

## **SECTION 09 54 26 - LINEAR WOOD CEILINGS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following linear wood ceiling systems:
  - 1. Exterior ceilings and soffits.
  - 2. Interior linear wood ceilings, soffits, and headwalls.
- B. Single Subcontract Responsibility: For requirements of single subcontract responsibilities under linear wood ceiling scope of work to include framing modules and supports. Framing modules and supports are to be fabricated from one of the following sections:
  - 1. Section 05 40 00 "Cold-Formed Metal Framing".
  - 2. Section 05 50 00 "Metal Fabrications".
- C. Related Requirements:
  - 1. Refer to Division 01 Sections for requirements regarding:
    - a. LEED credit achievement goals as summarized by the LEED Scorecard attached to Section 01 81 13 "Sustainable Design Requirements."
    - b. Requirements for documentation of LEED credits.
    - c. Payment application requirements as they relate to LEED documentation requirements.
  - 2. Section 01 91 19.43 "Exterior Enclosure Commissioning" for requirements related to exterior enclosure commissioning website, checklists, submittals, mockups, field observations, and testing".

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's technical data for each type of ceiling unit and suspension system required. Include product ambient temperature and relative humidity ranges coordinated with Mechanical Contract Documents.
- B. Sustainable Design Submittals:
  - 1. Completed "LEED Criteria Worksheet", for each component material of the product or assembly used in the installation of Work of this Section. Refer to Section 01 81 13 "Sustainable Design Requirements".

### **LINEAR WOOD CEILINGS**

09 54 26 - 1

2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
  3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
  4. Chain-of-Custody Qualification Data: For manufacturer and vendor.
  5. Product Data:
    - a. For composite wood products, indicating that product contains no urea formaldehyde.
    - b. For recycled content, indicating postconsumer and preconsumer recycled content and cost.
    - c. For installation adhesives, sealers, and stains, indicating VOC content.
  6. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
  7. Environmental Product Declaration (EPD): For each product.
  8. Health Product Declaration (HPD): For each product.
- C. Shop Drawings:
1. Submit shop drawings of the linear wood ceiling, soffit, and headwall work, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
    - a. Patterns of suspension system members with setting out/work points.
    - b. Joint patterns.
    - c. Method of attaching hangers to building structure.
      - 1) Furnish layouts for steel anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
    - d. Ceiling/Soffit/Headwall -mounted items including, but not limited to, lighting fixtures, speakers, and access panels.
    - e. Ceiling/Soffit/Headwall perimeter and penetrations through the ceiling, soffit, and headwall; trim and moldings.
    - f. Minimum Drawing Scale: 1/4" = 1'-0". Include details, at a minimum of 3" = 1'-0" scale, indicate detailing for the lineal wood ceiling system in relationship with adjoining construction.
  2. Sequencing and Phasing: Indicated on shop drawings the sequencing and phasing plans, proposed locations and methods, and approximate amount of crews working at each sequence or phase.
- D. Samples: Submit samples of each component indicated and for each exposed finish required, prepared on samples of size indicated below:

## LINEAR WOOD CEILINGS

09 54 26 - 2

1. Submit 12-inch long samples of exposed wall molding and suspension system, including hangers, main runners and cross tees; or connections to framing and support modules.
2. Submit samples for each type of wood plank, slat, fabric layer, and backer blade, with surfacing required, approximately 24-inches long and of same thickness and material indicated for the Work and showing the full range of characteristic variations expected.
3. Submit samples for interior and exterior applications with stepped application of clear sealers, ranging from bare wood, demonstrating each coating application, and final finish. Stepped application shall not be less than 6-inches per coat on wood planks 24-inch long by full width of plank.

### **1.3 INFORMATIONAL SUBMITTALS**

- A. **Structural Calculations:** Submit, for information only, copies of structural calculations indicating complete compliance with the specified performance requirements. Include calculations to show that maximum deflections do not exceed specified performance requirements under full design loading. Calculations shall be prepared, signed and sealed by a Professional Engineer registered in the State of Pennsylvania.
  1. Include design calculations for seismic restraints, including analysis data signed and sealed by the qualified engineer responsible for their preparation registered in the Project location.
- B. **Material Certificates:** Submit product certificates for each type of product, signed by product manufacturer.
- C. **Product Test Reports:** For each linear ceiling, for tests performed by a qualified testing agency.
- D. **Evaluation Reports:** Submit evaluation reports for the following, from ICC-ES:
  1. Anchors used for ceiling suspension attachments.
- E. **Letter of Compliance:** Submit signed letter of compliance as indicated in Article "Quality Assurance".

### **1.4 CLOSEOUT SUBMITTALS**

- A. **Maintenance Data:** For finishes to include in maintenance manuals.

## **LINEAR WOOD CEILINGS**

Package Number: T5  
Package Name: Terminal Interiors, M-P-E-FP, AV/IT,  
Security, Signage, and Landscape  
ACAA Project Number: TBD  
Project Manual Volume 3 of 3  
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09 54 26 - 3

## **1.5 MAINTENANCE**

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Ceiling Plank, Slat, fabric layers, and Backer Blade Units: Furnish quality of full-size plank, slat and backer blade units equal to 2 percent of amount installed.

## **1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Subcontract the linear wood ceilings work to a firm that has specialized in linear wood ceilings for interior and exterior conditions; who has successfully produced work similar in design and extent to that required for the Project; with not less than three (3) projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance of not less than five (5) years. The manufacturer shall have sufficient production capacity, have organized quality control, and published written and illustrated installation manuals, to produce and properly install linear wood ceiling assemblies without causing delay in the progress of the Work.
1. The manufacturer and installer may be one and the same entity.
- B. Installer Qualifications: Engage an Installer, who is authorized, licensed, certified or otherwise approved by linear wood ceiling manufacturer; with not less than five (5) years experience in the installation of materials specified; and who has completed linear wood ceilings similar in material, design, and extent to that indicated for this Project - as determined by Architect; and with a record of successful in-service performance. Provide project names, locations, completion dates, names and telephone numbers of each project's architect and owner.
- C. Letter of Compliance: Submit written statement signed by Contractor, linear ceiling installer, and linear ceiling manufacturer, stating that selected linear ceiling system complies with mechanical performance as indicated on the Mechanical Contract Documents with no detrimental effects. This compliance includes, but not limited to, the following:
1. No failures in material or workmanship as a result of Mechanical design ambient temperature and relative humidity. Failures includes warping, cupping, swelling, shrinking, cracking, and veneer delamination.
- D. Source Limitations:
1. Wood Products: Obtain each species, grade, and cut of wood from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

## **LINEAR WOOD CEILINGS**

09 54 26 - 4

2. Suspension Products: Provide linear wood ceiling suspension components from one source with resources to provide products of consistent quality in physical properties, and performance.
- E. Standards: Comply with the applicable provisions and recommendations of the following standards below, where standards, these specifications and the drawings conflict the more stringent shall apply:
1. Architectural Woodwork Standards, 2nd edition, published jointly by AWI, AWMAC, and WI.
  2. Baltic Birch Plywood Standards:
    - a. Japanese Agricultural Standard for Plywood for General Use, JPIC/JAS.
    - b. Russian Intergovernmental Standard GOST 3916.1 as maintained by the Euro-Asia Council for Standardization, Metrology and Certification (EASC).
- F. Fire Performance Characteristics: All Linear Ceilings:
1. Linear ceiling systems shall comply with the following to avoid and maintain plenums free from fire sprinkler systems:
    - a. Small openings, inclusive of but not limited to, gaps between the planks, gaps adjacent to other construction, and gaps accommodated for devices and systems, shall not exceed 20 percent of the ceiling, ceiling plane, or construction feature in accordance with NFPA 13, Section 8.15.1.2.1.2.
- G. Fire Performance Characteristics: Wood Products:
1. Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with classification marking of inspecting and testing organization in the form of separable paper label or, where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.
    - a. Surface Burning Characteristics: Class A (Class 1); not exceeding a flame spread of 25, and smoke developed of 50 when tested per ASTM E 84 for 30 minutes.
    - b. Fire-Retardant Treated Materials: Provide fire-retardant materials through the pressure process impregnation or other permanent means during manufacture in accordance with NFPA 703; NFPA 13, Section 8.15.1.2.11; NFPA 13, Appendix A8.15.1.2.11; and 2018 IBC, Section 2303.2.
      - 1) Moisture content of fire-retardant treated wood shall not exceed 19 percent for lumber and 15 percent for panels.

## LINEAR WOOD CEILINGS

09 54 26 - 5

- c. Spacing of Fire-Retardant Materials: The aggregate area of spacing (gaps) between linear wood ceiling, soffit, or headwall planks or slats shall not exceed 20 percent of the respective total area of such linear wood ceiling, soffit, or headwall assembly in order to maintain Class A (Class 1) assembly rating.
- d. Fire-Retardant Chemicals: Clear, non-washing, non-staining, non-discoloring, non-leaching, non-white turning upon washing or aging solution, and that does not bleed through or otherwise adversely affect wood finish.
  - 1) Exterior: Use Category UC3B, Above Ground Exposed.
  - 2) Interior: Use Category UC1, Interior Dry.
- H. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- I. Forest Certification: Provide linear wood ceiling systems produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- J. Pre-Construction Mockups:
  - 1. General: Engage the Owner to identify suitable locations on-site, e.g. hangars, where to locate pre-construction mockups for the duration of construction.
    - a. Environmental Conditioning: Maintain ambient temperature and relative humidity in accordance with Mechanical Contract Documents. Relative humidity shall not exceed 30 percentage point range.
  - 2. Construct pre-construction mockups, as indicated on Drawings or if not indicated on Drawings, then as directed by Architect, but not less than the following to verify design intent, range of aesthetic effects, and set quality standards for materials and execution. The pre-construction mockups shall be complete in every way utilizing actual materials, components, accessories, connections, and finishes as specified in the Contract Documents and accepted on the final submittals. The pre-construction mockup shall include attachments to structure, joints, moldings, trims, light fixtures, air inlets and outlets, speakers, sprinkler heads, and heat and smoke detectors.
    - a. Pre-construction mockups shall include respective linear wood ceiling, soffit, and headwall framing modules and supports. Refer to the following sections:
      - 1) Section 05 40 00 "Cold-Formed Metal Framing".
      - 2) Section 05 50 00 "Metal Fabrications".
    - b. Linear Wood Ceilings: Construct pre-construction mockups for each of the following linear wood ceilings assemblies, inclusive of respective framing modules and supports, for each of the following as indicated on Drawings:

## LINEAR WOOD CEILINGS

09 54 26 - 6

- 1) Exterior:
    - a) Concave module.
    - b) Trapezoid module.
    - c) Flat module, inclusive of non-visible ceiling access panels constructed of same linear wood ceiling system.
    - d) Typical example of trim, joints, termination at roof fascia, termination at curtain wall, and penetration.
    - e) Typical example of service access panels for maintenance of adjacent curtain wall assembly.
    - f) Insect screening.
  
  - 2) Interior:
    - a) Concave module.
    - b) Convex module.
    - c) Trapezoid module.
    - d) Headwall module.
    - e) Flat module, inclusive of non-visible ceiling access panels constructed of same linear wood ceiling system.
    - f) Typical example of trim, joints, termination at curtain wall, termination at clerestory, transition from ceiling to headwall, and column penetration.
    - g) Roller window shade integration into linear wood ceiling system.
    - h) Typical example of service access panels.
- c. Remediate and revise as required pre-construction mockups to obtain acceptance by Architect. Document remediations and revisions in final submittals.
  - d. Obtain Architect's acceptance of sample pre-construction mockups before starting the Work.
  - e. Retain and maintain pre-construction mockups during construction in undisturbed conditions as a standard for judging completed unit of Work.

- K. In-Place Sample Installations: After the construction and acceptance of pre-construction mockups, construct in-place sample installations, as indicated on Drawings or if not indicated on Drawings, then as directed by Architect, but not less than the following for the final linear wood ceiling, soffit, and headwall assemblies.
1. General: In-place sample installations will be used as a standard for judging acceptability of work for the Project. Replace unsatisfactory work as directed. Maintain in-place sample installations during construction as a standard for acceptability of linear wood ceiling work. Properly finished, maintained, and performing in-place sample installations shall be retained as a portion of the completed work.

## LINEAR WOOD CEILINGS

09 54 26 - 7

- a. Environmental Conditioning: Maintain ambient temperature and relative humidity in accordance with Mechanical Contract Documents. Relative humidity shall not exceed 30 percentage point range.
2. Provide in-place sample installations of at least one structural bay of primary columns demonstrating the following:
    - a. Exterior linear wood soffit area and its terminations at roof fascia and exterior curtain wall.
    - b. Exterior linear wood soffit area and its termination at clerestory roof fascia and clerestory curtain wall.
    - c. Interior linear wood ceiling, its transition to headwall, and termination at clerestory.
    - d. Interior linear wood ceiling demonstrating typical ceiling curvatures.
    - e. Include linear wood ceiling access panels where required.
  3. Refer to the following sections for related materials and requirements for incorporation into the in-place sample installations.
    - a. Section 05 40 00 "Cold-Formed Metal Framing".
    - b. Section 05 50 00 "Metal Fabrications".
    - c. Section 07 62 00 "Sheet Metal and Flashing".
    - d. Section 08 44 13 "Glazed Aluminum Curtain Walls".
- L. Pre-installation Conference: Conduct conference at Project site to comply with requirements in General and Supplementary Provisions. Prior to the start of the linear wood ceiling work, and at the Contractor's direction, meet at the site and review the construction schedule, availability of materials, installers personnel qualifications, equipment and facilities needed to make progress and avoid delays, installation procedures, and coordination with other work. Meeting shall include Contractor, Owner, Architect, Mechanical Engineer, exterior enclosure commissioning agent, linear wood ceiling installer, linear wood ceiling manufacturer technical representative, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the linear wood ceiling work.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver linear wood ceiling components, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle ceiling units carefully to avoid chipped edges or other damage to units in any way.

## **LINEAR WOOD CEILINGS**

09 54 26 - 8



## **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install linear wood ceiling work until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
  - 1. Conditioning period begins not less than seven days before delivery linear wood ceiling materials, is continuous through installation, and continues through Final Acceptance.
  - 2. Prior to delivery of linear wood ceiling materials, assure ambient temperature and relative humidity complies with Mechanical Contract Documents.
- B. Permit linear wood ceiling materials to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation. (Remove plastic wrap to allow panels to climatize).
- C. Field Measurements: Where linear wood ceiling work is indicated to fit to other construction, verify actual dimensions of other construction by accurate field measurements before fabrication of linear wood ceiling work; and indicate measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating linear ceiling work without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## **1.9 COORDINATION**

- A. Coordinate layout and installation of the linear wood ceiling and suspension system with other construction that penetrates ceilings or is supported by them, including building insulation, light fixtures, HVAC equipment, fire-suppression systems.

## **1.10 WARRANTY**

- A. Special Warranty: Submit a written warranty executed by the manufacturer and installer, agreeing to repair or replace planks, slats, backer blades, components, and grid systems that fail within the warranty period. Upon notification of such defective work, and within the warranty period, make the necessary repairs and replacements at the convenience of the Owner. Failures include, but are not limited to:
  - 1. Wood Planks, Slats and Backer Blades:
    - a. Defects in materials, finishes, or factory workmanship.

### **LINEAR WOOD CEILINGS**

09 54 26 - 9

- b. Failures indicated in Letter of Compliance.
  - 2. Grid System: Rusting and manufacturing defects.
  - 3. Special Warranty shall not exclude failures indicated in Letter of Compliance.
- B. Warranty Period:
  - 1. Wood Planks, Slats and Backer Blades: Five (5) years from date of Final Acceptance.
  - 2. Aluminum Planks with natural wood veneer finish, powder coat wood grain finish, or wood grain film finish: Ten years from date of Final Acceptance.
  - 3. Grid: Ten years from date of Final Acceptance.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. General: Provide linear wood ceiling assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Structural Performance: Provide exterior linear ceiling assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
  - 1. Wind Loads: The exterior linear ceiling assemblies work shall be designed, fabricated and installed to withstand the maximum upward and downward wind pressures as required by the 2015 IBC and ASCE 7, and RWDI Report, which ever is most stringent; for components and cladding using the following design parameters:
    - a. Basic Wind Speed:  $V_{ult}$  120 mph (ultimate).
    - b. Exposure Category: C.
    - c. Risk Category: III.
    - d. Internal Pressure Coefficient: +/- 0.18.
    - e. Structural Engineer Calculated Wind Pressures: As indicated on Structural Drawings.
  - 2. Deflection Limits: The deflection of exterior linear ceilings in a direction normal to the plane of the soffit when subjected to the full code required wind loads specified above shall not exceed 1/360 of the distance between supports when subjected to an upward and downward uniform pressure.

## **LINEAR WOOD CEILINGS**

09 54 26 - 10

- C. Seismic Performance: Linear ceiling shall withstand the effects of earthquake motions determined according to IBC and ASCE/SEI 7 for the geographic location of the site.
- D. Acoustical Performance: Linear ceiling system shall be capable of achieving an Noise Reduction Coefficient (NRC) of not less than 0.70.
  - 1. Provide micro-perforated linear ceiling system of perforation sizes, shapes, and patterns as required to achieve specified NRC.
  - 2. Location: Interior only.
- E. Mechanical Performance: Provide and continuously maintain an interior environment conducive for linear wood ceilings in accordance to Mechanical Contract Documents, or if not indicated, then as follows:
  - 1. Ambient Temperature: Acceptable range from 65 to 75 degrees F.
  - 2. Relative Humidity: Acceptable range from 30 to 60 percent relative humidity. Exceedance below or above stated range is detrimental to linear wood ceilings and is not acceptable.
- F. Select linear wood ceiling assembly component thicknesses and forming methods resulting in non-delaminating, sag, and warp free appearance.
- G. Wood Finish Performance: Provide factory or shop -applied, finish or coating that is UV, humidity, moisture, and weather -resistant, compatible with wood veneer, and not excluded from specified warranties.
- H. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- I. Thermal Movements: Fabricate the exterior linear ceiling to accommodate for such expansion and contraction of component materials, and supporting elements, as will be caused by surface temperatures ranging from +0 to +180 deg F, without causing buckling, opening of joints, delamination of veneers, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Dimensions shown on Drawings are based on an assumed design temperature of +70 deg F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.
- J. Design Modifications:
  - 1. Submit design modifications necessary to meet the performance requirements and field coordination.
  - 2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components.

## LINEAR WOOD CEILINGS

09 54 26 - 11

3. Maintain the general design concept without altering size of members, profiles and alignment.

## **2.2 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide linear ceiling systems by one of the following:
  1. Architectural Components Group, Inc. (AGCI), an Armstrong World Industries, Inc. company.
  2. 9Wood, Inc.
  3. Rulon International.
  4. Linder Group.
  5. CertainTeed Wood Ceilings (formerly Norton Industries, Inc.)
  6. CAP Architectural Products (formerly Hunter Douglas Architectural).
- B. Proposals: Each manufacturer identified above shall provide a complete proposal, including pricing, for each basis-of-design and acceptable alternate systems listed below.
  1. Interior Linear Ceilings:
    - a. Basis-of-Design: System: Continuous appearance metal linear plank substrate with natural wood veneer finish.
    - b. Acceptable Alternate: System: Continuous appearance plywood linear plank substrate with natural wood veneer finish.
  2. Exterior Linear Ceilings:
    - a. Basis-of-Design: System: Continuous appearance metal linear plank substrate with powder coat wood grain finish.
    - b. Acceptable Alternate: Continuous appearance plywood linear plank substrate with natural wood veneer finish.

## **2.3 WOOD PRODUCTS, GENERAL**

- A. Regional Materials: The following wood products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
  1. Wood Veneers.
- B. Wood Veneers:
  1. Species, Matching, and Cut for Transparent Finish: Complying with AWS Sections 4 and 5, and the following:

### **LINEAR WOOD CEILINGS**

09 54 26 - 12

- a. (WD##) Veneer: Plain sliced, book matched, White Oak, complying with HPVA HP-1, Grade AA.
  - 1) Final Veneer Selection: As determined by Architect.
  - 2) Veneer Stain: As determined by Architect.
2. Source of Veneer: From working and managed forests, and sawmills located in the State of Pennsylvania.
  - a. Basis-of-Design Primary Wood Source:
    - 1) Forest Land Owner: The Lyme Timber Company, 23 South Main Street, 3rd Floor, Hanover, New Hampshire 03755; Tel: (603) 643-3300.
    - 2) Forest Management: Three Rivers Forest Management, LLC, 990 Richmond Highway, Tappahannock, Virginia 22560; Tel: (434) 531-0456.
    - 3) Sawmill: Emporium Hardwoods Incorporated, 15970 PA-120, Emporium, Pennsylvania 15834; Tel: (814) 486-3764.
  - b. Basis-of-Design Wood Veneer Manufacturer:
    - 1) Danzer Veneer Americas, 119 Aid Drive, Darlington, Pennsylvania 16115; Tel: (724) 827-8366; Web: [www.danzer.com](http://www.danzer.com).
      - a) Contact: Bard Presler; Tel: (412) 310-6578; Email: [bard.presler@danzer.com](mailto:bard.presler@danzer.com).
      - b) Contact: Greg Lottes; Tel: (717) 262-3612; Email: [greg.lottes@danzer.com](mailto:greg.lottes@danzer.com).
- C. Certified Wood: All lumber, plywood, and composite wood shall be certified as "FSC Pure" according to FSC STD-01-00 and FSC STD-40-004.
- D. Composite Wood: All composite wood shall meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low emitting formaldehyde (ULEF) resin OR no added formaldehyde resins (NAUF); OR comparable European Norm (EN) Standard. Any composite wood labeled "no added formaldehyde" does not meet these criteria.
- E. Adhesives, General: Use only low emitting VOC adhesives that leave no glue lines on finished surfaces of linear wood ceilings work. Do not use adhesives that contain urea formaldehyde.
  1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Wood Glues: 30 g/L.
    - b. Contact Adhesives: 250 g/L.

## LINEAR WOOD CEILINGS

09 54 26 - 13

2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's (CDPH) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers", Standard Method v1.2-2017.

- F. Adhesives for Veneers: Manufacturer's recommended exterior grade, moisture resistant, adhesive.

## **2.4 LINEAR WOOD VENEER CEILING, WOOD SUBSTRATE**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide custom linear wood ceiling, soffit, and headwall products by Architectural Components Group, Inc. (ACGI) an Armstrong World Industries, Inc. company, based on Linear System, or comparable products, acceptable to the Architect, by one of the manufactures specified in this Section:
- B. Linear Wood Ceiling Components:
  1. Fabrication, General: Comply with applicable provisions for workmanship of AWS Architectural Woodwork Standards, Section 3 for Premium Grade, and the requirements shown and specified, where standards conflict the more stringent shall apply.
  2. Planks and Slats:
    - a. Exterior and Interior Core Composition: Exterior grade, multi-ply, 100 percent Baltic Birch, surfaced 2 sides (S2S), JPIC/JAS Standard Grade B/BB or GOST 3916.1 Standard Grade I (B, S), and adhered with exterior moisture resistant adhesive. Provide plywood core with 19 percent maximum moisture content. The adhesive shall be of type as recommended by the plywood manufacturer for exterior exposure and high humidity conditions. The core shall be factory sealed with a moisture resistant sealer of a type as recommended by the manufacturer for exterior exposure and high humidity conditions.
      - 1) Core Product: Exterior Grade, Baltic Birch Plywood.
        - a) Basis-of-Design: SVEZA; SVEZA Regular Exterior.
      - 2) Thickness: 3/4-inch (19 mm).
    - b. Veneer and Species: As specified in this Section.
    - c. Veneer Adhesive: As recommended by the linear wood ceiling manufacturer for exterior exposure, weather, moisture, and high humidity conditions at the Project site. Veneer adhesive shall be identical for all interior and exterior conditions.
    - d. Surface Texture: Smooth.
    - e. Fire-Resistance: Class A (Class 1).

## **LINEAR WOOD CEILINGS**

09 54 26 - 14

- f. Finish: Selection of clear or stain finishes shall be such that the aesthetic effects remains the same between interior and exterior finishes, as determined by the Architect.
  - 1) For Exterior and Interior Locations: Manufacturer's recommended exterior grade, UV, humidity, moisture, and weather -resistant finish specifically formulated for wood applications.
    - a) Color: Clear, unless otherwise directed by Architect.
    - b) Gloss: Matt or Satin.
    - c) Known manufacturers and products includes, but are not limited to, the following:
      - i) SIRCA; 6OPU901s01G30.
      - ii) Seal It Green Sealant & Wood Treatment Products; XTREME Marine Wood Sealer & Stain Treatment.
      - iii) Cutek America; Cutek Extreme with Colourtone.
      - vi) Penofin; Architectural Marine Grade Transparent Natural Satin Coating or TMF Hardwood.
  - g. Plank and Slat Size: Width and length as indicated on Drawings.
- 3. Acoustical Materials: Manufacturer's standard to provide NRC rating indicated for perforation pattern required.
- 4. Interior Fabric Layer: Non-flammable, sound-absorbent, fiber felt fabric material as recommended by manufacturer for closed plenum and the conditions at the Project site.
  - a. Size: Full width by full length of gap between slats and planks.
  - b. Fire-Resistance: Class A (Class 1).
  - c. Color: As selected by Architect from manufacturer's full range.
- 5. Exterior Fabric Layer: Non-flammable, bird and insect resistant, and weather resistant fabric material as recommended by manufacturer for closed plenum and the conditions at the Project site.
  - a. Size: Full width by full length of gap between slats and planks.
  - b. Fire-Resistance: Class A (Class 1).
  - c. Color: As selected by Architect from manufacturer's full range.

## **2.5 LINEAR WOOD VENEER CEILING, METAL SUBSTRATE**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide custom linear wood veneer ceiling, soffits, and headwall products by CAP Architectural Products; Box 6 System with Wood Veneer Finish, or comparable product, acceptable to the Architect, by one of the manufacturers specified in this Section.

### **LINEAR WOOD CEILINGS**

09 54 26 - 15

**B. Linear Wood Veneer Ceiling Components:**

1. Planks and Slats: Aluminum substrate complying with ASTM E 1264 for Type XIII or Type XX, formed to snap onto carriers securely, without fasteners, and fabricated to configurations, sizes, and shapes indicated.
2. Finish: Specified wood veneer finish applied to all exposed edges.
3. Materials:
  - a. Aluminum Sheet: ASTM B 209/B 209M, of alloy and temper recommended by the producer and finisher for type of use and finish indicated.
  - b. Backing: Manufacturer's standard to provide NRC rating indicated for perforation pattern required.
  - c. Pan Thickness: Not less than 0.028 inch thick.
  - d. Pan Width: As indicated on Drawings.
  - e. Pan Length: As indicated on Drawings.
4. Acoustical Materials: Manufacturer's standard to provide NRC rating indicated for perforation pattern required.
5. Interior Fabric Layer: Non-flammable, sound-absorbent, fiber felt fabric material as recommended by manufacturer for closed plenum and the conditions at the Project site.
  - a. Size: Full width by full length of gap between slats and planks.
  - b. Fire-Resistance: Class A (Class 1).
  - c. Color: As selected by Architect from manufacturer's full range.
6. Exterior Filler Strip: Bird and insect resistant, and weather resistant filler strip of same material as planks for closed plenum and the conditions at the Project site.
  - a. Size: Full width by full length of gap between slats and planks.
  - b. Fire-Resistance: Class A (Class 1).
  - c. Color: As selected by Architect from manufacturer's full range.

**2.6 LINEAR POWDER COAT CEILING, METAL SUBSTRATE**

- A. Acceptable Product: Subject to compliance with requirements, provide custom linear powder coat ceiling, soffits, and headwall products by Lindner AG; Exterior GRAPHIC Line, or comparable product, acceptable to the Architect, by one of the manufacturers specified in this Section.
- B. Linear Powder Coat Ceiling Components:
  1. Plank and Slats: Aluminum substrate complying with ASTM E 1264 for Type XIII or Type XX, formed to snap onto carriers securely, without fasteners, and fabricated to configurations, sizes, and shapes indicated.

**LINEAR WOOD CEILINGS**

09 54 26 - 16



2. Finish: Manufacturer's proprietary wood grain powder coat or baked enamel finish applied to all exposed faces.
  - a. Finish: Simulating wood veneer specified in this Section, and to the satisfaction of the Architect.
  - b. Ultraviolet Rays Resistance: Provided manufacturer's standard UV resistant coating.
3. Materials:
  - a. Aluminum Sheet: ASTM B 209/B 209M, of alloy and temper recommended by the producer and finisher for type of use and finish indicated.
  - b. Backing: Manufacturer's standard to provide NRC rating indicated for perforation pattern required.
  - c. Pan Thickness: Not less than 0.028 inch thick.
  - d. Pan Width: As indicated on Drawings.
  - e. Pan Length: As indicated on Drawings.
4. Exterior Filler Strip: Bird and insect resistant, and weather resistant filler strip of same material as planks for closed plenum and the conditions at the Project site.
  - a. Size: Full width by full length of gap between slats and planks.
  - b. Fire-Resistance: Class A (Class 1).
5. Color: As selected by Architect from manufacturer's full range.

## **2.7 METAL FINISHES**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- D. Baked-Enamel or Powder-Coat Finish: AAMA 2603 or AMMA 2604 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## **LINEAR WOOD CEILINGS**

09 54 26 - 17

1. Wood Grain Simulating Finish: Baked-Enamel or Powder-Coat Finish simulating wood grain finish of specified wood veneer in this Section and to the satisfaction of the Architect. Known manufacturers capable of finish include, but are not limited to:
  - a. Linetec; Decoral Wood Grain Finishes.

## **2.8 SUSPENSION SYSTEMS**

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 and the specified performance requirements.
  1. High-Humidity Finish: Provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.
- B. Suspension Systems: Provide systems complete with carrying channels, main beams, cross tees, splice sections, connector clips, hangers, molding, trim, retention clips, load-resisting struts, and other suspension components required to support ceiling units and other ceiling-supported construction.
  1. Each carrying channel shall have a midspan deflection, as calculated, not exceeding 1/360 of the span between hanger supports attached thereto.
  2. Main and Cross Tees: Fabricated from commercial quality hot dipped galvanized steel as per ASTM A 653 and having a Heavy Duty structural classification per ASTM C 635. Main beams and cross tees shall be double-web steel construction with 15/16 inch type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked black colored polyester paint.
- C. Overhead Deck Hanger 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.
  1. Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with eyepins, clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling assembly as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
  2. Refer to Section 01 45 00 "Structural Testing and Inspection", Article 3.3 "Concrete Reinforcement and Embedded Items" for testing of anchors.
- D. Attachment Devices (Fasteners): Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
- E. Wire for Ties: Provide wire complying with the following requirements:

### **LINEAR WOOD CEILINGS**

09 54 26 - 18

1. Nickel-Copper-Alloy Wire (For Exterior Applications Only): ASTM B 164, nickel-copper-alloy UNS No. N04400.
  2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- F. Hanger Rods and Flat Hangers: Each hanger shall be capable of carrying all loads suspended therefrom plus resisting the specified live loads from wind. Fabricate hangers from mild steel, and hot dip galavanize all hanger rods, flat hangers to comply with ASTM A 653/A 653M, G90 coating designation.
- G. Angle Hangers: Angles with legs not less than 7/8-inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

## **2.9 FRAMING SYSTEM**

- A. General: Refer to the following sections for framing modules and supports for linear wood ceiling, soffit, and headwall assemblies:
1. Section 05 40 00 "Cold-Formed Metal Framing".
  2. Section 05 50 00 "Metal Fabrications".
- B. Provide framing modules and support systems complete with all required accessories and connections to structure to support suspension components and linear wood ceiling assemblies.

## **2.10 ACCESSORIES**

- A. Insect Screening: Provide insect screening at locations indicated on Drawings.
1. Stainless Steel: ASTM A 240/A 240M, Type 304, 18-by-18 mesh, 0.009-inch wire.
    - a. Finish: Mill.
- B. Access Panels: Provide service access panels constructed of, and integral to, same linear ceiling system, of sizes and locations indicated on Drawings; or if not indicated on Drawings, then as directed by Architect.

## **LINEAR WOOD CEILINGS**

09 54 26 - 19

## **2.11 FABRICATION**

- A. General: Fabricate linear wood ceiling, soffits, and headwalls to the designs, shapes, and sizes shown using materials specified and shown to produce linear wood ceiling assemblies that meet or exceed performance requirements. To the greatest extent possible, complete fabrication, assembly, finishing, and other work before shipment to the Project site.
- B. Joints in Linear Wood Ceiling Assemblies: All linear wood ceiling assemblies shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted and rigidly secured.
- C. Fasteners:
  - 1. Concealed: As recommended by linear wood ceiling manufacturer.
  - 2. Exposed: Not permitted.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, including structural framing to which linear wood ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect linear wood ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear wood ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Measure each linear wood ceiling, soffit, and headwall area and establish layout of ceiling, soffit, and headwall units to balance border widths at opposite edges of each ceiling, soffit, and headwall. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

### **3.3 INSTALLATION, SUSPENSION SYSTEM**

- A. Install suspension system, framing modules, and supports in compliance with the authorities having jurisdiction, and in accordance with the manufacturer's installation instructions and the reviewed shop drawings.

## **LINEAR WOOD CEILINGS**

09 54 26 - 20

1. Install hangers plumb and free from contact with insulation or other objects within plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
  4. 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.
  5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  6. Do not attach hangers to steel deck tabs.
  7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated to meet performance requirements; provide hangers not more than 8 inches from ends of each member.
  9. Provide additional anchors and hangers for support of fixtures and other items including but not limited to access panels as required to prevent overloading of deck attachment, eccentric deflection or rotation of supporting runners. Provide cross bracing and additional framing as required to resist wind uplift at exterior linear wood ceilings.
- B. Install suspension system main beam tees by attaching to hangers so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members. Finish to lines and levels shown, with maximum deflection not to exceed 1/360 of the span between supports. Laser level accurately in all directions, leveling to a tolerance of 1/8-inch noncumulative and must be square to within 1/16 inch in 2 feet. Remove and replace dented, bent, or kinked members.
1. Install cross tees every 24 inches at 90 degrees to the main beam unless otherwise indicated to meet performance requirements. Install the 24 inch cross tees at midpoints of the 48 inch cross tees.
- C. Install wall moldings and trim of type indicated at perimeter of the linear wood ceiling area.

## LINEAR WOOD CEILINGS

09 54 26 - 21

1. Unless otherwise required to suit performance requirements, screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely do not use corner caps unless otherwise required to suit performance requirements.
  2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install backers to main beam tees using mechanical fasteners and at spacing required to suit performance requirements.
- E. Install linear wood ceiling slats in coordination with suspension system and exposed moldings and trim.
1. For clip-in slats, position slats according to manufacturer's written instructions.
  2. Align joints in adjacent courses to form uniform, straight, maximum 1/2 inch wide, joints parallel to soffit, unless otherwise indicated.
  3. Fit adjoining end to end slats to form flush joints that are in alignment.
  4. Cut slat edges that are exposed to view shall be treated to look like factory edges. Provide and install pre-finished peel and stick edge banding of the type recommended in writing by the linear wood ceiling manufacturer for this purpose.

### **3.4 INSTALLATION, FRAMING MODULES AND SUPPORT SYSTEM**

- A. Install wood ceiling, soffit, and headwall assemblies into framing modules and supports in accordance with manufacturer's instructions and accepted shop drawings.
- B. Erect and install framing modules and supports with linear wood ceilings, soffits, and headwalls in compliance with the authorities having jurisdiction, and in accordance with the manufacturer's installation instructions and accepted shop drawings.
- C. Install moldings and trim of type indicated at perimeter of the linear wood ceiling, soffit, and headwall areas.

### **3.5 ADJUSTING AND CLEANING**

- A. Replace damaged and broken linear wood ceiling, soffit, or headwall assemblies.
- B. Clean exposed surfaces of the exposed linear wood ceiling, soffit, and headwall systems, including trim, edge moldings, framing modules and support members, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented, delaminated, discolored, and bent units and units with splitting in the the veneer.

## **LINEAR WOOD CEILINGS**

09 54 26 - 22