



SECTION 11 61 13
ACOUSTICAL SHELLS
SIGHTLINE COMMERCIAL SOLUTIONS
BRAVADO™ ACOUSTICAL SHELL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Acoustical shells: Bravado™

1.2 RELATED SECTION

- A. Section 09 90 00 – Painting and Coating
- B. Section 11 61 33 – Rigging Systems and Controls
- C. Section 27 41 16 - Integrated Audio-Video Systems and Equipment

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.
- B. American Society for Testing and Materials (ASTM)
 - 1. A36 - Standard Specification for Structural Steel.
 - 2. A283 -Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 3. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - 4. A325 - Standard Specification for High-Strength Bolts for Structural Steel Joints.
 - 5. A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
 - 6. A555 - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods.
 - 7. A570 - Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
 - 8. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 9. B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.

10. B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
11. B210 – Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
12. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
13. B247 - Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings.
14. B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
15. E488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.

C. National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500-505 – Metal Finishes Manual.

D. Aluminum Association (AA):

1. ASD-1 Aluminum Standards and Data.
2. DAF-45 Designation System for Aluminum Finishes.
3. SAA-46 Standards for Anodized Architectural Aluminum.
4. ADM-2015 Aluminum Design Manual

E. American Plywood Association (APA)

1. US. Product Standard PS 1 - Structural Plywood.
2. US. Product Standard PS 1-83
3. American Hardboard Association (AHA): AHA A135.4-95: Basic Hardboard

F. American Welding Society (AWS):

1. ANSI/AWS D1.1/D1.1M Structural Welding Code - Steel.
2. ANSI/AWS D1.2/D1.2M Structural Welding Code - Aluminum.
3. ANSI/AWS D1.6/D1.6M Structural Welding Code – Stainless Steel.

G. National Electrical Manufacturers Association (NEMA):

1. NEMA LD 3 - High-Pressure Decorative Laminates.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Components shall withstand structural loading as determined by allowable design working stresses of materials.
- B. Provide components capable of withstanding effects of gravity loads and the following structural loads without exceeding allowable design working stress of materials for components, anchors and connections:

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data:
 - 1. Manufacturer's data sheets on each product to be used, including:
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- C. Shop Drawings: Submit plan and typical section detail to depict the proper configuration, assembly, installation, and termination of each product specified in this section. Including: Section details, Mounting methods, Typical Elevations, and Key plan layout.
- D. Verification Samples: Provide samples by request of the owner, architect or consultant.
- E. Manufacturer's Certificates and Test Reports: Certify products meet or exceed specified requirements.
- F. Contract Closeout Submittals: Comply with Section 01 70 00 Execution and Closeout Requirements.
 - 1. Project record documents
 - 2. Operating and maintenance manuals

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of five (5) years' experience.
 - 1. Sightline Commercial Solutions, 7008 Northland Drive North, Minneapolis, MN 55428; Toll Free Tel: 877-215-7245; Email: info@sightlinecommercial.com.
 - 2. Installer's Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project.
 - a. Acceptable to or licensed by manufacturer.
 - b. Not less than 3 years experience with systems.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.
- C. Protect from damage due to weather, excessive temperature, and construction operations. Store in a cool, dry place out of direct sunlight. Store products indoors in temperature-controlled facility.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Where products are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication.
- B. Where field measurements cannot be made without delaying the products fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products to

not delay fabrication, delivery and installation.

- C. Coordinate fabrication and delivery schedule of products with construction progress and sequence to avoid delay of product installation.
- D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2– PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Sightline Commercial Solutions, 7008 Northland Drive North, Minneapolis, MN 55428; Toll Free Tel: 877-215-7245; Email: info@sightlinecommercial.com.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS

A. Aluminum:

1. Extruded Pipe: Alloy 6061-T6 or similar.
2. Extruded Bars, Shapes and Moldings: Alloy 6005A-T51 or 6061-T6 or similar.

B. Stainless Steel:

1. Tubing: ASTM A 554, Type 304 or 316.
2. Pipe: ASTM A 312/A 312M, Type 304 or 316.
3. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20 or CF 8M or CF 3M.
4. Sheet, Strip, Plate, and Flat Bar: ASTM A 666 or ASTM A 240/A 240M, Type 316.
5. Bars and Shapes: ASTM A 276 - Type 316

C. Steel:

1. Tubing: ASTM A 500/A 500M, A 513
2. Pipe: ASTM A 53
3. Sheet, Strip, Plate, and Flat Bar: ASTM A 36/A 36M
4. Bars and Shapes: ASTM A 29/ A 28M

2.3 ACOUSTICAL SHELLS: BRAVADO™

- A. Basis of Design: Bravado™ Acoustical Shell System as manufactured by Sightline Commercial Solutions.
1. Stressed-skin laminated composite acoustical shell panel designed to reflect a range of audible frequencies for maximum performance and maximum audible audience range.
- B. Panel Materials:
1. High-Pressure Laminate (HPL): NEMA LD 3, grade VGS.
 2. Veneer-Faced Panel Products (MDF Core): AWI premium grade hardboard meets all CARB-2 requirements for formaldehyde emissions.
 3. Medium Density Fiberboard: 3/16 inch (5 mm) ANSI A208.2, CARB-2.
 4. Hardboard: AHA A135.4, Class 1 Tempered – formaldehyde free
- C. Panel Construction:
1. Core: 1-1/2 inch thick (38 mm) phenolic impregnated honeycomb core material, (3/8-60-60-15 percent) with open geometric pattern, cell walls vertical to panel skins, defined by alternating straight and sine wave layers.
 - a. Height of Sine Wave: 3/8 inch (10 mm).
 - b. Panel Wall Thickness: Correspond to 60 pound (22.40 kg) kraft.
 - c. Bonding Core Material to Panel Faces: Permanently cured polyurethane adhesive.
 - d. Foam Core Materials and Contact Adhesives: Not permitted.
 2. Panel Face Finish Options:
 - a. Vertical Grade High Pressure Laminate (HPL): On 3/16 inch (5 mm) (tempered hardboard
 - i) Material and finish as indicated with no exposed fasteners.
 - ii) Color: _____(as determined by the Architect or Theater Consultant)
 - b. Wood Veneer: AWI premium grade hardwood veneer on 3/16 inch (5 mm) tempered hardboard.
 - i) Color: _____(as determined by the Architect or Theater Consultant)
 - ii) Slip-matched and balance matched within panel face.
 - c. Painted Medium Density Fiberboard (MDF):
 - i) Exposed Faces: 3/16 inch (5 mm) thick stressed skin.
 - ii) Material and finish as indicated, with no exposed fasteners.
 - iii) Color: _____(as determined by the Architect or Theater Consultant)
 3. Panel Back face: 3/16 inch (4 mm) thick substrate.
 - a. High Pressure Laminate Panels: Black laminate on substrate to balance the panel.
 - b. Painted or veneer faced panels: Painted matte black
 4. Panel Edge Frame: Extruded aluminum edge angle on straight sides of panel.
 5. Base Panel Weight: Approximately 2.7 lbs per sq ft (13.2 kg per sq m).
- D. Acoustical Shell Towers:
1. Tower Frame: Extruded 6005-T5 aluminum alloy vertical tower frames with formed cross brace assemblies.

2. Stage Tower Transporter: Wheeled with one stroke lifting design using mechanical leverage to lift the tower.
 - a. Tri-Casters: 3 inch (76 mm) diameter, wheels minimum.
 - b. Movable by one person with an additional person for a visual guide.
 3. Tower Size and Configuration: As indicated on the Drawings.
 4. Shell Tower Panel Radius: 5 ft (1.5 m) standard.
 5. Shell Tower Panel Radius (ft/m): _____ custom.
 6. Door and Wing Panel Hardware:
 - a. Hinges: Extruded high-strength aluminum 6063T with seamless barrel and integral attachment flange. Molded Delrin bearings for silent operation. No metal-on-metal contact and requiring no replacement parts.
 - b. Slide-lock mechanism to lock door and pull handle.
- E. Acoustical Shell Ceiling: Adjustable-angle acoustical shell ceiling panels supported by integral aluminum support structure suspended from stage rigging truss battens. Stores in fly-loft in vertical position as indicated.
1. Ceiling Size and Configuration: As indicated on the Drawings.
 2. Panel Size:
 - a. Ceiling Panel Radius: 5 ft (1.5 m).
 - b. Ceiling Panel Radius: 10 ft (3.0 m).
 - c. Ceiling Panel Radius: 20 ft (6.1 m) Standard.
 - d. Ceiling Panel Radius (ft/m): _____ custom.
 3. Panel Face Finish:
 - a. Ceiling Panel Face Finish: High pressure laminate.
 - i) Color: _____ (as determined by the Architect or Theater Consultant)
 - b. Ceiling Panel Face Finish: Hardwood plywood veneer.
 - i) Color: _____ (as determined by the Architect or Theater Consultant)
 - c. Ceiling Panel Face Finish: Painted MDF.
 - i) Color: _____ (as determined by the Architect or Theater Consultant)
- F. Ceiling Rotational Hinges: Aluminum, with self-lubricating Delrin bearings.
- G. Stage Rigging and Battens: Provided by others per specifications.
- H. Integrated Lighting: UL approved fixtures located as indicated on the Drawings.
1. Final Approved Lighting: Chosen by the Architect.
 2. Final Approved Lighting: Chosen by the Theatre Consultant.
 3. Final Approved Lighting: Chosen by the Engineer.
 4. Final Approved Lighting: Chosen by the Owner.
 5. Connector Strip: UL listed, attached to ceiling set as indicated on the Drawings.
 6. Circuits wired to location as indicated on the Drawings for connection by others.

7. Tilt Switch: Provided with each light fixture (incandescent) or circuit (LED). To prevent accidental activation when ceiling row is in storage position.
8. Lighting Options:
 - a. ETC Source Four PAR MCM.
 - b. ETC Source Four PAR EA.
 - c. ETC Desire D40 LED series.
 - d. ETC D60
 - e. ETC Source 4WRD
 - f. ETC Color Source PAR LED.

I. Finishes:

1. Panel Aluminum Edging:
 - a. Mill finish standard
 - b. black anodize custom
2. Tower/Ceiling Aluminum Framing:
 - a. Mill finish standard
3. Tower/Ceiling Steel:
 - a. Black powder coat

2.4 FASTENERS

- A. Anchors: Select fasteners of type, grade and class required to produce connections suitable for anchoring system to other types of construction indicated.
- B. Component Hardware: Type best suited to application. Do not use metals that are corrosive or incompatible with materials joined.
 1. Provide concealed fasteners for interconnecting components and for attaching them to other work, unless exposed fasteners are unavoidable or are a standard fastening method for products indicated.

2.5 FABRICATION

- A. Assemble components in shop to greatest extent possible to minimize field work and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Mechanical Connections: Fabricate by connecting members with manufacturer's standard mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- C. Fabricate components in accordance with approved Shop Drawings.
- D. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- E. Cut, reinforce, drill and tap components as indicated on drawings to receive finish hardware, screws and similar items.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for applying and designating finishes.
 - 1. Aluminum: AA DAF-45.
 - 2. Stainless Steel: NAAMM AMP 503.
- B. Appearance of Finished Work:
 - 1. Variations in appearance of abutting or adjacent units are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same unit are not acceptable.
 - 2. 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: Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with manufacturer's written instructions. All unexposed metals to be mill finish.
 - 1. Anodize:
 - a. Clear Anodize AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker unless indicated otherwise.
 - b. Black Anodize AAMA 611, AA-M12C22A32, Class II, 0.010 mm or thicker unless indicated otherwise.
 - 2. No. 4 Brushed (Stainless Steel)
 - a. Circumferential on all round pipe and tube.
 - b. Linear running the length of the rail on all other materials.
 - 3. Powder coat:
 - a. Material: AAMA 2603 - Polyester powder coating, 3 mil average film thickness

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages. These include items such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete and masonry construction.
 - 1. Coordinate delivery of anchorages to project site.
 - 2. Coordinate that blocking is in place for all mounting fasteners.
- B. Clean debris and dust from surfaces and holes thoroughly prior to installation.

- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install systems in accordance with manufacturer's approved Shop Drawings and instructions.
- B. Erect acoustical shell systems in location indicated in coordination with Owner's personnel to verify components are complete and operational.
- C. Install acoustical systems units plumb, level and true, in accordance with Sightline Commercial Solutions recommendations and approved submittals. Suspend from stage rigging using specified installation accessories.
 - 1. Verify setting of units in performance and storage positions
 - 2. Verify adjustability of units.
 - 3. Install and test integral lighting (if provided).
- D. Perform cutting, drilling, and fitting required for installation of components. Accurately set in location, alignment, and elevation, measured from established lines and levels.
- E. Fit exposed connections accurately together to form tight joints except as necessary for operation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.5 CLEANING AND PROTECTION

- A. Upon completion of installation, remove surplus materials, rubbish, tools and equipment.
- B. Clean products in accordance with the manufacturer's recommendations.
- C. Protect installed products until completion of project.
- D. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 TRAINING AND DEMONSTRATION

- A. Train Owner's personnel to assemble, adjust, operate and maintain acoustical shell towers and acoustical shell ceiling units.

END OF SECTION