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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 18 July 2006

Revised throughout - changes not indicated by CHG tags
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DIVISION 09 - FINISHES

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04/06

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SECTION 09 51 00.00 40

ACOUSTICAL CEILINGS
04/06

****
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.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

This guide specification includes tailoring options for exposed grid system units, concealed grid system units, and metal pan units. Selection or deselection of a tailoring option will include or exclude that option in the section, but editing the resulting section to fit the project is still required.
****

PART 1 GENERAL

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

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

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

f. 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.

g. 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.

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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 A 1008/A 1008M	(2005a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A 167	(2004) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 489	(2004) Standard Specification for Carbon Steel Lifting Eyes
ASTM A 580/A 580M	(1998; R 2004) Stainless Steel Wire
ASTM A 641/A 641M	(2003) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A 653/A 653M	(2004a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 633	(1998e1) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C 423	(2002a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C 635	(2004) Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings

ASTM C 636	(2004) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C 834	(2001; R 2005) Standard Specification for Latex Sealants
ASTM E 119	(2000a) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E 1264	(1998; R 2005) Standard Classification for Acoustical Ceiling Products
ASTM E 1414	(2000a) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E 1477	(1998a; R 2003) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E 580	(2002e1) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint
ASTM E 795	(2000) Mounting Test Specimens During Sound Absorption Tests
ASTM E 84	(2005e1) Standard Test Method for Surface Burning Characteristics of Building Materials

U.S. ARMY CORPS OF ENGINEERS (USACE)

TI 809-04	(1998) Seismic Design for Buildings

UNDERWRITERS LABORATORIES (UL)

UL Fire Resist Dir	(2005) Fire Resistance Directory

1.2 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

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

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation 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

Approved Detail Drawings

Drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan.

SD-03 Product Data

Acoustical Ceiling Systems

Manufacturer's data shall be submitted indicating percentage of recycle material in acoustic ceiling tiles to verify affirmative procurement compliance.

Total weight and volume quantities of acoustic ceiling tiles with recycle material shall be submitted.

Manufacturer's catalog shall be submitted for the following items 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.

SD-04 Samples

Acoustical Units

Two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color.

SD-06 Test Reports

Fire Resistive Ceilings
Ceiling Attenuation Class and Test

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 Resist Dir may be submitted in lieu of test reports.

SD-07 Certificates

Acoustical Units

Certificate attesting that the mineral based acoustical units furnished for the project contain recycled material and showing an estimated percent of such material.

1.3 GENERAL REQUIREMENTS

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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 STC ratings, fire ratings, panel and suspension types on the drawings, keyed to finish schedules, rather than to include this data in the specification.
****

Acoustical treatment must consist of sound controlling units mechanically mounted on a ceiling suspension system. The unit size, texture, finish, and color must be 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 furnish I-P RLF, other ceiling elements like acoustical ceiling tiles, air diffusers, air registers and grills, shall also be I-P products. The Contractor shall coordinate the whole ceiling system with other details, like the location of access panels and ceiling penetrations, shown on the drawings. If I-P products are used, the Contractor shall be responsible for all associated labor and materials and for the final assembly and performance of the specified work and products. The location and extent of acoustical treatment shall be as shown on the approved detail drawings. Reclamation of mineral fiber acoustical ceiling panels to be removed from the job site shall be in accordance with paragraph RECLAMATION PROCEDURES.

1.3.1 Fire Resistive Ceilings

****
NOTE: Certified laboratory test reports for fire resistance rating and ceiling attenuation class

(CAC) cannot be obtained for ceiling assemblies which are nonstandard with the manufacturer. Therefore, where a fire resistance rating and/or ceiling sound transmission class are 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 Mil HDBK-1008, Fire Protection for Facilities Engineering, Design, and Construction. 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.

****

Acoustical ceiling systems indicated as fire resistant must be rated for fire endurance as indicated when tested in accordance with ASTM E 119. Suspended ceiling must have been tested 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. Ceiling assembly rating must be [[1] [1-1/2] [2] [3] [4] hour [concealed grid system] [exposed grid system]] [as shown on drawings]. Flame spread of acoustical units must be 25 or less and smoke development must be 50 or less when tested in accordance with ASTM E 84.

1.3.2 Ceiling Attenuation Class and Test

****

NOTE: Ensure that CAC rating chosen is coordinated with rating of walls detailed on the drawings. It is inappropriate to have high CAC rating for ceilings if walls nullify acoustical benefit.

Where room partitions do not extend to floor or roof deck above, ceiling plenum path may prevent acoustical privacy between rooms. Where required to provide adequate room to room sound attenuation, entire ceiling assembly including air terminals and light fixtures should have appropriate Ceiling Attenuation Class (CAC). Any penetration of ceiling assembly will destroy integrity of ceiling in this regard. Verify that other specification sections and drawings include appropriate data to ensure that these requirements are met for air terminals and light fixtures. For standard applications, specify CAC range of 35 - 39. A ceiling CAC range of 40-44 is recommended for all spaces where speech privacy is required and that are surrounded or sub-divided by partitions which do not extend to underside of floor or roof deck above. For classified conference rooms, executive offices, teleconferencing rooms and other occupancies requiring the highest degree of speech privacy, sound attenuation requirements will

have to be achieved by other means, most likely by high sound transmission class (STC) partition extending to the underside of floor or roof deck above.

****

The ceiling attenuation class (CAC) of the ceiling system must be [_____] for [_____] [and _____ for _____] when determined in accordance with ASTM E 1414. Provide fixture attenuators over light fixtures and other ceiling penetrations, and provide acoustical blanket insulation adjacent to partitions, as required to achieve the specified CAC. Test ceiling must be continuous at the partition and must be assembled in the suspension system in the same manner that the ceiling will be installed on the project.

1.3.3 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C 423 Test Method.

1.3.4 Light Reflectance

Determine light reflectance factor in accordance with ASTM E 1477 Test Method.

1.4 DELIVERY AND STORAGE

Materials must be delivered to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Materials mustbe carefully handled and stored in dry, watertight enclosures. Immediately before installation, acoustical units shall be stored 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

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

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period. Standard performance guarantee or warranty must contain an agreement to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

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.
****

Spare tiles of each color must be furnished at the rate of [_____] [5] tiles for each 1000 tiles installed. Tiles must be from the same lot as those installed.

PART 2 PRODUCTS

2.1 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 E 1264 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. 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 I - Cellulose composition with standard washable painted finish

Type II - Cellulose composition with plastic membrane-faced overlay

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

Type IX - Mineral composition with scrubbable pigmented or clear finish

Type X - Mineral composition with plastic/aluminum membrane

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 -

1. **Regularly large hole perforated**
2. **Randomly large hole perforated**
3. **Finely perforated**
4. **Fissured**
5. **Textured light to medium**
6. **Textured heavy**
7. **Smooth**
8. **Printed**
9. **Embossed**
10. **Embossed-in-register**
11. **Other (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.

Minimum ceiling attenuation class (CAC) formerly called ceiling sound transmission class (CSTC), requirement may be modified to minimum CAC rating of 35 or omitted for suspended ceiling systems where room-to-room sound attenuating requirements are less critical or are achieved by other means.

NRC Rating - Use NRC of 0.50 minimum only in spaces where sound control is not critical. For conference rooms, executive offices, teleconferencing rooms, and other occupancies where sound control is critical, use NRC 0.60 minimum. For open office environments, use NRC of 0.75 minimum.

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.

****

Contractor shall comply with EPA requirements in accordance with Section 01 62 35 RECYCLED / RECOVERED MATERIALS. Acoustical units shall conform to ASTM E 1264, Class A, and the following requirements:

2.1.1 AFFIRMATIVE PROCUREMENT

Mineral Wool, Cellulose, and Laminated Paperboard used in acoustic ceiling tiles are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (http://www.epa.gov/cpg/).

EPA's recommended Recovered Materials Content Levels for Mineral Wool, Cellulose, Structural Fiberboard and Laminated Paperboard are:

Product	Material	Percent of Post Consumer Materials	Percent of Total Recovered Materials
Laminate Paperboard	Post Consumer Paper	100	100
Rock Wool	Slag	75	
Cellulose	Post Consumer Paper	75	75

The recommended recovered materials content levels are based on the weight (not volume) of materials in the insulating core only.

****

NOTE: If the Architect/Engineer determines that use of certain materials meeting the CPG content standards and guidelines would result in inadequate competition, do not meet quality/performance specifications, are available at an unreasonable price or are not available within a reasonable time frame, the Architect/Engineer may submit to Contracting Officer a written justification and supporting documentation for not procuring designated items containing recovered material using the Recovered Materials Determination Form.

****

For informational purposes, a list of known sources for acoustical ceiling tiles using recycled material is provided in the EPA/CPG Supplier database at http://www.ergweb2.com/cpg4review/user/cpg_search.cfm.

Note that the Contractor is not limited to these sources. A product meeting CPG recycle requirements from other sources may be submitted for the Government's approval.

Contractor shall submit recycled material content data for acoustic ceiling tiles indicating compliance with affirmative procurement.

Contractor shall submit total weight and volume quantities of acoustic ceiling tiles with recycle material.

2.1.2 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.

****

a. Type: [I (cellulose composition)][III (non-asbestos mineral fiber with painted finish)] [IV (non-asbestos mineral fiber with membrane-faced overlay)] [IX (mineral fiber with scrubbable finish)] [X (mineral composition with plastic membrane)] [XI (mineral fiber with fabric faced overlay)] [XII (fiberglass base with membrane-faced overlay)].

b. Flame Spread: Class A, 25 or less

c. Pattern: [A] [B] [C] [D] [E] [F] [G] [I] [J] [K] [_____].

d. 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 E 795.

e. Minimum Light Reflectance Coefficient: [LR-1, 0.75 or greater] [_____].

f. Nominal size: [600 by 1200] [_____] mm [24 by 48] [_____] inch.

g. Edge detail: [Square] [Reveal] [Trimmed and butt] [_____].

h. Finish: Factory-applied [standard finish] [color finish].

i. Minimum CAC: [40] [_____].

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

a. Type: [I (cellulose composition)][III (non-asbestos mineral fiber with painted finish)] [IV (non-asbestos mineral fiber with membrane-faced overlay)] [IX (mineral fiber with scrubbable finish)] [X (mineral composition with plastic membrane)] [XI (mineral fiber with fabric faced overlay)] [XII (fiberglass base with membrane-faced overlay)].

b. Flame Spread: Class A, 25 or less.

c. Pattern: [A] [B] [C] [D] [E] [F] [G] [I] [J] [K] [_____].

d. Minimum NRC: [0.50] [_____] when tested on mounting Type B or Type E-400 of ASTM E 795.

e. Minimum Light Reflectance Coefficient: [LR-1, 0.75 or greater] [_____].

f. Nominal size: [300 by 300] [_____] mm. [12 by 12] [_____] inch.

g. Edge detail: [beveled] [square].

h. Joint detail: [kerfed and rabbeted] [tongue and grooved].

i. Finish: Factory-applied [standard finish] [color finish].

j. Minimum CAC: [40] [_____].

2.1.4 Metal Pans [A] [_____]

a. Type: [V, steel] [VI, ASTM A 167 stainless steel] [VII, aluminum] perforated pans with acoustical, non-asbestos, insulation backing.

b. Flame Spread: Class A, 25 or less.

c. Pattern: [A] [C] [I] [_____].

d. 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 E 795.

e. Minimum Light Reflectance Coefficient: [LR-1, 0.75 or greater] [_____].

f. Nominal size: [600 by 600] [_____] mm [24 by 24] [_____] inch.

g. Edge detail: Manufacturer's standard.

h. Joint detail: [Beveled] [_____].

i. Finish: Factory-applied standard finish.

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

2.1.5 Impact/Abrasion Resistant Units

a. Type: Non-asbestos mineral composition with a hardened mineral surface and factory applied white paint finish. Surface must be resistant to impact and abrasion.

b. Flame Spread: Class A, 25 or less.

c. Pattern: [_____].

d. Minimum NRC: [0.50] [_____] when tested on Mounting Type E-400 of ASTM E 795.

e. Minimum Light Reflectance Coefficient: LR-1, 0.75 or greater.

f. Nominal Size: [300 by 300] [600 by 600] [600 by 1200] mm [12 by 12] [24 by 24] [24 by 48] [_____] inch.

g. Edge Detail: [Square] [Beveled].

h. Joint Detail: [Trimmed and butted] [Kerfed and rabbeted].

2.1.6 Humidity Resistant Composition Units

a. 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. Panels must not sag or warp under conditions of heat, high humidity or chemical fumes.

b. Flame Spread: Class A, 25 or less.

c. Pattern: [_____].

d. Minimum NRC: [0.50] [_____] when tested on Mounting Type E-400 of ASTM E 795.

e. Minimum Light Reflectance Coefficient: LR-1, 0.75 or greater.

f. Nominal Size: [600 by 1200] [_____] mm [24 by 48] [_____] inch.

g. Edge Detail: Square.

2.1.7 Metal Faced Composition Units

a. [Type V (Steel facings with non-asbestos mineral composition absorbent backing).]

[Type VI (Stainless steel facings with non-asbestos mineral composition absorbent backing)]

[Type VII (Aluminum facings with non-asbestos mineral composition absorbent backing) with [anodized] [baked enamel] [acrylic] finish color [white] [_____].]

b. Flame Spread Class A, 25 or less.

c. Pattern: [_____].

d. 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. Base the tested NRC value on Mounting Type E-400 of ASTM E 795.

e. Minimum Light Reflectance Coefficient: LR-1, 0.75 or greater.

f. Nominal Size: 600 by [600] [1200] mm 24 by [24] [48] inch.

g. Edge Detail: Square.

h. Joint Detail: Trimmed and butted.

2.1.8 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.
****

Absorbers must be 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 C 423 and reported as a 4 frequency average.

2.2 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 90 COLOR SCHEDULE.

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 C 635 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 of Main Runner		
	Direct Hung	Indirect Hung	Furring Bar
Light Duty	7.38	2.95	6.64

Classification	kg/meter of Main Runner		
	Direct Hung	Indirect Hung	Furring Bar
Intermediate Duty	17.72	5.17	9.60
Heavy Duty	23.62	11.81	-

Classification	lb/Linear Foot of Main Runner		
	Direct Hung	Indirect Hung	Furring Bar
Light Duty	5.0	2.0	4.5
Intermediate Duty	12.0	3.5	6.5
Heavy Duty	16.0	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 bracketed phrase, in the last sentence, if no seismic details are provided.

****

Suspension system must be [[standard] [fire-resistive] [snap-in metal pan]] [[exposed-grid] [indirect hung concealed H and T or Z] [direct hung, concealed, downward access] [direct hung, concealed, upward access]] [[standard width flange] [narrow width flange] [narrow width slotted flange]] [as shown on drawings], and must conform to ASTM C 635 [for intermediate-duty systems] [for heavy-duty systems]. Surfaces exposed to view must be [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].

Wall molding must have a flange of not less than [23 mm 15/16 inch] [_____]. [Inside and outside corner caps] [[Standard] [Overlapped] [Mitered] corners] shall be provided. Suspended ceiling framing system musthave the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. The suspension system must have a maximum deflection of 1/360 of span length. Seismic details must conform to the guidance in TI 809-04 and ASTM E 580 [as shown on the drawings].

2.3 HANGERS

****

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

****

Hangers and attachment must support a minimum 1330 N 300 pound ultimate vertical load without failure of supporting material or attachment.

2.3.1 Wires

****

NOTE: Select stainless steel or nickel copper alloy wire for facilities where high humidity can be

expected such as large kitchens, dishwashing areas, indoor swimming pools, etc. Select zinc-coated steel wire for other locations.

When spacing of hanger wires exceeds 1200 mm (4 feet) or when heavy loads are supported, 3.4 or 4.1 mm (8 or 10 gage) wire should be specified.

****

Wires must conform to [ASTM A 641/A 641M, Class 1, [2.7] [_____] mm [0.11] [_____] inches in diameter.] [ASTM A 580/A 580M, composition 302 or 304, condition annealed stainless steel, [2.7] [_____] mm [0.11] [_____] inch in diameter.]

2.3.2 Straps

****

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

****

Straps must be 25 by 5 mm 1 by 3/16 inch galvanized steel conforming to ASTM A 653/A 653M, with a light commercial zinc coating or ASTM A 1008/A 1008M with an electrodeposited zinc coating conforming to ASTM B 633, Type RS.

2.3.3 Rods

****

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

****

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

2.3.4 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A 489. Eyebolt size must be a minimum [_____][1/4] inch [7] millimeter, [zinc coated][cadmium plated].

2.3.5 Masonry Anchorage Devices

Comply with [ASTM C 636][_____] for anchorage devices for [eyebolts][machine screws][wood screws].

2.4 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 shall remain

unchanged, i.e., if "sprinkler system" is omitted, the code number "6" will also be omitted from the listing.

****

Access panels must match adjacent acoustical units and must be designed and equipped with suitable framing and fastenings for removal and replacement without damage. Panel must be not less than 300 by 300 mm 12 by 12 inch or more than 300 by 600 mm 12 by 24 inch.

a. An identification plate of 0.8 mm 0.03 inch thick aluminum, 19 mm 3/4 inchin diameter, stamped with the letters "AP" and finished the same as the unit, be attached 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. The plates or buttons must be 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 must be 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) [_____]

2.5 ADHESIVE

****

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

****

Adhesive shall be as recommended by tile manufacturer.

2.6 FINISHES

Acoustical units and suspension system members must have manufacturer's standard textures, patterns and finishes as specified. Ceiling suspension system components must be treated to inhibit corrosion.

2.7 COLORS AND PATTERNS

Colors and patterns for acoustical units and suspension system components shall be as specified in Section 09 06 90 COLOR SCHEDULE.

2.8 ACOUSTICAL SEALANT

Acoustical sealant shall conform to ASTM C 834, nonstaining.

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.
****

Examine surfaces to receive directly attached acoustical units for uneveness, irregularities, and dampness that would affect quality and execution of the work. Areas where acoustical units will be cemented must be free of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Interior finish work such as plastering, concrete, and terrazzo work must be completed and dry before installation. Mechanical, electrical, and other work above the ceiling line must be completed and approved prior to the start of acoustical ceiling installation. Acoustical work must be provided complete with necessary fastenings, clips, and other accessories required for a complete installation. Mechanical fastenings must not be exposed in the finished work. Hangers must be laid out for each individual room or space. Hangers must be placed to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Main runners and carrying channels must be kept clear of abutting walls and partitions. At least two main runners must be provided for each ceiling span. Wherever required to bypass an object with the hanger wires, a subsuspension system must be installed, so that all hanger wires will be plumb.

3.1.1 Suspension System

Suspension system must be installed in accordance with ASTM C 636 and as specified herein. There must be no hanger wires or other loads suspended from underside of steel decking.

3.1.1.1 Plumb Hangers

Hangers must be plumb and must not press against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, hangers must be provided at a minimum of four hangers per

fixture and located not more than 150 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.
****

Where hangers must be splayed (sloped or slanted) around obstructions, the resulting horizontal force shall be offset by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Wall molding must be provided where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Wall molding must be secured not more than 75 mm 3 inch from ends of each length and not more than 400 mm 16 inch on centers between end fastenings. Wall molding springs must be provided 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.
****

Acoustical units must be installed in accordance with the approved installation instructions of the manufacturer. Edges of acoustical units must be in close contact with metal supports, with each other, and in true alignment. Acoustical units must be arranged so that units less than one-half width are minimized. Units in exposed-grid system must be held in place with manufacturer's standard hold-down clips, if units weigh less than 5 kg per square meter 1 psf or if required for fire resistance rating.

3.1.4 Caulking

****
NOTE: Specify caulking 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. Contact area of each daub shall be at least 50 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

Ceiling access panels must be located directly under the items which require access.

3.3 CLEANING

Following installation, dirty or discolored surfaces of acoustical units must be cleaned and left free from defects. Units that are damaged or improperly installed must be removed and new units provided 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 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 305 by 305 mm 12 by 12 inch or 305 by 610 mm 12 by 24 inch panels). 3) Fiberglass panels. 4) Ceramic based tiles. 5) Some proprietary products.
****

Ceiling tile, designated for recycling by the Contracting Officer, shall be neatly stacked on 1220 by 1220 mm 4 by 4 ft pallets not higher than 1220 mm 4 ft. Panels must be completely dry. Pallets shall then be shrink wrapped and symmetrically stacked on top of each other without falling over.

-- End of Section --