TIPS:

Editor's Notes to the specifier are in hidden text in highlighted boxes as Word Style CMT. These may be deleted from final copy if desired by searching for Style CMT in the "Find What" dialog and leaving "Replace With" empty.

To view non-printing Editor's Notes that provide guidance for editing, do the following:
Word 2003 - On the Tools menu, click Options, and then click the View tab. Under Formatting marks, select Hidden Text
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Notice: The information in this specification is subject to change without notice. USG assumes no responsibility for any errors that may inadvertently appear in this specification.

GENERAL NOTES TO SPECIFIER:

This Specification Section has been prepared to assist design professionals in the preparation of project or office master Specifications. It follows guidelines established by the Construction Specifications Institute (CSI), and therefore may be used with most master Specification systems with minor editing.

Electronic versions of this specification utilize automatic paragraph numbering based on Microsoft Word style formatting. To adjust levels of paragraphs assign appropriate style name (i.e. ART, PR1, PR2, etc.) and numbering will automatically adjust.

Edit this specification carefully by deleting and inserting text to suit Project-specific requirements. Modify as necessary and delete items that are not applicable. Verify that referenced Section titles are correct. (Titles and Section Numbers referenced are based on CSI MasterFormat, 2020 edition).

This is written as a closed proprietary specification. Review and modify to suit Project requirements and specifiers' practice. Optional items requiring selection by the specifier are enclosed within brackets, e.g. **[35]** **[40]** **[45]**. Make appropriate selections and delete others including the brackets themselves. Items requiring additional information are enclosed within brackets with single bracketed guillemets, e.g. **[<insert option here>]**. Revise header and footer to suit project/office requirements.

Sustainability requirements such as LEED are marked with green highlight thusly.

When editing is complete, delete all text on this page, then remove the page break at the top of the next page to remove this page from the document.

This Section assumes the Project Manual will contain complete Division 01 documents. Close coordination with Division 01 Sections is required. If the Project Manual does not contain the following sections, additional information should be included under the appropriate articles.

Section 01 25 00 - Substitution Procedures (if substitutions are to be allowed)
Section 01 33 00 - Submittal Procedures
Section 01 62 00 - Product Options
Section 01 66 00 - Product Storage and Handling Requirements
Section 01 74 00 - Cleaning and Waste Management
Section 01 77 00 - Closeout Procedures
Section 01 78 00 - Closeout Submittals

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PRODUCT INFORMATION
 For the most up-to-date technical information, visit usgdesignstudio.com or cgcdesignstudio.com
CUSTOMER SERVICE
 USG: 800 950-3839
 CGC: 800 387-2690
TECHNICAL SERVICE
 800 USG.4YOU (874-4968)
WEBSITES
 usg.com
 cgcinc.com
 usgdesignstudio.com
 cgcdesignstudio.com
SAMPLES/LITERATURE/FAX
 USG: usg.com
 CGC: Contact Local Sales Rep

SECTION 09 54 23 – Planx™ universal - LINEAR METAL CEILINGS

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section includes the following:

Linear metal panels for **[interior ceilings]** **[and]** **[exterior enclosed soffits]**.

Suspended metal support system and perimeter trim

Supplementary **[acoustical]** insulation over system.

* + - * 1. Related Requirements:

Retain Sections in subparagraphs below that contain requirements Contractor might expect to find in this Section but are specified in other Sections. Add other Sections as required.

Division 07 Section "Thermal Insulation."

Division 08 Section "Access Doors and Panels."

Division 09 Section "Gypsum Board Assemblies" for metal framing products.

Division 09 Section " Acoustical Ceilings" for metal suspension system

Division 09 Section "Acoustical Metal Pan Ceilings."

Division 09 Section "Metal Pan Ceilings."

Facility Services Subgroup Sections (Division 20-29) for fire protection, plumbing, HVAC, electrical, communications, electronic safety and security products interfacing with work of this Section.

* + - 1. REFERENCES
				1. Definitions:

NRC: Noise Reduction Coefficient.

* + - 1. adminstrative requirements
				1. Preinstallation Meetings: Conduct at **[Project site]** minimum **[one week]** **[prior to commencing work of this Section]** **[prior to purchasing materials for mock-up]**.

Retain options below for interior installations as required.

* + - * 1. Coordination: Coordinate layout and installation of linear metal panels and suspension system with other construction that penetrates ceilings or is supported by them, including **[partition assemblies]** **[fire-suppression system]** **[HVAC equipment]** **[light fixtures]** **[\_\_\_\_]**.
			1. ACTION SUBMITTALS
				1. See Division 01 Section **["Submittal Procedures"]** **["Administrative Requirements"]** for procedures.
				2. Product Data: For each type of product including linear panel profiles, suspension members, perimeter and integral trim, and accessories required to provide a complete installation.
				3. Shop Drawings: Indicate reflected ceiling plan,

Show overall and end joint pattern and joint locations, penetrating mechanical and electrical components with edge details, perimeter details at junction with walls, columns, and other structures, trim and molding details, and details at dissimilar materials.

Seismic Design: Include seal and signature of design professional on each drawing.

Mockup Drawings: Provide plans, sections, and elevations, indicating materials and size of mockup construction.

Indicate manufacturer and model number of individual components.

Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

Retain first paragraph below if Drawings do not include detailed plans or if Project involves unusual coordination requirements.

* + - * 1. Coordination Drawings: In accordance with Division 01 Section **["Project Coordination"]** **["Administrative Requirements"]** and including the following:

Locations of fire suppression, plumbing, HVAC, electrical lighting, speakers, and other devices and components penetrating ceilings.

Points of suspension showing relationship to above ceiling ductwork and pother obstructions.

Minimum Drawing Scale: **[1/4 inch = 1 foot (1:50)]** **[1/8 inch = 1 foot (1:100)]**.

* + - * 1. Samples: For **[each type and color of]** the following exposed products **[for initial selection]** **[and again]** **[for verification]**.

Sample Size: 12 inches (300 mm) in length for the following:

Linear metal panels. Include a spliced section.

Suspension system members.

Exposed molding and trim.

Reveal/filler strips.

Acoustical backer.

End caps.

* + - 1. INFORMATIONAL SUBMITTALS

Retain first paragraph below if products are required to withstand specific design loads and other criteria and Architect either has delegated design responsibility to Contractor or wants to review structural data as another way to verify product's compliance with performance requirements.

* + - * 1. Delegated-design submittal for design of **[seismic restraints and ]**attachment devices. Include design **[data]** **[calculations]** for products indicated to comply with seismic and other design loads for which design is assigned to Contractor.
				2. Test and Evaluation Reports: As follows:

Product test reports.

Retain option in first paragraph below if required by the International Building Code.

Evaluation reports for linear metal ceiling and components**[ and anchor type]**.

Retain paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports for hangers, anchors, and fasteners.
				2. Sustainable design submittals in accordance with Division 01 Section "Sustainable Design Requirements" as applicable to products specified in this Section.
				3. Qualification Statements for **[manufacturer]** **[installer]** **[design professional]** **[Contractor's testing agency]**.
			1. CLOSEOUT SUBMITTALS
				1. Maintenance data.
			2. MAINTENANCE MATERIAL SUBMITTALS
				1. Extra Stock Materials: Furnish prior to Substantial Completion.

Revise subparagraph below to suit Project. If preferred, replace percentage with a specific number of metal panels and pieces of each suspension component and their lengths.

Furnish **[extra panels]** in quantity equal to **[two]** **[\_\_\_\_]**percent of total material furnished.

Furnish **[extra exposed molding and trim]** in quantity equal to **[two]** **[\_\_\_\_]** percent of total material furnished.

Furnish extra **[carriers and accessories]** in quantity equal to **[two]** **[\_\_\_\_]** percent of total material furnished.

* + - 1. QUALITY ASSURANCE
				1. Qualifications:

Installer Qualifications: A firm or individual experienced and specializing in installing, applying, or erecting work comparable in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

Retain first paragraph below if Contractor or manufacturer selects testing agency or if Contractor is required to provide services of a qualified testing agency in "Field Quality Control" Article. Qualification requirements are in addition to those specified in Division 01 Section "Quality Requirements," which also includes the definition for "NRTL" (nationally recognized testing laboratory).

Contractor's Acoustical Testing Agency Qualifications: Qualified according to ISO/IEC 17025, ASTM E329, and ASTM E699 with the experience and capability to conduct testing and inspecting indicated and meeting the following, with additional qualifications specified in individual Sections, and, where required, that is acceptable to authorities having jurisdiction.

Design Professional Qualifications: Professional engineer experienced in providing design and engineering services of the kind indicated and who is licensed or registered in jurisdiction in which Project is located who assumes responsibility for the following:

Preparation of comprehensive seismic design and analysis data.

Data may be based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project, unless otherwise indicated.

Preparation of engineering calculations.

Preparation of shop drawings and other submittals.

* + - * 1. Mockups:

Field Mockups:

Location: **[As directed.]** **[As indicated on Drawings.]**

Size: **[\_\_\_\_]** feet long by **[\_\_\_\_]** feet wide.

In addition to other requirements, approval of field mockups is for finish, color, and workmanship.

Integrated mockups are large scale assemblies of building components used to demonstrate how the various components interrelate and to establish the finished quality and performance of these integrations. Integrated mockups are often located separately from the building but may also be in-place portions of the building. Mockup drawings are often required and should be mentioned under submittals.

Integrated Mockups: An integrated **[exterior]** **[interior]** **[room]** mockup is required involving work of this Section. Refer to Division 01 Section "MOCKUPS” for complete description of integrated mockup. Provide work of this Section as required to construct integrated mockups.

Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

Retain 1st option below for in-place mockups. Retain 2nd option if mockups were built in other than final locations and/or are intended for demolition.

**[Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.]** **[Remove mockups prior to Substantial Completion or earlier if directed by the Architect.]**

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. Deliver products to Project site in an undamaged condition in manufacturer's original, undamaged packaging with seals unbroken, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
				2. Protect materials, including finishes, during handling and installation to prevent damage.

Protective covering below is only available for some finishes. Verify with manufactuer prior to retaining.

Protect finishes on exposed metal surfaces from damage by applying a strippable, **[UV-resistant,]** temporary protective covering before shipping.

Remove strippable protective coverings prior to installation.

Protect strippable protective covering from exposure to sunlight and high humidity, except to extent necessary for the period of installation.

* + - 1. field CONDITIONS
				1. Ambient Conditions: Do not install interior linear metal ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
			2. WARRANTY

Refer to USG SC2102 for warranty details

* + - * 1. Manufacturer's Standard Ceiling Product Warranty: **[Manufacturer agrees]** **[Manufacturer and Installer agree]** to repair or replace components of linear metal ceiling assemblies that fail in materials within specified warranty period. Failures include, but are not limited to, the following:

Rusting, corrosion, or other finish failures.

Excessive sagging or deflection.

Warranty Period: One year from date of Substantial Completion.

1. PRODUCTS
	* + 1. MANUFACTURERS
				1. Basis of Design Product: Subject to compliance with requirements, provide USG Ceilings Plus® PLANX™ Universal Linear Metal Panel System by USG Ceilings Plus, LLC.

Retain one or both paragraphs below to indicate if specification is closed or open.

Comparable products by other manufacturers **[will]** **[will not]** be considered.

Substitutions **[will]** **[will not]** be considered. Comply with provisions of Division 01 Section **["Substitution Procedures."]** **["Price and Payment Procedures."]**

* + - * 1. Single-Source Responsibility: Provide linear metal ceiling assemblies and suspension components through one source from a single manufacturer**[, unless otherwise acceptable to Architect]**.
			1. PERFORMANCE / design criteria

Linear metal panels and suspension systems are suitable for exterior enclosed soffit applications, and for conditioned interior spaces.

Perform engineering analysis or delegate the responsibility to a qualified professional engineer. Retain paragraph below to delegate design responsibility to Contractor. Retain option below for projects in ASCE/SEI 7-22 Seismic Design Categories C, D, E, and F. Verify requirements of authorities having jurisdiction.

Normally retain paragraph below for exterior installations, Delete for interior-only installations in non-seismic areas if not required.

* + - * 1. Delegated Design: Professional services are specifically required of Contractor to design **[seismic restraints and ]**attachment devices. Engage a qualified design professional to design linear metal ceilings, using performance requirements and design criteria specified herein.
				2. Structural Performance Requirements: Provide linear metal ceilings, including anchorages, capable of withstanding, without failure, **[exterior exposure and ]**the effects of gravity loads **[, earthquake motions]** and the following loads and stresses within limits and under conditions indicated, without showing permanent deformation of ceiling system components including panels and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling units; or permanent damage to fasteners and anchors.

Design to support imposed loads of indicated elements without eccentric loading of supports. Where supported elements may induce rotation of ceiling system components, provide stabilizing reinforcement.

Retain subparagraph below for exterior applications.

Insert specific loads determined by Project's structural engineer in subparagraph below or indicate on Drawings. Model building codes and ASCE/SEI 7-22 set criteria for building components and claddings subject to wind loads. Verify requirements of authorities having jurisdiction.

Design Wind Loads: **[As indicated on Drawings.]**

Horizontal Deflection: Limited to 1/360 of the unsupported length.

Retain below for projects in ASCE/SEI 7-22 Seismic Design Categories C, D, E, and F. Verify requirements of authorities having jurisdiction.

Seismic Criteria: Design and install linear metal ceilings to withstand the effects of earthquake motions according to the following:

ASCE/SEI 7-22, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures."

Comply with ASTM E580/E580M "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions".

Comply with CISCA's "Seismic Construction Handbook."

* + - * 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Flame-Spread Index: 25 or less.

Smoke-Developed Index: 50 or less.

* + - * 1. Acoustical Performance Requirements: Provide linear metal ceilings identical to those tested by a qualified testing agency for the following acoustical properties in accordance with test methods indicated:

Noise-Reduction Coefficient (NRC): Identical to linear metal ceilings tested for sound-absorption performance in accordance with ASTM C 423, and rated for not less than NRC indicated.

Subparagraph below represents standard mounting referenced in ASTM E 1264.

Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface in accordance with ASTM E 795.

Retain paragraph and subparagraphs below for exterior applications.

* + - * 1. Thermal Performance Requirements:

Provide linear metal ceilings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, reduction of performance, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Differential values in subparagraph below (for aluminum in particular) are suitable for most of the U.S.

Temperature Change (Range): **[120 deg F (69 deg. C)]** **[\_\_\_\_]**, ambient; **[180 deg F (82 deg. C)]** **[\_\_\_\_]**, material surfaces.

Green Building Certification standards vary by organization. Organizations include, but are not limited to, LEED (Leadership in Energy and Environmental Design), Energy Star, BREEAM (the Building Research Establishment Environmental Assessment Method), Green Globes, Living Building Challenge, NGBA (National Green Building Standard), GreenGuard, WELL Building Standard, TX-CHPS (Texas Collaborative for High Performance Schools) and others.

Modify wording of requirements below and elsewhere to suit appropriate green building certification requirements. Refer to a certified professional for additional advice on proper wording.

Retain paragraph below for sustainably designed projects where requirements are spelled out in Division 01. Optionally insert desired outcomes in this Section, however do not repeat requirements specified elsewhere.

* + - * 1. Sustainability Characteristics: In accordance with Division 01 Section "SUSTAINABLE DESIGN REQUIREMENTS."
			1. LINEAR METAL CEILING PANELS

Reveal channels and acoustic backing are optional. Retain if desired.

* + - * 1. Linear metal ceilings consist of factory-formed and -finished linear metal panels or panels and custom suspension system complete with carriers, panel splice sections, **[reveal channels,]** **[acoustic backing,]** hold down clip, panel security/closure clip, panel end cap, panel retention clips, perimeter U-mold, access panels, hangers, edge moldings and trim, load-resisting struts, fixture adapters, trim, accessories, and other suspension components required to support ceiling units and other ceiling-supported construction and to provide a complete installation.
				2. Acoustical Metal Panel Standard: Provide manufacturer's standard linear metal panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, acoustical ratings, and light reflectances unless otherwise indicated.

Classification: **[Type C, Form C1, perforated, metal panels with mineral- or glass-fiber backing.]** **[Type C, Form C2, non-perforated, metal panels with mineral- or glass-fiber backing.]** **[Type XX, other types non-perforated, metal panels without backing.]** **[Type XX, other types [<describe>]**.]

* + - * 1. Metal Panels, General: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated to snap on and be securely retained on carriers without separate fasteners, and finished to comply with requirements indicated.

Thickness: Not less than **0.032 inch (0.81 mm).**

Panel Splices: Construction same as panels, in lengths and manufacturer's standard mill finish.

Perforation Pattern: Round, 0.0625 inch perforations on 45 degree pattern alignment.

1st options in three subparagraphs below apply to CD06319 pattern. 2nd options in three subparagraphs below apply to CD06310 pattern.

Pattern Designation: **[CD06319]** **[CD06310] [<insert custom option>]**.

Open Area: **[19]** **[10]** **[<insert custom option>]** percent.

Retain below if perforated panels are specified. Coordinate value retained with perforation pattern and sound absorber selected.

1st option applies to CD06319 pattern with Acoustibond backer. 2nd option applies to CD06310 pattern with Acoustibond backer. Higher NRC values may be achieved with additional acoustical infill, contact your USG Sales Rep.

NRC: Not less than **0.80 [<insert custom option>]**.

Select style or styles desired from the following four paragraphs.

Optional custom panel sizes are available with the following minimum/maximum dimensions:
• Length: 2 feet up to 12 feet
• Width: 2 inches up to 12 inches
• Depth: 2 inches up to 4 inches

* + - * 1. Optional Reveal Panel Size and Panel Face Width: **[4 inch (101.6 mm) module size with 3-1/16 inch (77.79 mm) panel face width.]** **[6 inch (152.4 mm) module size with 5-1/16 inch (128.59 mm) panel face width.]** **[8 inch (203.2 mm) module size with 7-1/16 inch (179.39 mm) panel face width.]** **[10 inch (254 mm) module size with 9-1/16 inch (230.19 mm) panel face width.]** **[12 inch (304.8 mm) module size with 11-1/16 inch (280.99 mm) panel face width.]** **[As indicated on Drawings.]**

Panel Depth: **[One inch (25.4 mm) deep.]** **[As indicated.]**

* + - * 1. No Reveal Panel Face Width: **[4 inch (101.6 mm) panel face width.]** **[6 inch (152.4 mm) panel face width.]** **[8 inch (203.2 mm) panel face width.]** **[10 inch (254 mm) panel face width.]** **[12 inch (304.8 mm) panel face width.]** **[As indicated on Drawings.]**

Panel Depth: **[One inch (25.4 mm) deep.]** **[As indicated.]**

* + - * 1. Integral Reveal Panel Size and Panel Face Width: **[4 inch (101.6 mm) module size with 3-1/16 inch (77.79 mm) panel face width.]** **[6 inch (152.4 mm) module size with 5-1/16 inch (128.59 mm) panel face width.]** **[8 inch (203.2 mm) module size with 7-1/16 inch (179.39 mm) panel face width.]** **[10 inch (254 mm) module size with 9-1/16 inch (230.19 mm) panel face width.]** **[12 inch (304.8 mm) module size with 11-1/16 inch (280.99 mm) panel face width.]** **[As indicated on Drawings.]**

Panel Depth: **[One inch (25.4 mm) deep.]** **[As indicated.]**

* + - * 1. Deep Box Panel Size and Panel Face Width: **[4 inch (101.6 mm) module size with 3-1/16 inch (77.79 mm) panel face width.]** **[6 inch (152.4 mm) module size with 5-1/16 inch (128.59 mm) panel face width.]** **[8 inch (203.2 mm) module size with 7-1/16 inch (179.39 mm) panel face width.]** **[As indicated on Drawings.]**

Panel Depth: **[Two inches (50.8 mm) deep.]** **[Four inches (101.6 mm) deep.]** **[As indicated.]**

Retain 3rd option below for proprietary USG Sarante finish. Retain 4th option below for generic Sarante finish. Retain 5th option below for proprietary USG Timbre finish. Retain 6th option below for generic Timbre finish.

* + - * 1. Panel Face Finish: **[Painted]** **[Anodized]** **[Sarante® - PVC-free, dimensionally simulated woodgrain applied to recycled aluminum] [Laminated plastic wood grain patterned color finish]** **[**Timbre™ - High definition coil coated wood grain directly applied to recycled aluminum] **[Direct-applied wood grain patterned color finish]**.
				2. Panel Accessories:

Panel Splices: Aluminum shapes fabricated to maintain panel alignment at joints.

Finish: Mill finish.

Retain below for cloud applications and where panels terminate at other than walls and other vertical surfaces where panel ends would be exposed.

End Caps: Metal caps fabricated to fit and conceal exposed ends of panels.

Finish: Match panels.

Optional Reveal Filler Strips: Snap-in aluminum shapes; fabricated to uninterruptedly close voids between panels.

Design: Recessed.

Finish: **[Matte black]** **[Match panels]** **[<insert as required>]**.

* + - 1. METAL SUSPENSION SYSTEMS
				1. Metal Suspension Systems Standard: Provide ceiling manufacturer's custom direct-hung metal suspension system formed to accept panels of types and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
				2. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.**[ Comply with seismic design requirements.]**

Subparagraph below does not apply to power-actuated fasteners. Delete if no anchorage to concrete is required. Verify safety factors with Project's structural engineer. Revise testing methods below if required by authorities having jurisdiction.

Postinstalled **[and Cast-in-Place]** Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching suspension hangers of type indicated capable of sustaining, without failure, a load equal to **[5]** **[<insert required safety factor>]**times that imposed by ceiling construction, as determined by testing by a qualified testing and inspecting agency in accordance with ASTM E 488 or ASTM E 1512 as applicable.

Anchor Type: Postinstalled **[expansion]** **[or]** **[bonded]** **[Cast-in-place]**.

Retain one of three options below. Retain 1st option for indoor atmosphere with rare condensation and subject to minimum wear or abrasion; revise thickness to suit more corrosive conditions or use stainless steel or nickel-copper alloy, depending on conditions. If postinstalled expansion anchors are used to attach nickel-copper-alloy wire hangers and braces, consider retaining nickel-copper anchors after verifying availability with manufacturers.

Anchor Material: **[Carbon-steel components zinc plated in accordance with ASTM B 633, Class Fe/Zn 5 for Class SC 1 service condition.]** **[Stainless-steel components in accordance with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.]** **[Components fabricated from nickel-copper-alloy rods in accordance with ASTM B 164 for UNS No. N04400 alloy.]**

Retain below if power-actuated fasteners are allowed. Verify safety factor with Project's structural engineer. Revise testing methods below if required by authorities having jurisdiction.

Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated capable of sustaining, without failure, a load equal to **[10]** **[<insert required safety factor>]** times that imposed by ceiling construction, as determined by testing by a qualified testing and inspecting agency in accordance with ASTM E 1190.

* + - * 1. Suspension Hangers, Braces, and Ties: Size components as required by ASTM C754 and by required delegated design.

Normally retain below.

Wire Hangers: Conform to requirements of ASTM C754 and the following:

Retain one of three material options below. Revise hangers to strap type if required by authorities having jurisdiction or by local union regulations.

Material: **[Zinc-coated, carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.]** **[Stainless-steel wire; ASTM A 580/A 580M, Type 304, nonmagnetic.]** **[Nickel-copper-alloy wire; ASTM B 164, nickel-copper-alloy UNS No. N04400.]**

Retain last option in "Size" Subparagraph below if required by authorities having jurisdiction or if desired for extra security and quality (including corrosion allowance). Because large sizes are difficult to work with, their use could result in poor leveling tolerance.

Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than **[0.106 inch (2.69 mm)]** **[0.135 inch (3.43 mm)]** diameter wire.

If retaining subparagraph below, insert member sizes or show sizes and locations on Drawings.

Rigid Hangers: Conform to requirements of ASTM C754 and the following. Assemble with bolted connections using minimum 1/4 inch diameter bolts or machine screws with hex nuts.

Protective Coating Finish:

Interior Applications: Conform to requirements of ASTM C645 or AISI S220.

Exterior Applications: Conform to requirements of ASTM C955 or AISI S240.

Rod and Flat Hangers: Formed from steel conforming to Specification A1008/A1008M.

Angle and Channel Hangers: Cold-formed from steel with a minimum 33,000 psi (228 MPa) yield strength and 0.0538 in. (1.37 mm) minimum bare steel thickness.

Retain below for projects in ASCE/SEI 7-22 Seismic Design Categories C, D, E, and F. Coordinate with manufacturer's requirements and authorities having jurisdiction.

Rigid Braces: Conform to requirements of ASTM E580 and the following:

Conduit Braces: EMT conduit per Article 358 of the NEC, size as required by design.

Stud Braces: Cold-formed metal framing, size and gage as required by design.

* + - * 1. Suspension-System Material: Manufacturer's standard cold-rolled steel sheet, not less than 0.021 inch (0.74 mm) nominal thickness, with factory-applied zinc coating and, where visible in finished assembly, with factory-applied paint finish in matte-black color.

Retain 1st option below for interior locations. Retain 2nd option below for exterior locations. Retain 3rd option below for manufacturer's standard finish.

Factory-Applied Zinc Coating: **[Electrolytic zinc-coated steel]** **[Hot-dip galvanized steel]** **[Manufacturer's standard protective zinc finish]**.

Factory finish components with matte-black paint finish.

* + - * 1. Carriers: Factory **[painted]** **[or coil-coated]**.

Main Tee Carrier Assemblies: Fabricated with profile to allow panels to snap-on at appropriate intervals.

Cross Tees: Designed to snap into main tees at 48 inches (1220 mm) on center.

Carrier Channels: For direct-mount ceiling and wall applications. Fabricated with profile to allow panels to snap-on at appropriate intervals.

* + - * 1. Edge Moldings and Trim: Provide manufacturer's standard U-shaped channel wall moldings **[that comply with seismic design requirements]** for perimeter panel edges terminating at walls, and to conceal edges of column penetrations through ceiling, to conceal ends of panels and carriers, for fixture trim and adapters, and for other conditions. Form from metal and finish matching linear metal panels.

For circular penetrations of ceiling, fabricate edge moldings to diameter required to fit penetration exactly.

* + - * 1. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main tee carriers at regular intervals and at light fixtures, air-distribution equipment, and other equipment; spaced as standard with manufacturer for use indicated.

Retain below for projects in ASCE/SEI 7-22 Seismic Design Categories C, D, E, and F. Coordinate with manufacturer's requirements and authorities having jurisdiction.

* + - * 1. Seismic Components:

Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

Compression posts may consist of lengths of metal studs or EMT conduit secured to hanger wires or rigid hangers and braces specified above. Verify sizes, gage, and spacing with a qualified structural design professional in compliance with applicable codes.

Compression Posts: Provide compression posts, framing or bracing as required to accommodate wind uplift and seismic forces.

Panel Retention Clips: Manufacturer's standard seismic clips designed and spaced to secure panels in place.

* + - * 1. Panel Retention Clips: Manufacturer's standard clips located as standard with manufacturer.

Retain below for exterior installations to comply with uplift and lateral bracing requirements for wind load. Coordinate with other requirements of manufacturer.

* + - * 1. Bracing Channels and Angles for Exterior Locations: Cold-rolled steel, hot-dip galvanized to comply with ASTM A 653/A 653M, G90 coating designation; size and profile as required to withstand wind load.
				2. Suspension-System Accessories:

Cut Panel Retention Clips: Fabricate to hold cut panels in proper location.

Perimeter U-Mold Hold Down Clips: Fabricate to hold cut panels down at wall molding.

* + - 1. Acoustic Materials

Coordinate thickness and density of retained acoustic materials with Project's acoustical performance requirements.

Selected acoustical fabric in first two paragraphs below is factory installed in the panel profiles. Retain desired type. Acoustical fabric in first paragraph below is available if additional acoustic insulation is desired for placement in the grid space above the panels.

* + - * 1. Sound-Absorbent, Natural Fiber Insulation: Recycled denim and cotton fibers saturated with a borate fire retardant and treated with an EPA registered fungal inhibitor; black-coated; formaldehyde free; surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing in accordance with ASTM E 84.

Thickness: **[One inch (25.4 mm)]** **[1-1/2 inches (38.1 mm)]** **[Two inches (50.8 mm)]**.

Density: **[3 lb/cu. ft. (0.048 g/cu cm)]** **[1-1/2 lb/cu. ft. (0.024 g/cu cm)]**

Size to fit concealed surface of panels and bond to panels in the factory with manufacturer's standard adhesive.

Post-Industrial Recycled Content: 85 percent.

Basis of Design Product: UltraSorb by USG Ceilings Plus, LLC.

* + - * 1. Sound-Absorbent Acoustical Fabric: Nonwoven acoustical fabric; surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing in accordance with ASTM E 84.

Size to fit concealed surface of panels for field installation.

Post-Industrial Recycled Content: **[<insert as required>]** percent.

Color: **[Black]** **[Natural] [White]**.

Basis of Design Product: Acoustibond™ by USG Ceilings Plus, LLC.

* + - 1. MATERIALS
				1. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.

**[Aluminum Sheet]**: Roll-formed aluminum sheet, complying with ASTM B 209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

Total recycled content is finish dependent and excludes hardware.

Recycled Materials Content: Up to 90% total recycled content.

**[Steel Sheet]**: Commercial-quality, cold-rolled, carbon-steel sheet; with protective coating complying with ASTM C 635.

* + - 1. PANEL FACE FINISH, GENERAL REQUIREMENTS
				1. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.

Protective covering below is only available for some finishes. Verify with manufactuer prior to retaining.

* + - * 1. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
				2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
			1. ALUMINUM FINISHES

Retain finishes in paragraphs below to suit Project. If retaining more than one, indicate location of each on Drawings or by inserts.

* + - * 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

Anodized finishes are not suitable for exterior use.

* + - * 1. Color Anodic Finishes:

Interior Locations: AAMA 611, AA-M32A32/A34, Architectural Class II, 0.4 to 0.7 mil (0.01016 to 0.01778 mm) thick.

Color: **[Brushed Aluminum PIA12]** **[Polished Chrome PM61]**.

* + - * 1. Pigmented Organic Paint Finish: Manufacturer's standard baked enamel coatings.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Color: **[Flat White 050]** **[Silver Satin 002]** **[Blanco Mat®]** **[Matte Black]** **[As [indicated]** **[ or, if not indicated, as ]**selected from manufacturer's full range.] **[Match Architect's sample.]**

* + - * 1. Laminated Plastic Wood Grain Patterned Color Finish: Manufacturer's **[Sarante®**] finish comprised of a dimensionally simulated wood grain pattern color printed on a PVC-free plastic blend film which is laminated to the metal sheet.

Retain below for SARANTE finishes.

 CP Maple S32, Red Birch S13, Sable Walnut S18, and Natural Walnut S38 finishes are available for interior and exterior.

Color: **[Oak Line S22]** **[Blond Pear S15]** **[Dark Jatoba S37] [Crème Ovang S11]** **[Blond Teak S21]** **[Golden Oak S31]** **[Valley Maple S12N]** **[CP Maple S32]** **[Honey Anigre S33N2]** **[Golden Birch S23N]** **[Red Birch S13]** **[Natural Ovang S25]** **[Cherry Anigre S34]** **[Cinnamon Cherry S14N]** **[Grey Cedar S24N]** **[Cherry Birch S35N2]** **[European Cherry S36N]** **[Tan Sawn Oak S16N]** **[Dark Oak S17]** **[Forest Walnut S27]** **[Earth Rosewood S26]** **[Sable Walnut S18]** **[Natural Walnut S38] [As [indicated]** **[ or, if not indicated, as ]** **[selected from manufacturer's full range]]**.

Retain below for Timbre® finishes.

* + - * 1. Direct-Applied Wood Grain Patterned Color Finish: Manufacturer's standard **[Timbre®]** coil-coated finish comprised of an AAMA 2605 PVDF wood grain patterned color finish applied to the metal panels.

Color: **[Maple 4010]** **[VG Fir 4011]** **[Red Birch 4012]** **[Golden Glow Oak 4198]** **[Walnut 4014]** **[Roasted Chestnut 4197]** **[Mahogany 4015]** **[Cherry 4013]** **[Driftwood 4199] [As [indicated]** **[ or, if not indicated, as ]** **[selected from manufacturer's full range]]**.

* + - 1. STEEL SHEET FINISHES
				1. Galvanized Protective Finish:

Retain 1st option below for interior locations. Retain 2nd option below for exterior and high-humidity locations.

Zinc-Coated (Hot-Dip Galvanized) Steel: ASTM A 653/A 653M, not less than **[G30 (Z90)]** **[G90 (Z275)]** zinc coating per side.

Retain 1st option below for interior locations. Retain 2nd option below for exterior and high-humidity locations.

Zinc-Iron Alloy-Coated (Galvannealed) Steel: ASTM A 653/A 653M, not less than **[A25 (ZF75)]** **[A60 (ZF180)]** zinc-iron alloy coating per side.

* + - * 1. Pigmented Organic Paint Finish: Manufacturer's standard baked enamel comparable in performance to AAMA 621 coatings.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Color: **[Matte black]** **[<insert as required>]**.

1. EXECUTION
	* + 1. EXAMINATION
				1. Verification of Conditions:

Examine areas and conditions, including structural framing and substrates to which linear metal ceiling assemblies attach or abut**[, with installer present,]** for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of the Work.

Verify major above-ceiling work is complete. Layout hangers to avoid interfering with other above-ceiling work.

Proceed with installation only after unsatisfactory conditions have been corrected.

* + - 1. PREPARATION

Retain below for wall-to-wall installations. If retaining option ensure Coordination Drawings are requested in Part 1 - General Article titled "Action Submittals".

* + - * 1. Measure each ceiling area and establish layout of linear metal panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width or less-than-half-length panels at edges, and comply with layout shown on reflected ceiling plans **[and Coordination Drawings]**.
				2. Coordinate linear metal ceiling assembly layout with **[fire suppression work, ]** **[mechanical work, ]** **[electrical fixtures, ]** and other suspended or permanent construction that penetrates the ceiling.

Delete below if not required.

* + - * 1. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
			1. INSTALLATION

Retain ASTM E580/E580M option below for projects in ASCE/SEI 7-22 Seismic Design Categories C, D, E, and F.

* + - * 1. Install suspension system in accordance with ASTM C 636/C 636M**[, ASTM E580/E580M,]** manufacturer's written instructions, and as specified herein.
				2. Remove **[strippable protective covering]** as metal products are installed, unless otherwise indicated in manufacturer's written installation instructions.
				3. Suspend ceiling hangers from building's structural members as follows:

Attach hangers to structural members or to post-installed anchors**[ or power-actuated fasteners]** that extend through permanent metal forms or floor deck into concrete.

Retain or delete three subparagraphs below as desired.

**[Do not support ceilings directly from permanent metal forms or floor deck.]**

A note in SDI Publication No. 31, "SDI Specifications and Commentary for Composite Steel Floor Deck," Article 5, that includes the caution: "Improper use of rolled-in hanger tabs could result in the overstressing of such tabs and/or the overloading of the composite deck slab." Suspended-ceiling failures and excessive deck deflection have been attributed to overloaded tabs.

**[Do not attach hangers to steel deck tabs.]**

In a significant development, late in 2002, SDI changed its long-held position recommending against suspending loads from roof deck. Commentary in SDI Publication No. 31 for steel roof deck stating that "suspended ceilings, light fixtures, ducts, or other utilities shall not be supported by the steel deck" has been eliminated. Retain or delete subparagraph below as desired.

**[Do not attach hangers to steel roof deck.]**

Install carrying channels or other supplemental support, designed to support imposed loads, for attachment of hanger wires in the following locations:

Where spacing of structural members does not permit installation of hanger wires at spacing required.

Where ductwork, equipment, and other non-structural items within ceiling plenum interfere with hanger spacing.

Retain 1st option below in states other than California. Retain 2nd option below for ceilings in hospitals and schools based on requirements issued by the Division of the State Architect in California. ASTM C 636/C 636M requires three full turns (360 degrees each) within a 3 inch length. California requires four.

Secure bracing wires to ceiling suspension members and to supports **[in accordance with specified standards.]** **[with a minimum of four tight turns.]** Suspend bracing from building's structural members as required for hangers. Fasten bracing wires into concrete with **[postinstalled]** **[or]** **[cast-in-place]**anchors **[or power-actuated fasteners]**.

Delete subparagraph above or first subparagraph below unless both types of hangers are required and their locations are indicated on Drawings or by inserts.

Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

Retain below for projects in ASCE/SEI 7-22 Seismic Design Categories C, D, E, and F. Coordinate with manufacturer's requirements and authorities having jurisdiction.

Install rigid braces as required to withstand the effects of earthquake motions

Retain below for applications where ceilings abut walls or columns.

* + - * 1. Install edge moldings and trim of type indicated at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal panels.

Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches (76 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.658 m). Miter corners accurately and connect securely.

Delete subparagraph below or revise if exposed fasteners are allowed. Modify if pop-rivets are allowed.

Do not use exposed fasteners, including pop rivets, on moldings and trim.

* + - * 1. Install suspension system carriers so they are aligned and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
				2. Cut linear metal panels for accurate fit at borders and at interruptions and penetrations by other work through ceilings.
				3. Install linear metal panels in coordination with suspension system and exposed moldings and trim.

Retain subparagraph below if panel orientation is shown on Drawings. Show direction of metal panels on Drawings.

Install linear metal panels oriented as indicated on Drawings.

Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.

Select one of five options in subparagraph below.

Install panels with butt joints **[aligned]** **[aligned, every other panel length]** **[staggered a minimum of 12 inches (305 mm)]** **[random]** **[as indicated]** using internal panel splices.

Where metal panel ends are visible, install end caps unless trim is indicated.

Retain subparagraph below if applicable.

Install filler strips where indicated.

Specified acoustical fabric is factory installed in the panel profiles. Retain paragraph and subparagraphs below if additional acoustic insulation is retained in Part 2 above.

* + - * 1. Install sound-absorbent acoustic insulation as ceilings are installed in thickness, extent, and in locations indicated..

Install sound-absorbent pads at right angle to perforated metal panels so pads do not hang unsupported.

Retain paragraph above or below and delete the other.

Install sound-absorbent insulation blankets/batts **[over entire area of linear metal ceilings]** **[over linear metal ceilings in widths extending 48 inches (1200 mm) on both sides of partitions that do not extend to floor above]**.

Maintain minimum 3 inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

Retain paragraph below if above ceiling access is required. Indicate sizes and location on reflected ceiling plan Drawings.

* + - * 1. Plenum Access Panels: Fabricate upward accessible assembly, according to manufacturer's instructions, for plenum access at locations indicated.
			1. FIELD QUALITY CONTROL

Retain this Article if desired or required by authorities having jurisdiction. ASCE/SEI 7 requires special inspections for suspended ceiling systems in certain seismic categories. Verify requirements of applicable building code and authorities having jurisdiction.

* + - * 1. Special Inspections: **[Owner will engage]** **[Engage]** a qualified special inspector to perform the following special inspections:

Compliance with seismic design.

Retain paragraph below, with or without "Special Inspections" Paragraph above, to identify who will perform tests and inspections. If retaining 2nd option below, retain "Field quality-control reports" paragraph in "Informational Submittals" Article.

* + - * 1. Testing Agency: **[Owner will engage]** **[Engage**] a qualified testing agency to perform tests and inspections and prepare test reports.

Retain paragraph below to require Contractor to perform tests and inspections. Testing requirements are examples only and apply only to ceilings with hangers attached to concrete by power-actuated fasteners and postinstalled anchors.

* + - * 1. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.

Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

Verify loadings in two subparagraphs below with structural engineer based on ceiling loadings and seismic zone where Project is located.

Within each test area, testing agency will select one of every 10 power-actuated fasteners and post‑installed anchors used to attach hangers to concrete and will test them for **[200 lbf (890 N)]** **[<insert as required>]** of tension; it will also select one of every two post‑installed anchors used to attach bracing wires to concrete and will test them for **[440 lbf (1957 N)]** **[<insert as required>]** of tension.

When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

See Division 01 Section "Quality Requirements" for retesting and reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.

* + - * 1. Linear metal ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
				2. Prepare test and inspection reports.

Insert other field quality-control procedures required for Project.

* + - 1. CLEANING

Refer to USG IC518 for cleraning instructions.

* + - * 1. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing remaining strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION

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