SECTION 11 61 00

THEATER AND STAGE EQUIPMENT

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\*\* NOTE TO SPECIFIER \*\* Wenger Corporation, including all Wenger, J.R. Clancy and GearBoss product brands; Broadcast, theater and stage equipment, sound-control door assemblies, acoustic room components, lockers, storage assemblies, specialty casework, special purpose rooms, integrated lighting, integrated controls and audio video systems.   
This section is based on the products of Wenger Corporation, which is located at:  
 555 Park Dr.  
Owatonna, MN 55060  
Toll Free Tel: 800-4WENGER (493-6437)  
Tel: (507) 455-4100  
Fax: (507) 455-4258  
Email:info@wengercorp.com  
Wenger Corporation - Syracuse, which is located at:  
7041 Interstate Island Road  
Syracuse, NY 13209  
Toll Free Tel: 800-836-1885  
Tel: (315) 451-3440  
Email:info@wengercorp.com  
Web: https://www.wengercorp.com

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Theater and stage equipment including the following:
       1. Acoustical clouds.
       2. Acoustical shells, DIVA.
       3. Acoustical shells, Maestro.
       4. Acoustical shells, Legacy Classic.
       5. Acoustic tower, Legacy Select Acoustic Tower.
       6. Stage tower transporter.
       7. Orchestra pit fillers.
       8. Stage platforms.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete sections below not relevant to this project; add others as required.

* + 1. Division 16 - Electrical for power wiring.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Hardboard Association (AHA):
       1. AHA A135.4-95: Basic Hardboard.
    2. American National Standards Institute (ANSI):
       1. ANSI E1.11 - Entertainment Technology -- USITT DMX512-A -- Asynchronous Serial Digital Data Transmission Standard For Controlling Lighting Equipment And Accessories.
       2. ANSI E1.20 - Entertainment Technology-RDM-Remote Device Management Over USITT DMX512 Networks.
    3. American Plywood Association (APA).
       1. Performance Standards and Policies for Structural Use Panels.
    4. ASTM International (ASTM):
       1. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
       2. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
       3. ASTM A1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
       4. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
       5. ASTM B221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
       6. ASTM B429 - Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
       7. ASTM E 413 - Classification for Rating Sound Transmission.
    5. International Building Code (IBC).
    6. National Electrical Code (NEC).
    7. National Electrical Manufacturers Association (NEMA): NEMA LD 3-2000 - High Pressure Decorative Laminates.
    8. U.S. Architectural and Transportation Barriers Compliance Board: Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities.
    9. U.S. Department of Commerce, National Institute of Standards and Technology: DOC PS 1: U.S. Product Standard for Construction and Industrial Plywood.
    10. US Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED).
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data: Manufacturer's data sheets on each product to be used, including:
        1. Provide test results by certified independent testing laboratory indicating compliance with performance requirements.
        2. Rated capacities, construction details, material descriptions, dimensions of individual components, profiles, and finishes.
        3. Maintenance instructions and recommendations.
        4. Acoustical testing data demonstrating minimal compliance with required acoustical performance criteria.
        5. Photometric data for light fixtures, if applicable to the product.

\*\* NOTE TO SPECIFIER \*\* Retain applicable paragraphs below for LEED projects. Add additional requirements that apply. Verify credits required and availability of materials from the Manufacturer. Refer to USGC LEED Reference Guide for detailed information. Delete if not required.

* + 1. LEED Submittals:
       1. Manufacturer's certificate indicating that composite wood products and adhesives contain no added urea formaldehyde.
       2. Manufacturer's certificate indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
       3. Manufacturer's signed confirmation indicating that composite wood products and adhesives used in acoustical shells contain no urea formaldehyde.
    2. Shop Drawings:
       1. Submit component and project specific installation drawings, cut sheets, and schedules showing all information necessary to fully explain the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation. Submit for approval before beginning any fabrication, installation, or erection.
       2. Include fabrication and installation details. Distinguish between factory and field work.
       3. Include plans, elevations, sections, attachments and work by other trades.
       4. Include wiring diagrams when applicable.
    3. Coordination Drawings: Project-specific Coordination Drawings, indicating the following items drawn and coordinated with each other. Include information required by Installers of each item in order to coordinate the Work. Include the following:
       1. Relationship of items shown on separate Shop Drawings.
       2. Dimensions and required clearances of adjacent or related work.
       3. Order of assembly of separate items.
       4. Information required for interface with other trades and components, including mechanical, electrical, and communication work.
    4. Product Schedule:
       1. Use designations indicated on the Drawings.
       2. Include room locations, dimensions, accessories, finishes, and project specific notes.
    5. Verification Samples:
       1. Exposed Finishes and Finish Materials: Not less than 4 by 4 inches (102 by 102 mm), for each type, color, pattern, surface and material selected.
    6. Closeout Submittals:
       1. Operation and Maintenance Data: For adjusting, repairing and replacing components and accessories.
       2. Warranty: Submit manufacturer's warranty.
       3. As-Built Drawings: For completed work.
    7. Field Quality Control Reports: Documenting inspections and demonstrations of installed products and equipment.
  1. QUALITY ASSURANCE
     1. Source Limitations: Obtain all products from a single manufacturer through one source providing a comprehensive material and installation package:
     2. Manufacturer Qualifications: Minimum 5 years' experience in design and manufacturing of similar products on projects of similar size, scope and complexity, and with the production capacity to meet the construction and installation schedule.
     3. Installer Qualifications: ESTA-certified and experienced in installation of the work of this section and acceptable to the manufacturer and in the regular employ of the manufacturer.
     4. Electrical Components: Listed and labeled per NFPA 70, Article 100 by a testing agency acceptable to Authorities Having Jurisdiction (AHJ).
     5. Regulatory Requirements: Where components are indicated to comply with accessibility requirements, comply with the U.S. Architectural and Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".
  2. DELIVERY, STORAGE, AND HANDLING
     1. Deliver materials in manufacturer's original unopened containers with manufacturer's labels attached. Do not deliver material until spaces to receive them are clean, dry, and ready for their installation. Ship to jobsite only after roughing-in, painting and other finishing work has been completed, installation areas are ready to accept work.
     2. Handle and install materials to avoid damage.
  3. PROJECT CONDITIONS
     1. Environmental Limitations: Do not deliver or install materials until spaces are enclosed and weather tight, wet work in spaces is complete and dry, HVAC system is operating and maintaining ambient temperature at occupancy levels during the remainder of the construction period.
     2. Field Measurements: Verify field measurements as indicated on Shop Drawings. Where measurements are not possible, provide control dimensions and templates.
        1. Coordinate installation and location of blocking and supports as requested.
        2. Verify openings, clearances, storage requirements and other dimensions relevant to the installation and final application.
        3. Where applicable, coordinate locations of electrical junction boxes.
     3. Field Measurements: Verify field measurements as indicated on Shop Drawings. Where measurements are not possible, provide control dimensions and templates.
        1. Coordinate locations of electrical junction boxes.
     4. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
  4. WARRANTY

\*\* NOTE TO SPECIFIER \*\* The "special warranty" is a warranty provided by the manufacturer to the building owner. The warranty terms below are available from Wenger Corp. Verify that other manufacturers listed or seeking approval furnish warranty meeting requirements. Durability is a key aspect of Wenger's product value for Owners. The available warranty reflects Wenger's high confidence in the performance of their products. Delete if not required.

* + 1. Special Warranty for Theater and Stage Equipment: Provide manufacturer's standard limited 5 year warranty from the date of delivery of the product.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Wenger Corporation, JR Clancy and GearBoss, which is located at: 555 Park Dr.; Owatonna, MN 55060; Toll Free Tel: 800-4WENGER (493-6437); Tel: 507-455-4100; Fax: 507-455-4258; Email: [request info (info@wengercorp.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Wenger+Corporation,+JR+Clancy+and+GearBoss&coid=36487&rep=&fax=507-455-4258&message=RE:%20Spec%20Question%20(11060wen):%20%20&mf=); Web: <https://www.wengercorp.com> | <http://www.jrclancy.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions shall be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
       1. Manufacturers seeking approval shall submit the following:
          1. Product data, including third-party certified acoustical data and proposed graphic/drawing layout for this project.
          2. Project references: Minimum of 5 installations not less than 3 years old, of comparable size, scope and complexity of this project, complete with owner contact information.
          3. Sample warranty.
       2. Submit substitution request not less than required days prior to bid date.
       3. Approval shall be indicated by issuance of written Addendum.
       4. Approved manufacturers shall meet separate requirements of Submittals Article.
       5. Manufacturers' products that are either listed as pre-approved in these Specifications or who have been granted approval as an alternate must still demonstrate all of the material performance and operational characteristics required by this Section.

\*\* NOTE TO SPECIFIER \*\* Below describes standard Wenger Diva acoustical cloud panels. Select panel face. Edit to meet job requirements. Wenger also provides complete custom design and fabrication of panels, including custom sizes and radii, acoustical densities and performance, custom accents, inlays, and faux finishes. Consult Wenger representative. Delete if not required.

* 1. ACOUSTICAL CLOUDS
     1. Basis of Design: DIVA Acoustical Clouds as manufactured by Wenger Corporation.

\*\* NOTE TO SPECIFIER \*\* STC performance of the acoustical panel used in acoustical cloud is a measurement of the efficiency of sound reflection provided by the acoustical cloud. Value below indicates the performance of the Wenger Diva panel.

* + 1. Acoustical Panel Sound Transmission: Provide third party test results indicating acoustical shell system comprised of acoustical shell panels have the following sound transmission requirements:
       1. Sound Transmission Class (STC): Minimum 21 per ASTM E 413.
    2. Materials:
       1. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063T alloy.
       2. Steel Tube: ASTM A 501, hot formed steel tubing.
       3. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B.
       4. Veneer-Faced Panel Products (MDF core): Meets all CARB-2 requirements for formaldehyde emissions.
       5. Hardboard: AHA A135.4, Class 1 Tempered - formaldehyde free.
       6. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS.
          1. HPDL with urea formaldehyde-free adhesive.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Acoustical Cloud Panels: Manufacturer's standard stressed-skin composite acoustical cloud panels, with STC meeting performance requirements, designed to mix and blend sound and reflect a maximum range of audible frequencies to audience.
       1. Core: 1-1/2 inches thick (38 mm) honeycomb core material shall have an open geometric pattern with cell walls vertical to panel skins and defined by alternating straight and sine wave layers. Height of sine wave shall be 1/2 inch, wall thickness shall correspond to 60 lb kraft. Bonding of core material to panel faces shall be with permanently cured urethane adhesive. Foam core materials and contact adhesives shall not be permitted.

\*\* NOTE TO SPECIFIER \*\* Delete face finishes not required.

* + - 1. Face, Wood Veneer-Faced Panel: 1/4 inch (6 mm) thick hardwood plywood-faced medium density fiberboard stressed skin, material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 22.
      2. Face, Wilsonart High Pressure Plastic Laminate-Faced Panel: Material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 21.
      3. Face, Sherwin Williams Kem Aqua Painted Panel: 3/16 inch (4.8 mm) thick hardboard stressed skin, material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 22.
      4. Back: 3/16 inch (4.8 mm) thick hardboard stressed skin, painted black.
      5. Panel Edge Frame: Straight panel edges are reinforced with extruded aluminum edge frame.
      6. Acclimate panel face and back materials in a temperature and humidity controlled environment for a minimum of 72 continuous hours so that they reach appropriate equilibrate condition prior to lamination to improve dimensional stability of finished laminated panels.
         1. Documentation of specified process must be available for review.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Overhead Sound Reflecting Acoustical Cloud: Acoustical cloud panels suspended directly from overhead supports.

\*\* NOTE TO SPECIFIER \*\* Delete radius not required.

* + - 1. Cloud Panel Radius: 5 foot (1.52 m).
      2. Cloud Panel Radius: 10 foot (3.05 m).
      3. Cloud Panel Radius: 20 foot (6.09 m).
      4. Cloud Panel Radius: As indicated.
      5. Cloud Panel Size and Configuration: As indicated.
      6. Cloud Panel Face Finish:
         1. Hardwood Plywood Veneer: Plain sliced, slip-matched and balance matched to maintain a uniform leaf width across the full width of the panel.

Veneer must be a minimum of 80+ or 85+ grade. Grade A veneer, or veneer of a lesser grade, is not acceptable.

Sort veneer by grain density, grain structure, and color.

Clip around character marks to minimize pin knots, mineral, gum, sap, and color variation.

Individually clip and hand splice each veneer leaf with the grain cathedrals centered in the middle of each leaf. Veneer leaves with grain cathedrals not centered shall be rejected as unacceptable for the Work of this Section.

NOTE TO SPECIFIER \*\* Delete species not required.

Species: White oak.

Species: Red oak.

Species: White birch.

Species: Maple.

Species: Cherry.

* + - * 1. Wood Finish: Transparent finish, stain color as selected by Architect.
        2. Wilsonart High Pressure Plastic Laminate: Color as selected by Architect.
        3. Sherwin Williams Kem Aqua Painted Hardboard: Color as selected by Architect.
    1. Cloud Suspension: Shackle from each of four corners to overhead supports.
    2. Miscellaneous Supports: Battens, channels, and other miscellaneous supports are part of the work of Division 05 Section "Metal Fabrications."

\*\* NOTE TO SPECIFIER \*\* Retain above and coordinate requirements below. Suspension items for auditorium clouds are supplied by Wenger. Batten supports above are specified in other sections.

* + 1. Acoustical Cloud Installation Accessories:
       1. Shackles: Rated screw pin shackles.
    2. Finishes:
       1. Aluminum Framing: Painted.
       2. Painted Finish for Acoustical Cloud Panel: Sherwin Williams Kem Aqua Paint.
       3. Transparent Wood Finish for Acoustical Cloud Panel Face: Manufacturer's standard, comparable to AWI custom grade acrylic lacquer.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. ACOUSTICAL SHELLS (DIVA)
     1. Basis of Design: DIVA Acoustical Shells as manufactured by Wenger Corporation. Full stage acoustical shell system consisting of mobile acoustical shell towers and adjustable acoustical shell ceiling.
     2. Materials:
        1. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063T alloy.
        2. Steel Tube: ASTM A 501, hot formed steel tubing.
        3. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B.
        4. Veneer-Faced Panel Products (MDF core): Meets all CARB-2 requirements for formaldehyde emissions.
        5. Hardboard: AHA A135.4, Class 1 Tempered - formaldehyde free.
        6. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS.
           1. HPDL with urea formaldehyde-free adhesive.

\*\* NOTE TO SPECIFIER \*\* STC performance of the acoustical panel used in acoustical shell system is a measurement of the efficiency of sound reflection provided by the acoustical shell. Value below indicates the performance of the Wenger Diva panel.

* + 1. Acoustical Panel Sound Transmission: Provide third party test results indicating acoustical shell system comprised of acoustical shell panels have the following sound transmission requirements:
       1. Sound Transmission Class (STC): Minimum 21 per ASTM E 413.

\*\* NOTE TO SPECIFIER \*\* Below describes standard Wenger Diva acoustical shell panels. Select panel face. Edit to meet job requirements. Wenger also provides complete custom design and fabrication of panels, tower, and ceiling system, including custom sizes and radii, acoustical densities and performance, custom accents, inlays, and faux finishes, and multiple storage options. Consult Wenger representative.

* + 1. Acoustical Shell Panels, General: Manufacturer's standard stressed-skin composite acoustical shell panels, with a minimum of STC 21 to meet performance requirements, designed to mix and blend sound and reflect a maximum range of audible frequencies to both audience and performers.
       1. Core; 1-1/2 inches thick (38 mm) honeycomb core material shall have an open geometric pattern with cell walls vertical to panel skins and defined by alternating straight and sine wave layers. Height of sine wave shall be 1/2 inch (12.7mm), wall thickness, not less than 60 lb kraft. Bonding of core material to panel faces shall be with permanently cured urethane adhesive. Foam core materials and contact adhesives shall not be permitted.

\*\* NOTE TO SPECIFIER \*\* Delete face types not required.

* + - 1. Face, Wood Veneer-Faced Panel: 1/4 inch (6 mm) thick hardwood plywood-faced medium density fiberboard stressed skin, material, and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 22.
      2. Face, Wilsonart High Pressure Plastic Laminate-Faced Panel: Material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 21.
      3. Face, Sherwin Williams Kem Aqua Painted Panel: 3/16 inch (4.8 mm) thick hardboard stressed skin, material, and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 22.
      4. Back: 3/16 inch (4.8 mm) thick hardboard stressed skin, painted black.
      5. Panel Edge Frame: Straight panel edges are reinforced with extruded aluminum edge frame.
      6. Acclimate panel face and back materials in a temperature and humidity-controlled environment for a minimum of 72 continuous hours so that they reach appropriate equilibrate condition prior to lamination to improve dimensional stability of finished laminated panels
         1. Documentation of specified process must be available for review.
         2. Failure to provide documentation of required acclimation process upon request shall result in the rejection of the materials as suitable for the Work of this Section.
    1. Mobile Acoustical Towers: Free-standing, self-supporting, movable towers for stage back and side walls. Towers consist of acoustical shell panels in rigid, diagonally braced vertical aluminum frame with formed steel base, with center panel and two hinged wing panels, in nesting configuration minimizing required storage space. Wing panel on tower equipped with latching hardware and stage access door where indicated. Counterweighted tower base with adjustable front leveling pads concealed by removable access panel.
       1. Tower Size: As indicated on project drawings.
       2. Tower Height and Width: As indicated on project drawings.
       3. Tower Panel Face Finish:
          1. Hardwood Plywood Veneer: Plain sliced, slip-matched and balance matched to maintain a uniform leaf width across the full width of the panel.

Veneer must be a minimum of 80 grade or greater. .

Grade A veneer, or any other veneer of a lesser grade, shall not be acceptable.

Sort veneer by grain density, grain structure, and color.

Clip around character marks to minimize pin knots, mineral, gum, sap, and color variation.

Individually clip and hand splice each veneer leaf with the grain cathedrals centered in the middle of each leaf. Veneer leaves with grain cathedrals not centered shall be rejected as unacceptable for the Work of this Section.

NOTE TO SPECIFIER \*\* Delete species not required.

Species: White oak.

Species: Red oak.

Species: White birch.

Species: Maple.

Species: Cherry.

Species: Custom, as selected by Architect.

* + - * 1. Wood Veneer Finish: Transparent finish, stain color as selected by Architect.
      1. Door and Wing Panel Hardware:
         1. Hinges: extruded from high-strength aluminum with a seamless barrel and integral attachment flange; hinge loads are carried by maintenance free, self-lubricating sintered bronze bearings which pivot on a 1/2 inch (12.7 mm) diameter steel pin that are designed for silent operation and requiring no replacement parts. Metal-on-metal hinges without self-lubricating materials shall not be accepted.
         2. Slide-lock mechanism, pull handle, and adjustable wing stay.
      2. Tower Frame:
         1. Extruded 6063 T6 aluminum alloy vertical tower frames with welded cross tube assemblies.
      3. Stage Tower Transporter:

NOTE TO SPECIFIER \*\* Delete type not required.

* + - * 1. Type: Wheeled mover will be a one stroke lifting design using mechanical leverage to lift the tower. The wheeled mover must incorporate casters that are a minimum of 6 inches (205 mm) in diameter. A wheeled mover requiring a hydraulic pump or a battery operated motor to lift the tower will not be accepted.
        2. Type: Air transporter configured to fit stage tower base and enable movement of towers through pneumatic cushion supporting majority (approximately 75 percent) of the tower's weight.
    1. Adjustable Acoustical Shell Ceiling: Acoustical shell ceiling consisting of adjustable-angle acoustical shell ceiling panels supported by integral extruded aluminum truss, suspended from stage rigging pipe batten, and stored in fly-loft in vertical position.
       1. Ceiling Panel Size and Configuration: As indicated on the project Drawings.
       2. Ceiling Panel Radius: 10 foot (3.05 m).
       3. Ceiling Hinges: Aluminum, with self-lubricating polymer bearings that are designed for silent operation. Metal on metal hinges without self-lubricating materials shall not be accepted.
       4. Integral Truss: Extruded 6063 T6 aluminum alloy. An integral truss is required to keep the ceiling row assembly straight and true. A truss is required to keep the pivoting hinges in line with each other to prevent binding and undue wear when rotating the ceiling row assembly to and from the performance position. A ceiling design without an integral truss shall not be accepted.
       5. Electrical system incorporating junction box(es) and associated cabling to distribute power and control signals to integrated lighting. System shall have UL or ETL classification. Any system without UL or ETL classification shall not be accepted.
       6. A tilt switch is provided to prevent accidental activation when the ceiling row is in the storage position.
       7. Hanger Arms
          1. The integral truss provides the structure to allow 1 inch (25 mm) square 11 gauge steel hanger arms to be located next to the rigging cables which is the strongest point to support the weight of the ceiling assembly. Hanger arms that are located more than 2 inches (25 mm) from the rigging cables are not acceptable.
       8. Ceiling Performance Angle Adjustment:
          1. Spring-loaded steel tube assembly allows the ceiling to be easily locked into the performance position. The stay assembly shall be easily readjusted and marked to identify preferred preset angles.

\*\* NOTE TO SPECIFIER \*\* Wenger acoustical shell ceilings may incorporate integrated lighting option. Consult your Wenger representative. Coordinate with electrical engineer and theater rigging consultant.

* + 1. Integrated LED Light Fixture: The fixture shall be the Lieto Acoustic Shell Fixture by the Wenger Corporation, headquartered at 555 Park Drive Owatonna, Minnesota 55060.
       1. No known equal. If providing alternate fixture for approval, submit a proposed fixture layout and photometric point by point calculations generated by an industry accepted computer modeling platform e.g. AGI32 that demonstrates a minimum of 100 foot candles and a uniformity ratio no greater than 3:1 (Max:Min) within the shell for review in accordance with Division 01 procedures.
          1. Orchestra Shell lighting fixture models requiring quantities of fixtures in excess of the quantity indicated on the project drawings in order to develop any of the specified photometric performance criteria shall not be accepted.
       2. The orchestra shell manufacturer shall provide and install lighting required by this section based on its photometric performance, the required characteristics of the lighting fixtures and other features of the installation including interconnections and all requirements as expressed herein.
       3. The shell manufacturer shall determine the model, quantity and layout of the lighting fixtures required to satisfactorily accomplish and achieve all of the design criteria required herein and include costs for the provision and installation of the requisite bill of materials in their bid for the Work of this Section.
       4. All orchestra shell lighting scope described herein shall be completed by the orchestra shell manufacturer for a complete and operating system.
    2. Lighting Layout:
       1. Ceiling panels shall include integral, recessed lighting fixtures with attributes as specified below that appropriately spaced across each ceiling row and interconnected providing power and control to each individual lighting fixture.
       2. The provided array of Orchestra Shell lighting fixtures shall combine to create a uniform, diffuse distribution of lighting across the entirety of the performance area below that is defined as that located within the footprint of the orchestra shell enclosure.
    3. Lighting Fixture Attributes:
       1. Individual lighting fixtures shall provide the following features and performance characteristics:
          1. Correlated Color Temperature (CCT): 3000 degrees Kelvin.
          2. Color Rendering Index (CRI): 80.
          3. Minimum Rated LED Life (L70): 70,000 Hours.
          4. Cooling Fans: Not Allowed.
          5. Noise Criteria (maximum allowed): NC-17.
       2. Fixtures must be designed so that they can be independently aimed from below the ceiling panel without requiring the use of tools. The fixture's total adjustable three-axis range of motion shall be a minimum of 30 degrees,
       3. Fixtures shall be available with trim rings on the face side of the panels for a clean installation and to shield, cover and limit visibility around the fixture.
       4. Fixtures shall use DMX512 (ANSI E1.11) controlled drivers that dim smoothly to 1 percent light output without visible stepping, flash or flicker.
       5. Fixtures shall include RJ45 connector(s) or 5-pin XLR connector(s) supporting the input/output (daisy-chain) connection of DMX512 lighting control system protocol.
       6. Fixtures shall include Powercon style twist-lock connector(s) supporting the input/output (daisy-chain) connection of electrical power.
       7. Fixtures shall be individually addressable using - Remote Device Management (RDM - ANSI E1.20) control standards. Fixtures shall maintain all RDM connection and functionality regardless of whether fixtures are in their "playing" position (horizontal orientation) or "storage" position (vertical orientation.)
       8. Fixtures shall produce an even beam of light, uniformly spread throughout the field.
       9. Fixtures shall be available in models that produce symmetrical and asymmetrical beam spread patterns.
       10. Fixtures proposed for the Work of this Section shall be available with IES format photometric files associated with each fixture model proposed for use herein. IES files can be used in lighting fixture performance computer modeling and analysis software such as AGI32 to demonstrate that the lighting performance meets the design criteria required herein.
       11. Fixtures proposed for the Work of this Section shall be submitted for third-party, independent testing laboratory characterization and quantification of the fixture's relative sound pressure levels during normal operation. Include printed lighting fixture product data with the stated Noise Criteria (NC) level of the tested fixture as part of submittal process.
       12. Fixtures shall produce no Ultra-Violet (UV) or Infra-Red (IR) radiation or Radio Frequency Interference (RFI.)
       13. Fixtures shall be flicker free and suitable for use with video.
       14. Fixtures shall be individually listed as a "Directly Controlled Luminaire" for use with UL 924 Emergency Lighting Control.
       15. Fixtures shall include a safety cable.
       16. Fixture depth shall be minimal such that the presence of the lighting fixture(s) does not increase the stored depth of the ceiling row.
       17. Fixtures shall be available with optional glare control accessories including concentric ring louver, hexcel style "egg-crate" louver and homogenizing lens.
       18. Fixtures shall be listed, carry the label of a nationally recognized testing laboratory and shall be RoHS compliant.
       19. Fixtures pre-approved as meeting the "Basis of Design" criteria established herein for the orchestra shell lighting fixtures shall be the Lieto manufactured by the Wenger Corporation.
           1. Requests for substitutions associated with other lighting fixtures shall be submitted no less than 10 days before the scheduled bid date and shall be considered based on the following criteria and submitted data:

Product Data: Manufacturer's data sheets associated with each product to be included.

Test results from certified independent testing laboratory indicating compliance with performance requirements required herein.

Maintenance instructions and recommendations.

Acoustical testing data from a certified independent testing laboratory demonstrating minimal compliance with required acoustical performance

Photometric Analysis Document as indicated in paragraph D.3., below

Sample warranty

* + - * 1. Approval of substitution requests shall be solely indicated by issuance of written Addendum.
    1. Lighting Performance:
       1. Photometric Performance:
          1. A minimum intensity level 100 foot-candles, average illuminance measured 30 inches (762 mm) above the stage floor.
          2. Uniformity ratio (max:min): Less than 3.0:1.
          3. Uniformity ratio (avg:min): Less than 2.5:1.
       2. Each fixture shall be located and aimed so as to minimize light "scalloping" on the tower walls.
       3. Photometric Analysis Document:
          1. The photometric performance of the lighting produced by the shell manufacturer's proposed lighting system shall be computer modeled and submitted for the review and approval of the specifier as part of the shop drawing submittal process. The purpose of the submitted analysis is to demonstrate that the manufacturer's quantity and layout of selected lighting fixtures complies with each of the specific photometric requirements called out herein. The computer modeling shall be performed using commercially available lighting analysis software such as AGI32.
          2. Include at least the following information in the submitted "point-by-point" photometric analysis document:

Lighting Fixture Schedule - Lighting fixture description including fixture manufacturer, fixture model, output wattage, beam spread, lumens produced, produced CCT and CRI, accessories, IES filename, Light Loss Factor (LLF) setting.

Calculation Summary - including:

Average Illuminance in Footcandles.

Maximum Illuminance in Footcandles.

Minimum Illuminance in Footcandles.

(Uniformity ratio (max:min).

Uniformity ratio (avg:min).

Isocontour lines set at 10 footcandle increments across the entire range of lighting studied in the analysis document.

Calculation grid at 30 inches (762 mm) above the finished floor (a.f.f.) with calculation points spaced at increments no greater than 5 feet (1524 mm).

The manufacturer, product name and revision number of the software used to create the analysis document.

Date completed and identification of the software operator/technician responsible for the preparation of the analysis document.

* + 1. Control, Wiring and Interconnections:
       1. Each fixture shall be equipped with an integral, electronic tilt switch that shall maintain all RDM connection and functionality at all times regardless of whether fixtures are in their "playing" position (horizontal orientation) or "storage" position (vertical orientation.)
       2. Lighting Control System Data Cabling (DMX512):
          1. DMX512 lighting control system data cables shall be provided by the shell manufacturer to facilitate the interface of the orchestra shell lighting with the stage lighting system infrastructure.
          2. DMX512 lighting control system cabling to the ceiling row (provided under another Section) shall be by a theatrically rigged connection direct to the first lighting fixture in that ceiling panel's row.
          3. Orchestra shell manufacturers shall provide DMX512 control data system jumper cables of required length(s) using the fixtures' RJ45 or 5-Pin XLR connectors to daisy-chain control to each of the panel's orchestra shell lighting fixtures.
          4. Fixtures shall be provided with on-board, software selectable, 120 ohm, DMX512 terminator resistor capability.
          5. Secure, dress and organize all data cables to ensure that they do not snag or catch adjacent rigging equipment, scenery and draperies.
       3. Electrical Power:
          1. Each ceiling panel's lighting fixture array shall receive its power (provided under another Section) via a theatrically rigged, "strain-relieved" connection terminated at the ceiling panel's junction box.
          2. Jumper cables with PowerCon style connectors shall be used to daisy-chain supply of electrical power from the junction box to each fixture in turn, on the ceiling panel.
          3. Organize, secure and dress all power cables to ensure that they do not snag or catch adjacent rigging equipment, scenery and drapery.
       4. Warranty:
          1. The fixture shall carry a five-year warranty against defects in materials and workmanship. Warranty coverage shall commence at project "acceptance," not with factory shipment. See the Wenger warranty card for service contact information, specifics and Integrated Lighting: Manufacturer's standard UL-approved fixtures located as indicated.

\*\* NOTE TO SPECIFIER \*\* Rigging and pipe battens are not furnished by Wenger. Coordinate with theater rigging consultant or with Division 05 metal fabrications section.

* + 1. Stage Rigging and Battens: Rigging and battens supporting an acoustical shell ceiling are part of the work of stage curtains, specified elsewhere in this Section.
    2. Miscellaneous Supports: Channels, and other miscellaneous supports are part of the work of Division 05 Section "Metal Fabrications."
    3. Finishes:
       1. Aluminum Framing: Mill finish.
       2. Steel Finish: Immediately after cleaning and pretreating, electrostatically apply thermosetting TGIC polyester powder coating.
       3. Opaque Painted Finish for Acoustical Shell Panel: 100 percent acrylic latex, 2-coat, eggshell finish.
       4. Transparent Wood Finish for Acoustical Shell Panel Face: Manufacturer's standard finish, comparable to AWI custom grade acrylic lacquer.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. ACOUSTICAL SHELLS (MAESTRO)
     1. Basis of Design: Maestro Acoustical Shells as manufactured by Wenger Corporation. Full stage acoustical shell system consisting of mobile acoustical shell towers and adjustable acoustical shell ceiling.
     2. Materials:
        1. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063T alloy.
        2. Steel Tube: ASTM A 500, hot formed steel tubing.
        3. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B.
        4. LPL (Low pressure laminate) Thermally fused polyester resin impregnated paper.
        5. Veneer-Faced Panel Products (MDF core): Meets all CARB-2 requirements for formaldehyde emissions.
        6. Hardboard: AHA A135.4, Class 1 Tempered - formaldehyde free.
        7. Thermally-fused polyester surfacing that meets performance requirements of NEMA LD 3 for VGS grade.
        8. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS.
           1. HPDL with urea formaldehyde-free adhesive.

\*\* NOTE TO SPECIFIER \*\* STC performance of the acoustical panel used in acoustical shell system is a measurement of the efficiency of sound reflection provided by the acoustical shell. Value below indicates the performance of the Wenger Diva panel.

* + 1. Acoustical Panel Sound Transmission: Provide third party test results indicating acoustical shell system comprised of acoustical shell panels have the following sound transmission requirements:
       1. Sound Transmission Class (STC): Minimum 20 per ASTM E 413.
    2. Acoustical Shell Panels, General: Manufacturer's standard stressed-skin composite acoustical shell panels, with a minimum of STC 20 to meet performance requirements, designed to mix and blend sound and reflect a maximum range of audible frequencies to both audience and performers.
       1. Core; 1-1/2 inches thick (38 mm) honeycomb core material shall have an open geometric pattern with cell walls vertical to panel skins and defined by alternating straight and sine wave layers. Height of sine wave shall be 1/2 inch; wall thickness shall correspond to 60 lb. kraft. Bonding of core material to panel faces shall be with permanently cured formaldehyde free urethane adhesive. Foam core materials and contact adhesives shall not be permitted.

\*\* NOTE TO SPECIFIER \*\* Delete face types not required.

* + - 1. Face, Low Pressure Laminate Panel: 1/8 inch (3 mm) thick hardboard stressed skin with a thermally-fused polyester surfacing. Material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 20.
      2. Face, Wilsonart High Pressure Plastic Laminate-Faced Panel: Material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 20.
      3. Face, Sherwin Williams Kem Aqua Painted Panel: 1/8 inch (3 mm) thick hardboard stressed skin, material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 20.
      4. Face, Wood Veneer-Faced Panel: 1/4 inch (6 mm) thick hardwood plywood-faced medium density fiberboard stressed skin, material and finish as indicated, with no exposed fasteners. This panel assembly shall have a minimum of STC 21.
      5. Back: 1/8 inch (3 mm) thick hardboard stressed skin, black.
      6. Panel Edge Frame: Straight panel edges are reinforced with extruded aluminum edge frame.
      7. Acclimate panel face and back materials in a temperature and humidity controlled environment so that they reach appropriate equilibrium condition prior to lamination to improve dimensional stability of finished laminated panels.
         1. Documentation of specified process must be available for review.
    1. Mobile Acoustical Towers: Free-standing, self-supporting, movable towers for stage back and side walls. Towers consist of acoustical shell panels in rigid, diagonally-braced vertical steel frame, with center panel and two hinged wing panels, in nesting configuration minimizing required storage space. Wing panel on tower equipped with latching hardware and stage access door where indicated. Counterweighted tower base with adjustable front leveling pads concealed by removable access panel.
       1. Tower Size: 12 foot (3660 mm) wide or 10 foot (3050 mm) wide; consisting of one 4 foot (1220 mm) center panel and two 4 foot (1220 mm) wing panels; or one 4 foot (1220 mm) center panel and two 3 foot (914 mm) wing panels for the 10' option.
       2. Tower Panel Radius: 8 foot (2438 mm).
       3. Tower Panel Face Finish:
          1. LPL - Thermally fused polyester resin impregnated paper.
          2. Painted.
          3. High-pressure laminate.
          4. Wood veneer.
       4. Door and Wing Panel Hardware:
          1. Hinges: steel tube with self-lubricating sintered bronze bearings which pivot on a 5/16 inch (8 mm) diameter steel pin that are designed for silent operation and requiring no replacement parts. Metal-on-metal hinges without self-lubricating materials on towers are not acceptable.
          2. Slide-lock mechanism, pull handle, and adjustable wing stay.
       5. Tower Frame:
          1. Tubular steel vertical tower frames with welded steel structure.
       6. Stage Tower Transporter: Wheeled mover shall be a one stroke lifting design using mechanical leverage to lift the tower. The wheeled mover shall incorporate casters that are a minimum of 6" in diameter. A wheeled mover requiring a hydraulic pump shall not be accepted.
    2. Adjustable Acoustical Shell Ceiling: Acoustical shell ceiling consisting of adjustable-angle acoustical shell ceiling panels supported by integral steel frame, suspended from stage rigging pipe batten, and stored in fly-loft in vertical position.
       1. Ceiling Panel Size and Configuration: As indicated on drawings.
       2. Ceiling Panel Radius: 10 foot (3050 mm).
       3. Hanger Arms:
          1. The integral steel frame provides the structure to allow 1 inch (25 mm) square, 11 gauge steel hanger arms to be located next to the stage rigging cables, which is the strongest point to support the weight of the ceiling assembly. Hanger arms that are located more than 2 inches (25 mm) from the rigging cables are not acceptable.
       4. Ceiling Performance Angle Adjustment:
          1. Poly strap with adjustable length allows the ceiling to be easily set into the performance position. The strap is adjustable to preferred angles in approximately 1 degree increments from 0 to 45 degrees.
    3. Integrated LED Light Fixture: The fixture shall be the Lieto Acoustic Shell Fixture by the Wenger Corporation, headquartered at 555 Park Drive Owatonna, Minnesota 55060.
       1. No known equal. If providing alternate fixture for approval, submit a proposed fixture layout and photometric point by point calculations generated by an industry accepted computer modeling platform e.g. AGI32 that demonstrates a minimum of 100 foot candles and a uniformity ratio no greater than 3:1 (Max:Min) within the shell for review in accordance with Division 01 procedures.
          1. Orchestra Shell lighting fixture models requiring quantities of fixtures in excess of the quantity indicated on the project drawings in order to develop any of the specified photometric performance criteria shall not be accepted.
       2. The orchestra shell manufacturer shall provide and install lighting required by this section based on its photometric performance, the required characteristics of the lighting fixtures and other features of the installation including interconnections and all requirements as expressed herein.
       3. The shell manufacturer shall determine the model, quantity and layout of the lighting fixtures required to satisfactorily accomplish and achieve all of the design criteria required herein and include costs for the provision and installation of the requisite bill of materials in their bid for the Work of this Section.
       4. All orchestra shell lighting scope described herein shall be completed by the orchestra shell manufacturer for a complete and operating system.
    4. Lighting Layout:
       1. Ceiling panels shall include integral, recessed lighting fixtures with attributes as specified below that appropriately spaced across each ceiling row and interconnected providing power and control to each individual lighting fixture.
       2. The provided array of Orchestra Shell lighting fixtures shall combine to create a uniform, diffuse distribution of lighting across the entirety of the performance area below that is defined as that located within the footprint of the orchestra shell enclosure.
    5. Lighting Fixture Attributes:
       1. Individual lighting fixtures shall provide the following features and performance characteristics:
          1. Correlated Color Temperature (CCT): 3000 degrees Kelvin.
          2. Color Rendering Index (CRI): 80.
          3. Minimum Rated LED Life (L70): 70,000 Hours.
          4. Cooling Fans: Not Allowed.
          5. Noise Criteria (maximum allowed): NC-17.
       2. Fixtures must be designed so that they can be independently aimed from below the ceiling panel without requiring the use of tools. The fixture's total adjustable three-axis range of motion shall be a minimum of 30 degrees,
       3. Fixtures shall be available with trim rings on the face side of the panels for a clean installation and to shield, cover and limit visibility around the fixture.
       4. Fixtures shall use DMX512 (ANSI E1.11) controlled drivers that dim smoothly to 1 percent light output without visible stepping, flash or flicker.
       5. Fixtures shall include RJ45 connector(s) or 5-pin XLR connector(s) supporting the input/output (daisy-chain) connection of DMX512 lighting control system protocol.
       6. Fixtures shall include Powercon style twist-lock connector(s) supporting the input/output (daisy-chain) connection of electrical power.
       7. Fixtures shall be individually addressable using - Remote Device Management (RDM - ANSI E1.20) control standards. Fixtures shall maintain all RDM connection and functionality regardless of whether fixtures are in their "playing" position (horizontal orientation) or "storage" position (vertical orientation.)
       8. Fixtures shall produce an even beam of light, uniformly spread throughout the field.
       9. Fixtures shall be available in models that produce symmetrical and asymmetrical beam spread patterns.
       10. Fixtures proposed for the Work of this Section shall be available with IES format photometric files associated with each fixture model proposed for use herein. IES files can be used in lighting fixture performance computer modeling and analysis software such as AGI32 to demonstrate that the lighting performance meets the design criteria required herein.
       11. Fixtures proposed for the Work of this Section shall be submitted for third-party, independent testing laboratory characterization and quantification of the fixture's relative sound pressure levels during normal operation. Include printed lighting fixture product data with the stated Noise Criteria (NC) level of the tested fixture as part of submittal process.
       12. Fixtures shall produce no Ultra-Violet (UV) or Infra-Red (IR) radiation or Radio Frequency Interference (RFI.)
       13. Fixtures shall be flicker free and suitable for use with video.
       14. Fixtures shall be individually listed as a "Directly Controlled Luminaire" for use with UL 924 Emergency Lighting Control.
       15. Fixtures shall include a safety cable.
       16. Fixture depth shall be minimal such that the presence of the lighting fixture(s) does not increase the stored depth of the ceiling row.
       17. Fixtures shall be available with optional glare control accessories including concentric ring louver, hexcel style "egg-crate" louver and homogenizing lens.
       18. Fixtures shall be listed, carry the label of a nationally recognized testing laboratory and shall be RoHS compliant.
       19. Fixtures pre-approved as meeting the "Basis of Design" criteria established herein for the orchestra shell lighting fixtures shall be the Lieto manufactured by the Wenger Corporation.
           1. Requests for substitutions associated with other lighting fixtures shall be submitted no less than 10 days before the scheduled bid date and shall be considered based on the following criteria and submitted data:

Product Data: Manufacturer's data sheets associated with each product to be included.

Test results from certified independent testing laboratory indicating compliance with performance requirements required herein.

Maintenance instructions and recommendations.

Acoustical testing data from a certified independent testing laboratory demonstrating minimal compliance with required acoustical performance

Photometric Analysis Document as indicated in paragraph D.3., below

Sample warranty

* + - * 1. Approval of substitution requests shall be solely indicated by issuance of written Addendum.
    1. Lighting Performance:
       1. Photometric Performance:
          1. A minimum intensity level 100 foot-candles\* \*average illuminance measured 30 inches (762 mm) above the stage floor.
          2. Uniformity ratio (max:min): Less than 3.0:1.
          3. Uniformity ratio (avg:min): Less than 2.5:1.
       2. Each fixture shall be located and aimed so as to minimize light "scalloping" on the tower walls.
       3. Photometric Analysis Document:
          1. The photometric performance of the lighting produced by the shell manufacturer's proposed lighting system shall be computer modeled and submitted for the review and approval of the specifier as part of the shop drawing submittal process. The purpose of the submitted analysis is to demonstrate that the manufacturer's quantity and layout of selected lighting fixtures complies with each of the specific photometric requirements called out herein. The computer modeling shall be performed using commercially available lighting analysis software such as AGI32.
          2. Include at least the following information in the submitted "point-by-point" photometric analysis document:

Lighting Fixture Schedule - Lighting fixture description including fixture manufacturer, fixture model, output wattage, beam spread, lumens produced, produced CCT and CRI, accessories, IES filename, Light Loss Factor (LLF) setting.

Calculation Summary - including:

Average Illuminance in Footcandles.

Maximum Illuminance in Footcandles.

Minimum Illuminance in Footcandles.

(Uniformity ratio (max:min).

Uniformity ratio (avg:min).

Isocontour lines set at 10 footcandle increments across the entire range of lighting studied in the analysis document.

Calculation grid at 30 inches (762 mm) above the finished floor (a.f.f.) with calculation points spaced at increments no greater than 5 feet (1524 mm).

The manufacturer, product name and revision number of the software used to create the analysis document.

Date completed and identification of the software operator/technician responsible for the preparation of the analysis document.

* + 1. Control, Wiring and Interconnections:
       1. Each fixture shall be equipped with an integral, electronic tilt switch that shall maintain all RDM connection and functionality at all times regardless of whether fixtures are in their "playing" position (horizontal orientation) or "storage" position (vertical orientation.)
       2. Lighting Control System Data Cabling (DMX512):
          1. DMX512 lighting control system data cables shall be provided by the shell manufacturer to facilitate the interface of the orchestra shell lighting with the stage lighting system infrastructure.
          2. DMX512 lighting control system cabling to the ceiling row (provided under another Section) shall be by a theatrically rigged connection direct to the first lighting fixture in that ceiling panel's row.
          3. Orchestra shell manufacturers shall provide DMX512 control data system jumper cables of required length(s) using the fixtures' RJ45 or 5-Pin XLR connectors to daisy-chain control to each of the panel's orchestra shell lighting fixtures.
          4. Fixtures shall be provided with on-board, software selectable, 120 ohm, DMX512 terminator resistor capability.
          5. Secure, dress and organize all data cables to ensure that they do not snag or catch adjacent rigging equipment, scenery and draperies.
       3. Electrical Power:
          1. Each ceiling panel's lighting fixture array shall receive its power (provided under another Section) via a theatrically rigged, "strain-relieved" connection terminated at the ceiling panel's junction box.
          2. Jumper cables with PowerCon style connectors shall be used to daisy-chain supply of electrical power from the junction box to each fixture in turn, on the ceiling panel.
          3. Organize, secure and dress all power cables to ensure that they do not snag or catch adjacent rigging equipment, scenery and drapery.
       4. Warranty:
          1. The fixture shall carry a five-year warranty against defects in materials and workmanship. Warranty coverage shall commence at project "acceptance," not with factory shipment. See the Wenger warranty card for service contact information, specifics and Integrated Lighting: Manufacturer's standard UL-approved fixtures located as indicated.

\*\* NOTE TO SPECIFIER \*\* Rigging and pipe battens are not furnished by Wenger. Coordinate with theater rigging consultant or with Division 05 metal fabrications section.

* + 1. Stage Rigging and Battens: Rigging and battens supporting acoustical shell ceiling are part of the work of stage curtains, specified elsewhere in this Section.
    2. Miscellaneous Supports: Channels, and other miscellaneous supports are part of the work of Division 05 Section "Metal Fabrications."
    3. Finishes:
       1. Steel Finish: Immediately after cleaning and pretreating, electrostatically apply thermosetting TGIC polyester powder coating or wet paint.
       2. Opaque Painted Finish for Acoustical Shell Panel: 100 percent acrylic latex, 2-coat, eggshell finish.
       3. Transparent Wood Finish for Acoustical Shell Panel Face: Manufacturer's standard finish, comparable to AWI custom grade acrylic lacquer.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. ACOUSTICAL SHELLS (LEGACY CLASSIC)
     1. Basis of Design: Legacy Classic Acoustical Shells as manufactured by Wenger Corporation; mobile acoustical towers.
     2. Materials:
        1. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063T alloy.
        2. Steel Tube: ASTM A 500, hot formed steel tubing.
        3. Hardboard: AHA A135.4, Class 1 Tempered - urea formaldehyde free.
        4. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS.
           1. HPDL with urea formaldehyde-free adhesive.
     3. Acoustical Shell Panels: Manufacturer's standard stressed-skin composite acoustical shell panels, designed to mix and blend sound and reflect a maximum range of audible frequencies to both audience and performers.
        1. Core: 3/4-inch (19-mm) thick honeycomb, resin-impregnated, bonded to frame and faces with permanent urethane adhesive. Contact cement adhesive does not meet the requirements of this specification.
        2. Face, Painted Panel: 0.10 inch (2.5 mm) thick hardboard stressed skin, material and finish as indicated, with no exposed fasteners.
        3. Back: 0.10 inch (2.5 mm) thick hardboard stressed skin.
        4. Panel Edge Frame: Extruded aluminum edge angle, along straight edges.
     4. Mobile Acoustical Towers: Free-standing, self-supporting, movable towers for stage back and side walls. Towers consist of acoustical shell panels with rigid steel frame in nesting configuration. Counterweighted tower base, painted oyster, with non-marring casters.
        1. Size: 6 feet (1829 mm) wide.
        2. Height: 15 feet 2 inches (4623 mm).
        3. Canopy Angle: Canopy may be set at 45, 60, 75 and 90 degree angles. Canopy tool included to raise and lower canopy.
        4. Kicker Panel: Hinged to bottom of lower panel and folds flat for storage.
        5. Lift Mechanism: Pulley design lift assisted mechanism raises and lowers shell in just 6 turns with the use of a handle.
        6. Tower Panel Face Finish: Laminated Hardboard: [Match Architect's sample].
        7. Tower Storage: Towers nest for maximum space utilization.
     5. Adjustable Acoustical Shell Ceiling: Acoustical shell ceiling consisting of adjustable-angle acoustical shell ceiling panels, suspended from stage rigging pipe batten, and stored in fly-loft in vertical position.
        1. Size and Configuration: As indicated.
        2. Radius: 10 feet (3050 mm).
        3. Panel Face Finish:

\*\* NOTE TO SPECIFIER \*\* Delete panel face finish not required.

* + - * 1. Painted Hardboard: Match Architect's sample.
        2. Plastic Laminate: Color as selected by Architect from manufacturer's available wood grain patterns.
      1. Panel Hinges: Self-lubricating ABS bushings and steel framework.

\*\* NOTE TO SPECIFIER \*\* Wenger acoustical shell ceilings may incorporate integrated lighting option. Consult your Wenger representative. Coordinate with electrical engineer and theater rigging consultant.

* + 1. Integrated Lighting: Manufacturer's standard UL-approved fixtures located as indicated. Exposed wire harness.

\*\* NOTE TO SPECIFIER \*\* Rigging and pipe battens are not furnished by Wenger. Coordinate with theater rigging consultant or with Division 05 metal fabrications section.

* + 1. Stage Rigging and Battens: Rigging and battens supporting acoustical shell ceiling are specified in Division 11 Section "Stage Curtains and Rigging Systems."
    2. Miscellaneous Supports: Battens, channels, and other miscellaneous supports are specified in Division 05 Section "Metal Fabrications."
    3. Electrical Wiring: Wiring of integral light fixtures is specified in Division 16 wiring sections.
    4. Finishes:
       1. Steel Framing: Powder coat painted finish, black.
       2. Low Pressure Thermofused Acoustical Shell Panel: Polyester decorative finishes.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. ACOUSTIC TOWER (LEGACY SELECT ACOUSTIC TOWER)
     1. Basis of Design: Legacy Select Acoustic Tower as manufactured by Wenger Corporation; mobile acoustical towers.
     2. Materials:
        1. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063T alloy.
        2. Steel Tube: ASTM A 500, hot formed steel tubing.
        3. Hardboard: AHA A135.4, Class 1 Tempered - urea formaldehyde free.
        4. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS.
           1. HPDL with urea formaldehyde-free adhesive.
     3. Acoustical Shell Panels: Manufacturer's standard stressed-skin composite acoustical shell panels, designed to mix and blend sound and reflect a maximum range of audible frequencies to both audience and performers.
        1. Core: 3/4-inch (19-mm) thick honeycomb, resin-impregnated, bonded to frame and faces with permanent urethane adhesive. Contact cement adhesive does not meet the requirements of this specification.
        2. Face, Painted Panel: 3/16-inch (5-mm) thick hardboard stressed skin, material and finish as indicated, with no exposed fasteners.
        3. Back: 3/16-inch (5-mm) thick hardboard stressed skin, painted black.
        4. Panel Edge Frame: Extruded aluminum edge angle, along straight edges.
     4. Mobile Acoustical Towers: Free-standing, self-supporting, movable towers. Towers consist of acoustical shell panels with rigid steel frame in nesting configuration. Tower is equipped with removable bottom filler panel that stores on back of tower. Counterweighted tower base, painted black, with non-marring casters.
        1. Size: 6 feet (1829 mm) wide.
        2. Height: 11 feet 6 inches (3505 mm).
        3. Panel Radius: 10 feet (3050 mm).
        4. Fabrication: Construct panels utilizing nested configuration and folding top to enable nested storage and passage of panel through 34 by 80 inch (864 by 2032 mm) door opening. Equip top panels with compression gas springs to support raising and lowering of panel. Include standard tools required to raise and lower panels.
        5. Panel Face Finish:

\*\* NOTE TO SPECIFIER \*\* Delete panel face finish not required.

* + - * 1. Painted Hardboard: Match Architect's sample.
        2. Plastic Laminate: Color as selected by Architect from manufacturer's available wood grain patterns.
      1. Panel Hinges: Self-lubricating ABS bushings and steel framework.
    1. Finishes:
       1. Steel Framing: Powder coat painted finish, black.
       2. Opaque Painted Finish for Acoustical Shell Panel: 100 percent acrylic latex, 2-coat, matte finish.
       3. Woodgrain Laminate: Selection of Wilson Art decorative laminates.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. STAGE TOWER TRANSPORTER
     1. Wheeled Mover: Single-stroke, lifting-design wheeled mover:
        1. The wheeled mover shall be designed to use mechanical leverage to lift the tower.
        2. The wheeled mover shall incorporate tri-casters that are a minimum of 6 inches in diameter.
        3. Wheeled movers requiring a hydraulic pump or a battery-operated motor to lift the tower shall not be accepted.

\*\* NOTE TO SPECIFIER \*\* Air transporter is optional. Delete if not required.

* + 1. Air Transporter:
       1. The air transporter shall be designed to enable the movement of the towers on a pneumatic cushion of air.
       2. The air transporter shall be configured to fit the tower base.
       3. The air transporter shall be designed to support (approximately) 75 percent of the tower's weight.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. ORCHESTRA PIT FILLERS
     1. Orchestra pit fillers for:

\*\* NOTE TO SPECIFIER \*\* Delete application not required.

* + - 1. Stage level.
      2. Audience seating level.
      3. Floor level platform.
    1. Basis of Design: Portable, interlocking platform system with interchangeable, adjustable columns cross braced to independently supported platforms, with individually removable acoustically-isolated honeycomb panels, as manufactured by Wenger Corporation.
    2. Structural Performance, Orchestra Pit Filler:
       1. Uniform Live Load: 150 lbf/sq. ft. (7.1 kN/sq. m).
       2. Point Load: No permanent deformation from 1000 lb (453 kg) load on 2-inch (50 mm) diameter rubber wheeled caster.
       3. Deflection: Not exceeding L/360 at design live load for 72 inch (1829 mm) long panel and span.

\*\* NOTE TO SPECIFIER \*\* Verify seismic performance requirements of authorities having jurisdiction. Consult project structural engineer. When required, retain below plus retain related Submittals requirement and Part 3 seismic bracing requirements.

* + 1. Seismic Performance: Comply with ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" based upon seismic design criteria indicated.
    2. Materials:
       1. Aluminum:
          1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
          2. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063-T6 alloy.
          3. Extruded Structural Pipe and Tube: ASTM B 429.
       2. Softwood Plywood: DOC PS 1.
       3. Hardboard: AHA A135.4, tempered grade.

\*\* NOTE TO SPECIFIER \*\* Wenger offers optional application of wood strip flooring to match flooring specified for adjacent stage floor. Coordinate flooring selection between this section and wood flooring specification. Final sanding and finishing of applied stage flooring is performed in the field by the stage flooring installer and not by Wenger. Consult with Wenger representative.

* + - 1. Wood Stage Flooring: Refer to Division 09 Section "Wood Flooring."
    1. Framing Components:
       1. Main Support Beams: Extruded aluminum with dual fastener tracks for panel connection and adjustable beam-to-stage connection bracket fastened to stage using threaded insert and 3/8 inch (9.5 mm) diameter threaded locking device.
       2. Cross Beams: Extruded aluminum with single fastener track for panel connection, attached to main support beams with pin and socket connection requiring no tools.
       3. Column Assemblies: Extruded aluminum, with pinned connection to main support beams and threaded leveling foot allowing total adjustment of 4 inches (102 mm), plus or minus.
       4. Bracing: Aluminum or steel, attached to main support beams and cross beams, with pinned connection to columns.
    2. Composite Panel Deck:
       1. Thickness: 3-9/16 inch (90 mm) overall.
       2. Panel Faces: Softwood Plywood, 11/32 inch (8.7 mm) thick, A-C Group One exterior with 1/8 inch (3 mm) tempered hardboard on face.
       3. Core: Phenolic impregnated paper honeycomb, 2-5/8 inch (67 mm) thick.
       4. Panel Edges: Extruded PVC, with glass-filled nylon corners.
       5. Panel Attachments: Integral spring-loaded screw assemblies.

\*\* NOTE TO SPECIFIER \*\* Select traffic surface below. Hardboard is available with natural finish or painted black. Wood tongue-and-groove flooring is matched to adjacent stage flooring, and shall be field finished by the stage wood flooring Installer following delivery of the orchestra pit filler. Delete surface and finish not required.

* + - 1. Traffic Surface: Hardboard, tempered, 1/8 inch (3.2 mm).
         1. Finish: Natural finish.
         2. Finish: Painted black.
      2. Traffic Surface: Tongued and grooved wood strip flooring.
         1. Finish: Hard Maple.
         2. Finish: Red Oak.
         3. Finish: White Oak.

\*\* NOTE TO SPECIFIER \*\* Retain and edit optional accessories below per project requirements.

* + 1. Accessories:
       1. Storage and Transport Carts: Manufacturer's standard steel tube-framed transport carts configured for panel and frame components, with heavy-duty casters and clamping safety strap, configured deck units or framing members.
       2. Back Closure Panels: Perimeter closure panels matching horizontal surface, not less than 3/4 inch (19 mm) thick plywood, mounted to platform with clamps.
       3. Curtain Closures: Manufacturer's standard stage-drapery-fabric skirting closures with hanging accessories, color as selected by Architect from manufacturer's full range.
    2. Finishes:
       1. Metal Finishes:
          1. Aluminum: Mill finish.
          2. Steel: Powder-coated finish.

\*\* NOTE TO SPECIFIER \*\* Edit finishes below to correspond to project requirements. Note that field finishing of wood strip flooring is not provided by Wenger.

* + - 1. Hardboard Opaque Finish: 100 percent acrylic paint, specially formulated for adhesion to impermeable surfaces, 1-coat, satin finish, black.
      2. Wood Strip Flooring Finish: Unfinished. Refer to Division 08 Section "Wood Flooring" for requirements for field applied transparent finish to match adjacent stage flooring.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. STAGE PLATFORMS
     1. Basis of Design: StageTek Platforms; portable stage platforms and seated risers as manufactured by Wenger Corporation.
     2. Structural Performance Requirements:
        1. Stage Platforms and Risers: Standard Uniform Load 4 feet by 8 feet (1219 mm by 2438 mm) Deck: 125 lbf/sq ft (6 kN/sq m). Heavy-Duty Uniform Load 4 feet by 8 feet (1219 mm by 2438 mm) Deck with additional 5th leg: 200 lbf/sq ft (9.6 kN sq m).
        2. Stage Platforms and Risers: Dynamic Live Load: Side load of 15 percent of total Uniform Live Load: 600lb (2.7 kN) side load on a 4 feet by 8 feet (1219 mm by 2438 mm) platform under a total Uniform Live Load of 4,000 lbs (17.8 kN).
        3. Stage Platforms and Risers: Point Load: 1,500lb (6.7 kN) applied via 1 inch (2.5 cm) diameter pin.
        4. Stage Platforms and Risers: Fully replaceable components including corners, frame and wood deck. Replaceable in the field with common tools.
        5. Treads of Stairs: Uniform Load: 500 lbs (227 Kg) per 36 inches x 11 inches tread. (91.44 cm X 27.94 cm), and concentrated load: 300 lbs (136 Kg) on area of 12 sq. in. (77.4 sq. cm): Total Uniform Load of 1,000 lbs (454 Kg) per stair assembly.
        6. Guard Rail Concentrated Load: 200 lbf (0.89 kN) applied at any point in any direction.
        7. Guard Rail Uniform Load: 50 lbf/ft. (0.73 kN/m) applied to top rail.
        8. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 lbf (0.22 kN) applied to 1 sq. ft. (0.093 sq. m) area.
        9. Guard Rail In-Fill Panel compliant with IBC 4 inches (102 mm) sphere code.
     3. Materials:
        1. Aluminum:
           1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
           2. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063-T6 alloy.
           3. Extruded Structural Pipe and Tube: ASTM B 429.

\*\* NOTE TO SPECIFIER \*\* Retain and edit requirements in paragraph and subparagraphs below for projects seeking LEED certification. Confirm that manufacturer(s) are able to meet requirements.

* + - 1. Materials Meeting Sustainable Design Requirements:
         1. Provide stage platforms and risers made with products and adhesives that contain no urea formaldehyde.
      2. Softwood Plywood: DOC APA PS1.
      3. Hardboard: AHA A135.4, Tempered Grade.
      4. Hardware and Fasteners: Manufacturer's standard non-corroding type, permanently mounted to units, remaining set or tightened under load and vibration in service, and designed to preclude user contact with sharp edges.
    1. Frame: Extruded 6063-T6 aluminum, 4 inches tall (102 mm), with hidden contours to accept attachments. Rounded 1.5 inches (38 mm) hand-hold area open to accept power-grip (closed-grip) around entire perimeter. Frame components are repairable and replaceable.
    2. Corners: Cast 380 aluminum corner assembly engages leg 3 inches (76.2 mm) and secures leg with a full-length 2.75 inches (69.85 mm) convex brace driven by a threaded bolt operated with a nylon t-handle. Corner assemblies are repairable and replaceable.
    3. Legs: Legs operate individually and are constructed of extruded 6063-T6 aluminum round tube, 2.50 inches diameter (63.5 mm) with a wall thickness of .075 inch (1.905 mm). Standard fixed-height legs available in 8, 16, 24, 32, and 40 inches (200, 410, 610, 810, and 1020 mm) high, as required for layout indicated. Non-marking cap. Legs to store resting on frame rails or in clamping brackets within deck frames.

\*\* NOTE TO SPECIFIER \*\* Retain optional subparagraphs below that are applicable to project.

* + - 1. Custom Length Legs: Provide where required for layout indicated.
      2. Fixed Height Legs: Provide where indicated. Legs constructed of extruded 6063-T6 aluminum round tube, 2.50 inches diameter (63.5 mm) with a wall thickness of .075 inch (1.905 mm). Standard fixed-height legs available in 8, 16, 24, 32, 40, and 48 inches (200, 410, 610, 810, 1020 and 1220 mm) high, as required for layout indicated. Non-marking cap. Legs to store resting on frame rails or in clamping brackets within deck frames.
      3. Adjustable Legs: Provided where indicated. Constructed of extruded 6063-T6 aluminum tube, 2.50 inches diameter (63.5 mm) with a wall thickness of .0750 inch (1.905 mm) with an adjustable threaded foot for infinite adjustability plus or minus 2 inches (51 mm) from nominal length of leg. The foot shall provide a non-marking rubber pad.
      4. Telescoping Legs: Provide where indicated. Standard Telescoping Legs available in 3 configurations adjusting between 16 inches to 28 inches (40.64 cm to 71.12 cm), 24 inches to 40 inches (60.96 cm to 101.60 cm), and 30 inches to 54 inches (76.20 cm to 137.16 cm). Nominal height adjustment in increments of 4 inches (102 mm) secured with spring-loaded quick-release pin. Constructed of extruded 6063-T6 aluminum round outer tube, 2.50 by .075 inch (63.5 by 1.905 mm) telescoping over a 2 inches by .125 inch (50.8 by 3.17 mm) inner tube. With an adjustable threaded foot providing for fine adjustability between beyond nominal set length of leg. The foot shall provide a non-marking rubber pad. Inner and outer Tubes secured with non-rattling bushings and shall not pull apart from each other.

\*\* NOTE TO SPECIFIER \*\* Select one of four options for deck panel finish below. Hardboard is available with natural finish two sides, or with painted finish on top and natural finish on bottom.

* + 1. Deck Panels: Manufacturer's standard panel construction, 3/4-inch (19-mm) overall thickness, consisting of minimum 1/2-inch (12-mm) thick plywood substrate with finish surfaces consisting of, edged with extruded aluminum:

\*\* NOTE TO SPECIFIER \*\* Delete finish not required.

* + - 1. Finish: 1/8 inch (3 mm) tempered hardboard, with painted top surface .
      2. Finish: Black 0.030 inch (.76-mm) thick Standard Textured polypropylene with black smooth HDPE backer sheet.
      3. Finish: Black 0.050 inch (1.27-mm) thick Heavy Duty textured polypropylene with black smooth HDPE backer sheet.
      4. Finish: Manufacturer's standard carpet, with plywood bottom.
      5. Finish: Plywood substrate ready to receive scheduled field-applied carpet.
      6. Panel Dimensions: Manufacturer's standard sizes, as required for layout indicated.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Guards and Railings: Complying with performance requirements, clamp-attached without tools, lower horizontal rail acts as chair stop. Optional infill panels bring Guard Rails into compliance with International Building Code specifying that a 4 inches (102 mm) sphere object cannot pass through the railing.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Ramps: Complying with performance and accessibility requirements including 2015 IBC Section 1012, adjustable to meet platform height, portable and compatible with platform panel storage cart.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Stairs: Fixed stair set, sized as required by platform layout, with handrails and slip-resistant treads.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Stairs: Articulating stair set, sized as required by platform layout, with handrails and slip-resistant treads.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Box Step: Single relocatable box step equipped with clamps for fixing in place, height as required, located as indicated.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Leg Storage Clips: Provide bottom-of-deck panel leg storage clips.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Chair Stops: Clamp on leg stop, able to be installed and demounted without tools constructed of tube steel. Semi-permanent Chair Stop constructed of extruded PVC and secured into deck with screws.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Storage Cart: Steel tube-framed, folding transport cart with heavy-duty 8 inch (200 mm) casters and clamping safety strap. Provide number of carts required for layout indicated. Cart designed to carry up to 6 decks or 6 guardrails. Combinations of decks and guardrails can be stored on cart.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Closure Panels: Closure panels matching standard textured horizontal surface, not less than 3/4 inch (19 mm) thick plywood, secured with tool-free snap attachment located as follows:
       1. Front of unit.
       2. Sides of unit.
       3. Intermediate risers.

\*\* NOTE TO SPECIFIER \*\* Retain optional accessories if required by project.

* + 1. Curtain Closures and Backdrops: Manufacturer's standard stage-drapery-fabric curtain closures with hanging accessories, as follows:
       1. Skirting closures.
       2. Backdrop closure, 8 foot (2.4 m) high, with metal frame.
       3. Color: As selected by Architect from manufacturer's full range.
    2. Metal Finishes: Aluminum: Mill finish.
    3. Opaque Finish for Hardboard: 100 percent acrylic paint, specially formulated for adhesion to impermeable surfaces, 1-coat, satin finish, black.
    4. Fabrication: Provide portable stages and risers meeting performance requirements, with the following characteristics:
       1. Portable and storable in space indicated.
       2. Easily set up and disassembled without use of special tools or loose fasteners.
       3. Modular and reconfigurable.
       4. Platform components replaceable with common tools to include corners, frame sections, and platform decking.
       5. Platforms supported by individual legs that are storable inside the platform frame.
       6. Platforms designed for comfortable and secure power-grip (closed-grip) anywhere around entire deck perimeter.
       7. Lightweight leg sets/understructures, 40 inches (101 cm) tall or shorter weigh less than 10 lbs (4.5 kg).

1. EXECUTION
   1. EXAMINATION
      1. Examine installation areas and mounting surfaces with Installer present, for compliance with manufacturer's installation tolerances including required clearances, floor level, location of blocking and anchoring reinforcements, and other existing conditions that may affect installation or performance.
      2. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
      3. Proceed with installation only after correction of unsatisfactory conditions.
   2. PREPARATION
      1. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   3. INSTALLATION - GENERAL
      1. Install manufactured units in accordance with manufacturer's recommendations, approved submittals, and in proper relationship with adjacent construction.
      2. Clean exposed surfaces. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
   4. INSTALLATION OF THEATER AND STAGE EQUIPMENT
      1. Install manufactured units in location indicated to verify components are complete and operational. Adjust equipment until satisfactory results are achieved.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Acoustical Cloud Installation: Install auditorium acoustical cloud units plumb, level, and true, in accordance with manufacturer's recommendations and approved submittals. Suspend from overhead structure using specified installation accessories. Clean exposed surfaces of acoustical clouds. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Acoustical Shell Installation:
       1. Acoustical Shell Towers:
          1. Following assembly of all acoustical shell towers, use the transporter to place each acoustical shell tower in its proper playing position location on the stage, as indicated in coordination with Owner's personnel.
          2. Verify that all shell tower components including access doors, door locks and telescoping wing-stays are complete and operational.
          3. Strike shell tower units following approval of assembled acoustical shell and use air or wheeled transporter to store in shell tower stacking location(s) indicated
       2. Acoustical Shell Ceiling Panels:
          1. Suspend each row of acoustical ceiling panels from stage rigging using specified installation accessories, in accordance with manufacturer's recommendations and approved submittals.
          2. Install acoustical shell ceiling panel units plumb, level, and true.
          3. Verify setting of units in performance and storage positions.
          4. Verify adjustability of units.
          5. Install, connect, address, commission and test integral lighting

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Orchestra Shell Installation: Install orchestra shell components in accordance with manufacturer's written instructions.
       1. Position all components accurately as indicated on Drawings and true, plumb, and level.
       2. Note any deviations required to adjust for field obstructions and report to required persons to incorporate changes into as-built drawings.
       3. Installation supervisor shall be a currently certified ETCP Rigger for Theatre.
       4. Utilize only qualified riggers for installation, trim, and adjustment.
       5. Clean and touch up all field welds and abraded paint finishes with matching materials.
  1. FIELD QUALITY CONTROL
     1. Inspect installed work to verify compliance with requirements.
        1. Verify that electrical work complies with manufacturer's submittals and written installation requirements.
        2. Perform installation and startup checks as recommended by manufacturer.
        3. Prepare inspection reports and submit to Architect.
  2. DEMONSTRATION
     1. Train Owner's personnel to adjust, operate, and maintain equipment. Turn over keys, tools, and operation and maintenance instructions to Owner.
  3. CLEANING AND PROTECTION
     1. Repair or replace defective work as directed by Architect upon inspection.
     2. Clean surfaces. Touch up marred finishes, or replace damaged components that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by manufacturer.
     3. Protect installed products from damage, abuse, dust, dirt, stain, or paint until completion of project. Do not permit use during construction.

END OF SECTION