentage of recycled content for Type III ceiling tiles. Provide certification of indoor air quality for Type III Ceiling Tiles.]]

[IV (non-asbestos mineral fiber with membrane-faced overlay).[Provide Type IV Acoustical Ceiling Tiles containing a minimum of 60 percent recycled content. Provide data identifying percentage of recycled content for Type IV ceiling tiles. Provide certification of indoor air quality for Type IV Ceiling Tiles.]]

[IX (mineral fiber with scrubbable finish).[Provide Type IX Acoustical Ceiling Tiles containing a minimum of [50][_____] percent recycled

content. Provide data identifying percentage of recycled content for Type IX ceiling tiles. Provide certification of indoor air quality for Type IX Ceiling Tiles.]]

[X (mineral composition with plastic membrane).[Provide certification of indoor air quality for Type X Ceiling Tiles.]]

[XI (mineral fiber with fabric faced overlay).[Provide certification of indoor air quality for Type XI Ceiling Tiles.]]

[XII (fiberglass base with membrane-faced overlay).[Provide Type XII Acoustical Ceiling Tiles containing a minimum of [25][_____] percent recycled content. Provide data identifying percentage of recycled content for Type XII ceiling tiles. Provide certification of indoor air quality for Type XII Ceiling Tiles.]]

2.2.2.2 Flame Spread

Class A, 25 or less

2.2.2.3 Pattern

[A] [B] [C] [D] [E] [F] [G] [I] [J] [K] [_____]

2.2.2.4 Minimum NRC

[_____] when tested on mounting Type B or Type E-400 of ASTM E795

2.2.2.5 Minimum Light Reflectance Coefficient

[LR-1, 0.75 or greater] [_____]

2.2.2.6 Nominal Size

[300 by 300][600 by 600][600 by 1200][_____] mm[12 by 12][24 by 24][24 by 48][_____] inch

2.2.2.7 Edge Detail

[Manufacturer's standard] [Beveled] [Square]

2.2.2.8 Joint Detail

[Kerfed and rabbeted] [Tongue and grooved] [Butted]

2.2.2.9 Finish

Factory-applied standard finish. See paragraph COLORS AND PATTERNS.

2.2.2.10 Minimum CAC

[_____]

2.2.3 Metal Pans [A] [_____]

2.2.3.1 Type

[V, steel.[Provide certification of indoor air quality for Type V Ceiling Tiles.]]

[VI, ASTM A167 stainless steel.[Provide certification of indoor air quality for Type VI Ceiling Tiles.]]

[VII, aluminum perforated pans with acoustical, non-asbestos, insulation backing.[Provide certification of indoor air quality for Type VII Ceiling Tiles.]]

2.2.3.2 Flame Spread

Class: A, 25 or less

2.2.3.3 Pattern

[A] [C] [I] [_____]

2.2.3.4 Minimum NRC

[0.75] [_____] in open office areas; [0.60] [_____] in conference rooms, executive offices, teleconferencing rooms, and other rooms as designated; [0.50] [_____] in all other rooms and areas when tested on mounting Type E-400 of ASTM E795.

2.2.3.5 Minimum Light Reflectance Coefficient

[LR-1, 0.75 or greater] [_____]

2.2.3.6 Nominal Size

[600 by 600][600 by 1200][_____] mm[24 by 24][24 by 48][_____] inch

2.2.3.7 Edge Detail

[Manufacturer's standard] [Square] [Reveal] [_____].

2.2.3.8 Joint Detail

[Beveled] [_____]

2.2.3.9 Finish

Factory-applied standard finish. See paragraph COLORS AND PATTERNS.

2.2.3.10 Pads

[Completely enclosed, of material and thickness required for acoustical and fire test ratings] [_____].

2.2.4 Impact/Abrasion Resistant Units

2.2.4.1 Type

Non-asbestos mineral composition with a hardened mineral surface and factory applied white paint finish. Provide a surface resistant to impact and abrasion.[Provide certification of indoor air quality for Impact/Abrasion Resistant Ceiling Tiles.]

2.2.4.2 Flame Spread

Class A, 25 or less

2.2.4.3 Pattern

[_____]

2.2.4.4 Minimum NRC

[_____] when tested on Mounting Type E-400 of ASTM E795.

2.2.4.5 Minimum Light Reflectance Coefficient

[LR-1, 0.75 or greater][_____]

2.2.4.6 Nominal Size

[600 by 600] [600 by 1200] [_____] mm[24 by 24] [24 by 48] [_____] inch

2.2.4.7 Edge Detail

[Manufacturer's standard] [Square] [Beveled]

2.2.4.8 Joint Detail

[Trimmed and butted] [Kerfed and rabbeted]

2.2.4.9 Finish

Factory-applied standard finish. See paragraph COLORS AND PATTERNS.

2.2.5 Humidity Resistant Composition Units

2.2.5.1 Type

Non-asbestos mineral or glass fibers bonded with ceramic, moisture resistant thermo-setting resin, or other moisture resistant material and having a factory applied white paint finish. Provide panels that do not sag or warp under conditions of heat, high humidity or chemical fumes.

[Provide certification of indoor air quality for Humidity Resistant Ceiling Tiles.]

2.2.5.2 Flame Spread

Class: A, 25 or less

2.2.5.3 Pattern

[_____]

2.2.5.4 Minimum NRC

[_____] when tested on Mounting Type E-400 of ASTM E795.

2.2.5.5 Minimum Light Reflectance Coefficient

LR-1, 0.75 or greater

2.2.5.6 Nominal Size

[600 by 600][600 by 1200][_____] mm[24 by 24][24 by 48][_____] inch

2.2.5.7 Edge Detail

Square

2.2.5.8 Finish

Factory-applied standard finish. See paragraph COLORS AND PATTERNS.

2.2.6 Metal Faced Composition Units

2.2.6.1 Type

[Type V (Steel facings with non-asbestos mineral composition absorbent backing).[Provide certification of indoor air quality for Type V Ceiling Tiles.]]

[Type VI (Stainless steel facings with non-asbestos mineral composition absorbent backing).[Provide certification of indoor air quality for Type VI Ceiling Tiles.]]

[Type VII (Aluminum facings with non-asbestos mineral composition absorbent backing) with [anodized] [baked enamel] [acrylic] finish color [white] [_____].[Provide certification of indoor air quality for Type VII Ceiling Tiles.]]

2.2.6.2 Flame Spread

Class: A, flame spread 25 or less

2.2.6.3 Pattern

[_____]

2.2.6.4 Minimum (NRC)

Base the tested NRC value on Mounting Type E-400 of ASTM E795.

2.2.6.5 Minimum Light Reflectance Coefficient

LR-1, 0.75 or greater

2.2.6.6 Nominal Size

[600 by 600][600 by 1200] mm[24 by 24][24 by 48] inch

2.2.6.7 Edge Detail

[Manufacturer's standard][Square][Beveled]

2.2.6.8 Joint Detail

Trimmed and butted

2.2.6.9 Finish

Factory-applied standard finish. See paragraph COLORS AND PATTERNS.

2.2.7 Unit Acoustical Absorbers

****

NOTE: Unit acoustical absorbers should be used in high noise areas such as bowling alleys, industrial areas or in other locations when recommended by an acoustical consultant. Quantity and spacing should be shown on the drawings.

****

Provide individually mounted sound absorbing plaques composed of glass fibers or non-asbestos mineral fibers and having a NRC range of not less than 0.60 - 0.70 when tested in accordance with ASTM C423 and reported as a 4 frequency average.

2.3 SUSPENSION SYSTEM

****

NOTE: If more than one type of acoustical unit is required, a separate paragraph for that type unit will be used. Each unit type will be designated with a letter or number symbol, such as A, B, etc. Use the same letters or numbers to key unit types to locations listed or shown on the drawings and in Section 09 06 00 SCHEDULES FOR FINISHES.

Each different type of suspension system must be shown on the drawings.

Generally, lay-in panels supported by exposed grid suspension system provide most economical installation and allow greatest access to space above ceiling. Where lay-in panels are subject to displacement by building occupants or where ceiling must be directly attached to underside of structural system, concealed framing system may be more appropriate. In lobbies, auditoriums, chapels or clubs where a monolithic appearance may be desired, greater expense of concealed suspension system may be justified. Downward access concealed systems should not be specified in areas of high seismic activity.

An intermediate-duty suspension system should be specified when the minimum load-carrying capacity of the main runner is 175 N per m 12 pounds per linear foot on a simple span of 1200 mm 4 feet without the mid-span deflection exceeding 1/360th of the span. Intermediate-duty systems are used primarily for ordinary commercial structures where some ceiling loads, due to light fixtures and air diffusers are anticipated.

A heavy-duty suspension system should be specified when the above described minimum load-carrying

capacity is 230 N per m 16 pounds per linear foot. Heavy-duty systems are used when ceiling loads are greater than ordinary commercial construction. See ASTM C635/C635M for load testing methods for metal suspension systems for acoustical tile and lay-in panel ceilings.

Select classification required to support ceiling load including acoustical units, lights and other items supported by suspension system. Light duty should be specified for residential construction only. Load carrying capacities based on 1200 mm (4 foot) hanger spacing:

Classification	kg/meter lb/Linear Foot of Main Runner		
	Direct Hung	Indirect Hung	Furring Bar
Light Duty	7.44 5.0	2.98 2.0	6.7 4.5
Intermediate Duty	17.86 12.0	5.21 3.5	9.67 6.5
Heavy Duty	23.81 16.0	11.91 8.0	-

Corner caps are not available in all types of wall moldings and are an extra cost item when available.

Provide seismic details, if a Government designer (either Corps office or A/E) is the Engineer of Record, and show on the drawings. Delete the second bracketed phrase, in the last sentence, if no seismic details are provided.

****

Provide [[standard] [fire-resistive] [snap-in metal pan]] [[exposed-grid] [indirect hung concealed H and T or Zee] [direct hung, concealed, downward access] [direct hung, concealed, upward access]] [[standard width flange] [narrow width flange] [narrow width slotted flange]] [as indicated] suspension system conforming to ASTM C635/C635M [for intermediate-duty systems] [for heavy-duty systems]. Provide surfaces exposed to view of [aluminum or steel with a factory-applied [white] [black] [color] baked-enamel finish] [aluminum with a clear anodized finish] [aluminum with colored factory-applied vinyl paint finish]. Provide wall molding having a flange of not less than [24 mm 15/16 inch] [_____]. Provide [inside and outside corner caps] [[standard] [overlapped] [mitered] corners]. Provide a suspension system with a maximum deflection of 1/360 of the span length capable of supporting the finished ceiling, light fixtures, air diffusers, and accessories, as shown.[Conform seismic details [to the guidance in UFC 3-301-01 and ASTM E580/E580M] [as indicated].]

[Provide Suspension System containing a minimum of 15 percent recycled content. Provide data identifying percentage of recycled content for suspension systems.]

2.4 HANGERS

****
NOTE: Construction drawings should include a detail drawing showing splayed and countersplayed suspension system hanger wires.
****

Provide hangers and attachment capable of supporting a minimum 1334 N 300 pound ultimate vertical load without failure of supporting material or attachment.

2.4.1 Wires

****
NOTE: Select stainless steel or nickel copper alloy wire for facilities where high humidity can be expected such as large kitchens, dishwashing areas, or indoor swimming pools. Select zinc-coated steel wire for other locations.

When spacing of hanger wires exceeds 1219 mm 4 feet or when heavy loads are supported, 3.25 or 2.59 mm 8 or 10 gauge wire should be specified.
****

Conform wires to [ASTM A641/A641M, Class 1, [2.0] [_____] mm [0.08 inch (12 gauge)] [[_____] inch] in diameter.] [ASTM A580/A580M, composition 302 or 304, condition annealed stainless steel, [2.0] [_____] mm [0.08 inch (12 gauge)] [[_____] inch] in diameter.]

2.4.2 Straps

****
NOTE: Normally wire hangers should be used. If the project is in an area subject to violent storms, steel straps or rod hangers should be specified.
****

Provide straps of 25 by 5 mm 1 by 3/16 inch galvanized steel conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.4.3 Rods

****
NOTE: Normally wire hangers should be used. If the project is in an area subject to violent storms, steel straps or rod hangers should be specified.
****

Provide 5 mm 3/16 inch diameter threaded steel rods, zinc or cadmium coated.

2.4.4 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A489. Provide minimum [_____] [6] mm [1/4] inch, [zinc coated][cadmium plated] eyebolts.

2.4.5 Masonry Anchorage Devices

Comply with [ASTM C636/C636M] [_____] for anchorage devices for [eyebolts] [machine screws] [wood screws].

2.5 ACCESS PANELS

****
NOTE: Include this paragraph only when access panels are specified in paragraph titled SUSPENSION SYSTEM. Delete identification code numbers and systems not applicable to the particular project and add additional numerical codes and system descriptions if necessary. Code numbers and corresponding system descriptions must remain unchanged, i.e., if "sprinkler system" is omitted, the code number "6" will also be omitted from the listing.
****

Provide access panels that match adjacent acoustical units, designed and equipped with suitable framing and fastenings for removal and replacement without damage. Size panel to be not less than 300 by 300 mm 12 by 12 inch or more than 300 by 600 mm 12 by 24 inch.

a. Attach an identification plate of 0.8 mm 0.032 inch thick aluminum, 19 mm 3/4 inch in diameter, stamped with the letters "AP" and finished the same as the unit, near one corner on the face of each access panel.

b. Identify ceiling access panel by a number utilizing white identification plates or plastic buttons with contrasting numerals. Provide plates or buttons of minimum 25 mm 1 inch diameter and securely attached to one corner of each access unit. Provide a typewritten card framed under glass listing the code identification numbers and corresponding system descriptions listed above. Mount the framed card where directed and furnish a duplicate card to the Contracting Officer. Code identification system is as follows:

(1) Fire detection/alarm system

(2) Air conditioning controls

(3) Plumbing system

(4) Heating and steam systems

(5) Air conditioning duct system

(6) Sprinkler system

(7) Intercommunication system

[(8) Nurse's call system

][(9) Pneumatic tube system

][(10) Medical piping system

] (11) Program entertainment

(12) Telephone junction boxes

[(13) Detector X-ray

] (14) [_____]

2.6 ADHESIVE

****
NOTE: Tiles larger than 300 by 600 mm 12 by 24 inch should not be attached by adhesive method.
****

****
NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the bracketed sentences below requiring products with indoor air quality certifications as defined in Part 1 of this specification.
****

Use adhesive as recommended by tile manufacturer. [Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. For products located on the interior of the building (inside of the weatherproofing system), provide certification or validation of indoor air quality for adhesives.]

2.7 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

2.8 COLORS AND PATTERNS

****
NOTE: Editing of color reference sentence(s) must be coordinated with the Government. Generally Section 09 06 00 SCHEDULES FOR FINISHES or drawing is used when the project is designed by an architect or interior designer. Color must be selected from manufacturers' standard colors or identified as a manufacturer's color in this specification only when the project is very simple and has minimal finishes.

When the Government directs that color be located in the drawings a note must be added that states: "Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval.

Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers. The word "color" as used herein includes surface color and pattern."

Prior to specifying a custom color finish, research to determine if additional cost and lead time is feasible. Note there is often a minimum order requirement; this requirement will also affect future orders.

When a manufacturer's name, stock number, pattern, and color is used, be certain that the product conforms to this specification, as edited.
****

Use colors and patterns for acoustical units and suspension system components [as specified in Section 09 06 00 SCHEDULES FOR FINISHES][as indicated; colors listed are not intended to limit the selection of equal colors from other manufacturers].

2.9 ACOUSTICAL SEALANT
****
NOTE: For projects where these products are located on the interior of the building (defined as inside of the weatherproofing system), include the bracketed sentences below requiring products with indoor air quality certifications as defined in Part 1 of this specification.
****

Conform acoustical sealant to ASTM C834, nonstaining. [Provide sealants used on the interior of the building (defined as inside of the weatherproofing system)][in accordance with requirements of Section 07 92 00 JOINT SEALANTS.][that meet either emissions requirements of CDPH SECTION 01350 (limit the requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for Sealants.]

PART 3 EXECUTION

3.1 INSTALLATION

****
NOTE: Adhesive method of application should not be used for new construction. It may be used for application to existing ceiling surfaces in remodel work.
****

Do not install building construction materials that show visual evidence of biological growth.

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be

cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with ASTM C636/C636M and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than 152 mm 6 inch from each corner of each fixture.

3.1.1.2 Splayed Hangers

****

NOTE: The designer will add a detail to the construction drawings detailing the proper method of splaying and countersplaying hangers when hangers must be splayed (sloped or slanted) around obstructions.

****

Splay (slope or slant) hangers around obstructions, offsetting the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than 76 mm 3 inch from ends of each length and not more than 406 mm 16 inch on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

****

NOTE: In areas where the ceiling will be subject to impact or where lay-in ceiling units are subject to pressure differentials between the air plenum above the ceiling and the space below, units will be specified to be held in place with manufacturer's standard hold-down clips.

If the ceiling has a fire endurance rating or the panels weigh less than 4.9 kilograms per square meter 1.0 pound per square foot, hold down clips are required. Hold down clips may also be specified where frequent cleaning is required to prevent displacement during cleaning.
****

Install acoustical units in accordance with the approved installation instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with manufacturer's standard hold-down clips, if units weigh less than 4.9 kg/square meter 1 psf or if required for fire resistance rating.

3.1.4 Acoustical Sealant

****
NOTE: Specify acoustical sealant only when the space above the ceiling will be used as an air plenum, or when required to reduce sound transmission between rooms.
****

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.1.5 Adhesive Application

****
NOTE: Adhesive method of application should not be used for new construction. It may be used for application to existing ceiling surfaces in remodel work. Tiles larger than 300 by 600 mm 12 by 24 inch should not be attached by the adhesive method.
****

Wipe back of tile to remove accumulated dust. Daub acoustical units on back side with four equal daubs of adhesive. Apply daubs near corners of tiles. Ensure that contact area of each daub is at least 51 mm 2 inch diameter in final position. Press units into place, aligning joints and abutting units tight and uniform without differences in joint widths.

3.2 CEILING ACCESS PANELS

Locate ceiling access panels directly under the items which require access.

3.3 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

[3.4 RECLAMATION PROCEDURES

****

NOTE: If the job requires removal of acoustical ceiling systems, or acoustical units are left over from new construction, the decision to recycle must be weighed against the cost of packaging and transportation, especially in remote areas. Most mineral fiber and fiberglass ceilings can be recycled. The following ceiling tiles cannot be recycled: 1) Faced materials (vinyl faced, mylar, metal faced). 2) Molded or cast ceiling products and glue up ceiling tiles (either 300 by 300 mm 12 by 12 inch or 300 by 600 mm 12 by 24 inch panels). 3) Fiberglass panels. 4) Ceramic based tiles. 5) Some proprietary products.

****

Neatly stack completely dry ceiling tile, designated for recycling by the Contracting Officer, on 1219 by 1219 mm 4 by 4 foot pallets not higher than 1219 mm 4 foot. Shrink wrap and symmetrically stack pallets on top of each other without falling over.

] -- End of Section --