



# ADDENDUM 01 NARRATIVE

**Addendum No.** 001  
**Date:** March 5, 2024  
**Project No.:** SP23-2 Tulsa Performing Arts Center (Beck Project 202331)  
**Project:** Tulsa Performing Arts Center  
**Location:** Tulsa Oklahoma

This addendum is issued for information of the parties to the above titled project, and will be a part of the contract. Items in this addendum take precedence over the original bid documents. Items not specifically revised remain in effect.

## **ADDENDUM 001**

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### **1.1 Attachments:** **Specifications:**

00 01 10 – TABLE OF CONTENTS  
08 43 13 – Aluminum Framed Storefront

#### Drawings:

G001 – Drawing Index, Location Map, Symbols, Abbreviations, Keynotes  
A624 – Enlarged Plans Storefront Entrances  
A625 – Enlarged Plans Storefront Entrances  
A801 – Door Schedule, Door Elevations, Door Frame Elevations  
TR101 – Chapman Speaker Rigging  
AV104 – AV 4<sup>th</sup> Floor Plan -Chapman  
AV105 - AV 5<sup>h</sup> Floor Plan -Chapman  
AV106 – AV 6<sup>th</sup> floor Plan – Chapman  
AV301 – AV Section – Chapman Centerline  
AV901 – AV Speaker Predictions

### **1.2 Changes to Specification items:**

1. 00 0110 - TABLE OF CONTENTS
  - a. Sections added or revised.
2. 08 43 13 – Aluminum Framed Storefront
  - a. Added hardware specification and general revisions
3. 08 44 13 – Glazed Aluminum Curtainwall.
  - a. Section Eliminated
4. 11 61 33 – Theatre Rigging, Curtains and Tracks
  - a. Section 1.07- Added section C.
5. 27 41 00 - Performance Audio Systems
  - a. Section 1.5B: Added Item 1.
  - b. Appendix A: Part 3.1: Updated to note the coverage of the main and delay arrays.
  - c. Appendix B: Chapman Speaker System updated to reflect new speaker quantities and types

### **1.3 Changes to Drawings:**

#### Architectural:

1. G001 – Drawing Index, Location Map, Symbols, Abbreviations, Keynotes
  - a. Revision to drawing index
2. A624 – Enlarged Plans Storefront Entrances
  - a. General Revisions
3. A625 – Enlarged Plans Storefront Entrances
  - a. General Revisions

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4. A801 – Door Schedule, Door Elevations, Door Frame Elevations
  - a. Revisions to Door Schedule
5. TR101
  - a. Detail 1 – Removed additional hinged panel to enlarge ceiling opening for speakers.
  - b. Detail 2 – Adjusted section to reflect changed to opening and size of line array.
6. AV104, AV105, AV106, AV301 and AV901
  - a. Updated to show speaker systems as recommended by the manufacturer with larger main arrays and smaller delay arrays.

## Request for Information:

Response to RFI submitted by Ford AV dated 03/01/2024

1. **RFI #1, Item #1** – New Winch Power Requirements Versus Existing Power Specifications  
Specification section 274100 and 116133 do not provide any information about the existing power in place for the existing motorized winch systems. Please confirm the existing power specs versus the requirements of the new J.R. Clancy system.

**Response: #1** The existing power is 480v 3-phase.

2. **RFI #1, Item #2** – Weight Capacity of Orchestra Pit Lift/Cover  
Can you confirm the weight capacity of the orchestra pit lift? We are trying to determine if it will support the weight of scaffolding and/or a motorized lift.

**Response: #2** The pit lift has a 25,000-pound capacity.

3. **RFI #1, Item #3** – Will all new conduits/enclosures be required to be painted to match finishes? Specification 274100 mentions all supporting structures and enclosures supplied by the systems contractor, not having a standard factory paint finish shall be painted. Does this include all of the new conduits/enclosures for all new speaker locations? Please clarify which of the new conduits/enclosures will require painting to match finishes.

**Response: #3** all newly installed structures or enclosures in the view of the audience must be painted to architect's specifications. Structures and enclosures on the stage or pit shall be painted black or to match existing finishes.

## Miscellaneous:

1. Bid Date shall be changed from March 15, 2024 to March 22, 2024. Refer to CM Clarification Number 01



End of Addendum 001

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~~08 44 13 - Glazed Aluminum Curtain Walls~~ **ADDENDUM 1 SECTION REMOVED**

08 71 00 - Door Hardware

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**END OF SECTION**



**SECTION 08 43 13  
ALUMINUM-FRAMED STOREFRONTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior aluminum-framed storefront, with vision glass integrated with glazed aluminum curtain walls.
- B. Aluminum doors and frames.
- C. Weatherstripping.
- D. Door hardware.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 08 42 29 - Automatic Entrances.
- C. Section 08 4314 - Interior Aluminum-Framed Storefronts: Interior storefront system.
- D. Section 08 44 13 - Glazed Aluminum Curtain Walls. Entrance doors in curtain wall system.
- E. Section 08 80 00 - Glazing: Glass and glazing accessories.

**1.03 REFERENCE STANDARDS**

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.
- C. AAMA 501.4 - Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drift; 2018.
- D. AAMA 501.5 - Test Method for Thermal Cycling of Exterior Walls; 2007.
- E. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.
- F. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- G. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- H. AAMA 1304 - Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems; 2002.
- I. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- J. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- K. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- L. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- M. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- N. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- O. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- P. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

- Q. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- R. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).
- S. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).
- T. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. See Section 01 31 00 - Project Management and Coordination, for project coordination requirements.
- B. Coordinate with installation of other components that comprise the exterior enclosure.
- C. Door Hardware Coordination: Storefront entrance door installer shall meet with Contractor Project Field Superintendent to coordinate timing and schedule for storefront door installer receipt of storefront door hardware.
  - 1. Contractor Project Field Superintendent shall provide storefront door hardware to storefront door hardware installer with hardware for each door packaged and labeled with hardware set number and door number hardware will be installed on.
- D. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
  - 1. Review conditions of operations, procedures and coordination with related Work.
  - 2. Agenda:
    - a. Tour, inspect and discuss conditions at openings where storefront system will be installed and other preparatory work performed by other trades.
    - b. Review storefront system requirements (Drawings, Specifications and other Contract Documents).
    - c. Review required submittals, both completed and yet to be completed.
    - d. Review storefront system Shop Drawings.
    - e. Review and finalize construction schedule related to storefront system work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
    - f. Review requirements for Manufacturer's Quality Control Inspector inspections and operational tests.
    - g. Review safety precautions relating to installation of storefront system.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
  - 1. Include design engineer's stamp or seal on shop drawings .
- D. Samples: Submit three samples 12 by 12 inches in size illustrating finished aluminum surface.
- E. Test Report: Results of entrance door structural corner weld strength test per Kawneer dual moment load test procedure and certification by an independent testing laboratory to ensure weld compliance and corner integrity.
- F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- G. Design Data: Design calculations, identify dimensional limitations; include load calculations at points of attachment to building structure, bearing seal and signature of Professional Structural

Engineer licensed to practice in the State in which the Project is located, documenting compliance of exterior assemblies with wind pressure criteria.

1. Include design engineer's stamp or seal on design data .
- H. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- J. Designer's Qualification Statement.
- K. Installer's Qualification Statement.
- L. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer as follows:
  1. Material and Workmanship.
  2. Welded Door Corner.
  3. Finish.

#### **1.06 QUALITY ASSURANCE**

- A. Designer Qualifications: Design structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure. This is to be under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
  1. The storefront system should be designed to meet the structural loads as required by the 2018 edition of the International Building Code, and all dimensions on the Drawings.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- D. Source Limitations: Obtain glazed aluminum-framed storefront and glazed aluminum curtainwall system through one source from a single manufacturer.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

#### **1.08 FIELD CONDITIONS**

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

#### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Material and Workmanship: Correct defective Work within a five year period after Date of Substantial Completion.
- C. Welded Door Construction: Provide limited lifetime warranty for life of the door for welded door corners of storefront swinging doors.
- D. Finish: Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Basis of Design: Kawneer North America: [www.kawneer.com/#sle..](http://www.kawneer.com/#sle..)
  1. Storefront System 1: Trifab VersaGlaze 601TCG, center set, provide where shown.
    - a. 2- inch x 4- 1/2- inch nominal dimension.
    - b. Thermally broken.



- 1) Exterior storefront is to be thermally broken.
- 2) Interior storefront is not required to be thermally broken.
2. Storefront System 2: Trifab VersaGlaze 451 or 451T, center set, provide where shown.
  - a. 2- inch x 6- inch nominal dimension.
  - b. Thermally Broken.
    - 1) Exterior storefront is to be thermally broken.
    - 2) Interior storefront is not required to be thermally broken.
- B. Other Acceptable - Aluminum-Framed Storefronts Manufacturers: Subject to compliance with requirements, provide Basis of Design or comparable product by one of the following:
  1. Oldcastle BuildingEnvelope: [www.oldcastlebe.com/#sle](http://www.oldcastlebe.com/#sle).
  2. Tubelite, Inc: [www.tubeliteinc.com/#sle](http://www.tubeliteinc.com/#sle).
  3. YKK AP, [www.ykkap.com/](http://www.ykkap.com/).

## 2.02 STOREFRONT SYSTEM

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
  1. Unitized, shop assembly.
  2. Glazing Rabbet: For 1 inch insulating glazing.
  3. Glazing Position: Centered (front to back).
  4. Finish: Class I color anodized.
    - a. Factory finish all surfaces that will be exposed in completed assemblies.
    - b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
  5. Finish Color: Match existing.
  6. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
  7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
  8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
  9. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
  10. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
  11. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
  12. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.

## 2.03 PERFORMANCE REQUIREMENTS

- A. General Requirements
  1. Product to comply with the specified performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction, as determined by testing of aluminum storefront systems representing those indicated for this project.
  2. Aluminum storefront systems shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  3. Failure includes any of these events:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage .
    - c. Loosening or weakening of fasteners, attachments, and other components.

- d. Failure of operating units.
- B. Delegated Design:
  - 1. Design aluminum storefront systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load, and as applicable to the requirements of the 2018 International Building Code
  - 1. Design Wind Loads: Comply with requirements of ASCE 7 and Wind Load Design Criteria indicated on Structural Drawing entitled "General Notes."
  - 2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- D. Air Leakage Laboratory Test:
  - 1. The test specimen shall be tested in accordance with ASTM E 283.
  - 2. With interior seal, air leakage rate shall not exceed 0.06 cfm/ft<sup>2</sup> (0.3 l/s · m<sup>2</sup>) at a static air pressure differential of 6.2 psf (300 Pa).
  - 3. Without interior seal, air leakage rate shall not exceed 0.06 cfm/ft<sup>2</sup> (0.3 l/s · m<sup>2</sup>) at a static air pressure differential of 1.6 psf (75 Pa).
  - 4. CSA A440 Fixed Rating.
- E. Water Resistance:
  - 1. The test specimen shall be tested in accordance with ASTM E 331.
  - 2. There shall be no leakage at a minimum static air pressure differential of 10 psf (479 Pa) as defined in AAMA 501.
  - 3. CSA A440 B5 Rating.
- F. Uniform Load:
  - 1. A static air design load of 35 psf (1436 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330.
  - 2. There shall be no deflection in excess of L/175 of the span of any framing member.
  - 3. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
  - 4. CSA A440 C2 Rating.
- G. Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 by the story height and ultimate displacement of 1.5 by the design displacement.
- H. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures.
  - 1. Temperature Change (Range): 0 deg F; 180 deg F.
  - 2. Test Interior Ambient-Air Temperature: 75 deg F.
  - 3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for minimum 3 cycles.
- I. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

#### **2.04 STOREFRONT ENTRANCE DOORS AND HARDWARE**

- A. Aluminum -Framed Storefront Entrance Doors: Factory fabricated, factory finished aluminum framing members, hardware, anchorage and attachment devices.
  - 1. Product:
    - a. Exterior Pair: Kawneer, 500 Standard Entrance.
    - b. Interior Pair: Kawneer, 500 Standard Entrance.
  - 2. Finish: As specified for storefront system.
  - 3. Unitized shop assembly.

4. Door corner construction of mechanical clip fastening, SIGMA 1-1/8 inch long fillet welds along top and bottom of rail extrusion at stile and rail intersection and deep penetration plug weld at all four corners of door.
  - a. Welding shall be full penetration plug weld to leg of clip, 1-1/8 inch long top and bottom of rails at stiles intersection.
5. Doors and hardware shall conform to requirements of ANSI A117.1 and ADA.
- B. Performance Requirements:
  1. Wind, Water and Air: Meet wind, water and air requirements as specified for storefront system.
  2. Structural Performance: Corner strength shall be tested per Kawneer dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity.
  3. Forced Entry Resistance: Comply with AAMA 1304.
- C. Door Types:
  1. Single acting. Dual Glazed for exterior, single glazed for interior
  2. Exterior Pair: Dual glazed aluminum.
  3. Interior Pair: Single glazed aluminum.
- D. Door Description:
  1. Thickness: 1-3/4 inches
  2. Top Rail: 5- inches wide.
  3. Vertical Stiles: 5- inches wide.
  4. Bottom Rail: 10- inches wide.
  5. Glazing Stops: Square.
- E. Exterior Storefront Entrance Door Weatherstripping: Furnished and installed by storefront system supplier.
  1. Meeting stiles on pair of doors shall be equipped with adjustable astragal utilizing wool pile with polymeric fin.
  2. Door weathering on a single acting door and frame (single or pairs) comprised of thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

## 2.05 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
  1. Provide stiffening as needed to meet the noted heights and wind requirements.
  2. Framing members for interior applications need not be thermally broken.
  3. Glazing Stops: Flush.
  4. Cross-Section: As noted above
  5. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member as required.
  6. Sill Receptor (Sill Flashing): Continuous extruded sill with metal end dams of same material and dimension as sill receptor. Back leg of sill receptor minimum 1-1/2 inches.
- B. Glazing: See Section 08 80 00.

## 2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M. As required for structural support within the mullions
- D. Fasteners: Stainless steel.
- E. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- F. Concealed Flashings: Galvanized steel, 26 gauge, 0.0179 inch minimum base metal thickness.

- G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- H. Sealant for Setting Thresholds: Non-curing butyl type.
- I. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- J. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

## **2.07 FINISHES**

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Color: Match existing.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

## **2.08 DOOR HARDWARE**

- A. For each door, include weatherstripping.
- B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- C. Sill Sweep Strips: Resilient seal type, \_\_\_\_\_ of neoprene; provide on all doors.
- D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors. Must meet requirements of the Americans with Disabilities Act
- E. Hinges: Continuous Geared hinge, swing clear; top and bottom.
  - 1. Provide on Second street Entrance doors and Gallery entrance doors. At the Third street entrance pair doors, provide continuous hinges .
- F. Pivots: Center type; top and bottom.
  - 1. Provide on Third Street Entrance Single Doors.
- G. Push Sets: \_\_\_\_\_.
  - 1. At all interior entrance doors, provide Kawneer Architects Classic CP-II Push Bars
- H. Door Pulls
  - 1. At Second Street and Third Street entrance doors: Rockwood RM2410 -OvalTek- Flat Straight Pull - Large Round Posts.
    - a. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. At West Entrance Doors provide Kawneer Architects Classic Pull CO-12
- I. Exit Devices: Panic type.
  - 1. At Second and Gallery Entrance Exterior Single Doors, provide Kawneer 1786 Rim Latch
  - 2. At Second Street Double doors. provide Adams Rite G86 Concealed Vertical Rod type
  - 3. At all Third Street Entrance Exterior Doors, provide Adams Rite G86 Concealed Vertical Rod type
- J. Door Closers: Concealed overhead.
  - 1. At Gallery and Second Street entrances. COC with single acting offset arm: LCN 5030 Series
  - 2. At Third Street. Concealed overhead double acting closer. Provide surface stop to header to make doors single acting. Provide Center pivot arm and clamping block assembly in the top rail.
- K. Provide on doors as indicated.
  - 1. Locks: Dead latch with thumbturn inside ; keyed cylinder outside. Provide Cylinder Guard
- L. Automatic Door Operators and Actuators: See Section 08 42 29.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify dimensions, tolerances, operational clearances, and method of attachment with other work.

- B. Verify openings are sized to receive storefront system and sill is level in accordance with manufacturer acceptable tolerances.
- C. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.
- D. Proceed with installation only after correcting unsatisfactory conditions.
  - 1. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

### **3.02 INSTALLATION**

- A. Install storefront and entrance system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
- G. Install sill flashings, sill receptor, end dams and other members in bed of sealant to provide weathertight construction. Turn up ends and edges; seal to adjacent work to form water tight dam.
- H. Install components to drain water passing joints and condensation and moisture occurring or migrating within storefront system to exterior.
- I. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- J. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- K. Install intersection and joint sealant at framing member joints, intersections and covering sill receptor anchors at locations indicated in manufacturer's published installation instructions.
- L. Install additional flashing under sill receptor in bed of sealant where indicated on Drawings.
- M. Install storefront doors and hardware in accordance with manufacturer's instructions, ANSI/ICC A117.1 and ADA requirements.
- N. Install glass in accordance with Section 08 8800 - Glazing, using glazing method required to achieve performance criteria.
- O. Install perimeter sealant in accordance with Section 07 9000 - Joint Sealants.
- P. Install hardware using templates provided.
  - 1. See Section 08 42 29 for operator and actuator installation requirements.
- Q. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- R. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

### **3.03 TOLERANCES**

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 400 0 - Quality Requirements, for contractor quality control requirements.

- B. Inspect storefront entrance system installation, flashing, attachment to building structure, and continuity of weather barrier assembly.
- C. Inspect glass installation, sealant and finish.
- D. Manufacturer's Field Services: Manufacturer's Quality Control Inspector.
  - 1. Perform initial and final inspections.
  - 2. Prepare and submit inspection reports for each inspection made.
- E. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.
- F. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.
- G. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
  - 1. Perform a minimum of two tests in each designated area as directed by Architect.
  - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
  - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
    - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
  - 4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
    - a. Maximum allowable rate of air leakage is 0.09 cfm/sq ft.
  - 5. Field testing is to be the responsibility of the installer.
- H. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.
  - 1. Tests that do not meet the specified performance requirements and units that have deficiencies shall be corrected as part of the contract amount.
  - 2. Retesting, and paying for the retesting, is to also be the responsibility of the installer.

**3.05 ADJUSTING**

- A. Adjust operating hardware for smooth operation.
  - 1. Comply with all applicable accessibility requirements.

**3.06 CLEANING**

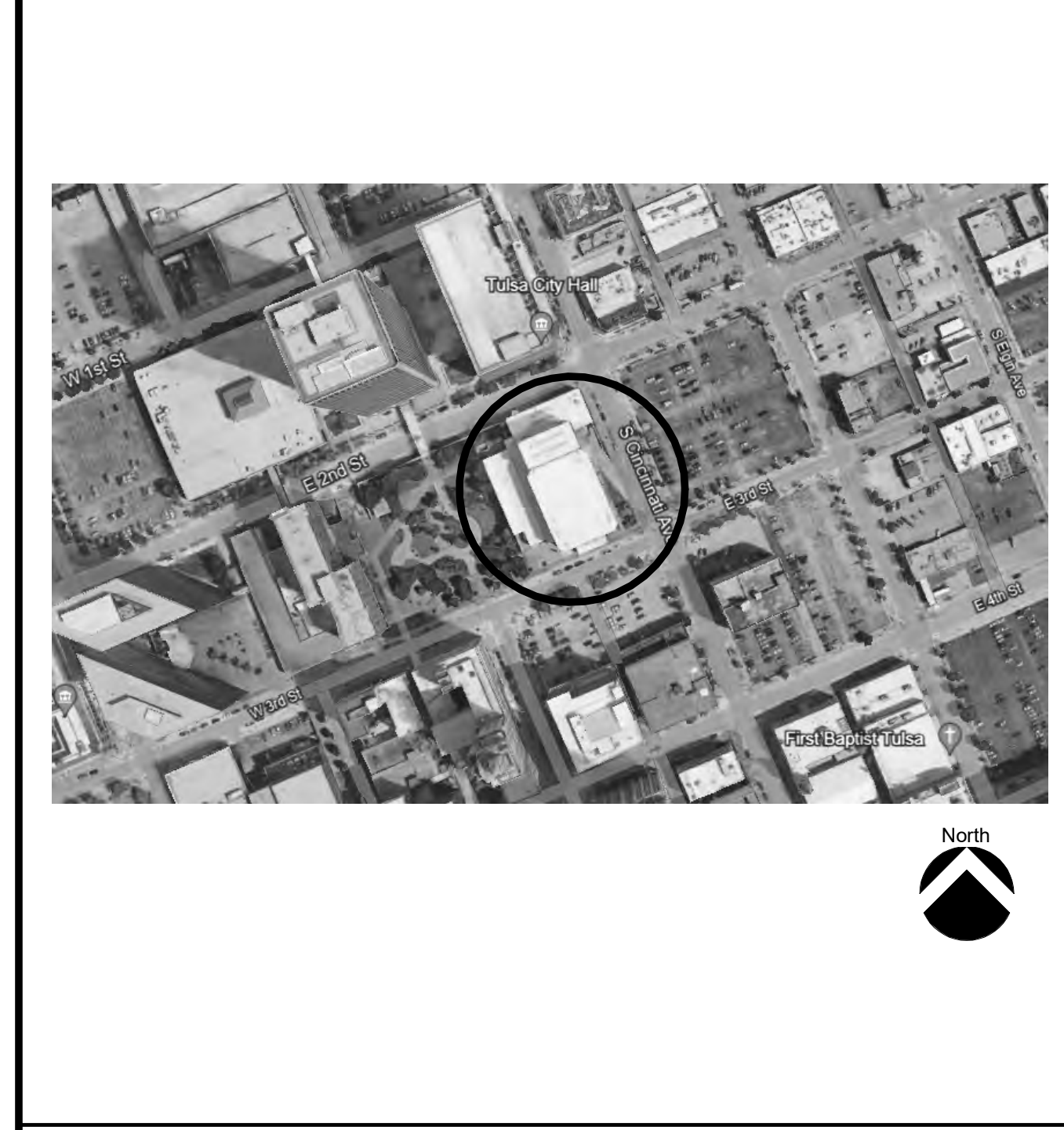
- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.
- D. Just before Substantial Completion Inspection, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

**3.07 PROTECTION**

- A. Remove and replace glass that has been broken, chipped, cracked, abraded or damaged during construction.
- B. Protect installed products from damage until Date of Substantial Completion.

**END OF SECTION**

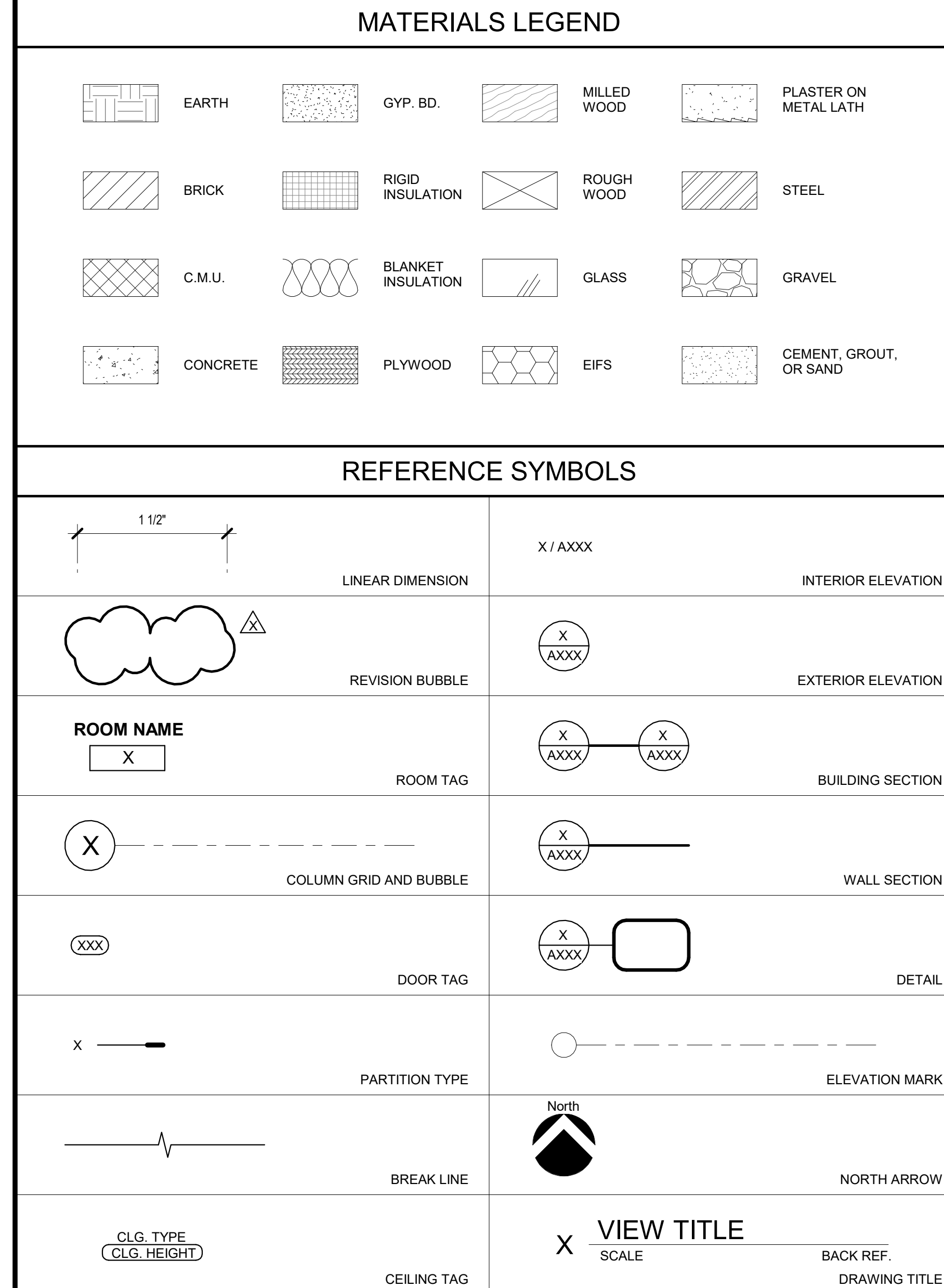
PROJECT TEAM	
<p><b>PROPERTY OWNER:</b> CITY OF TULSA 175 E. 2ND STREET TULSA, OKLAHOMA 74103</p> <p><b>PROPERTY MANAGER:</b> TULSA PERFORMING ARTS CENTER 110 E. 2ND STREET TULSA, OKLAHOMA 74103 PHONE: 918.585.7111</p> <p><b>CONSTRUCTION MANAGER:</b> LOWRY CONSTRUCTION SERVICES, INC. 1729 S. BOSTON AVE. TULSA, OK 74119 PHONE: 918.592.2442 FAX: 918.592.0254</p>	<p><b>M.E.P. ENGINEER:</b> PHILLIPS + GOMEZ 15 W 6TH ST SUITE 2510 TULSA, OK 74119 PHONE: 918.584.0102</p> <p><b>AUDIO VISUAL:</b> SCHULER SHOOK 219 MAIN STREET SE, SUITE 200 MINNEAPOLIS, MN 55414 PHONE: 612.339.9568</p> <p><b>ARCHITECT:</b> BECK DESIGN 110 WEST 7TH STREET SUITE 710 TULSA, OK 74119 PHONE: 918.583.5300 FAX: 918.585.1967</p>



### GENERAL NOTES

- FIELD VERIFY ALL MEASUREMENTS REQUIRED. USE DIMENSIONS SHOWN ON DRAWINGS AND ACTUAL FIELD MEASUREMENTS. DO NOT SCALE DRAWINGS. VERIFY ALL DIMENSIONS AND CONDITIONS AND NOTIFY ARCHITECT OF ANY DISCREPANCIES IN WRITING BEFORE PROCEEDING WITH WORK.
- PRIOR TO THE SUBMISSION OF BIDS, THE CONTRACTOR SHALL VISIT THE SITE AND BE RESPONSIBLE FOR COORDINATING THE EXISTING CONDITIONS WITH THE WORK SPECIFIED IN THE CONTRACT DOCUMENTS, TO CONFIRM THAT THE INTENT OF THE CONTRACT DOCUMENTS CAN BE FULFILLED. NOTIFY THE ARCHITECT IN WRITING OF ALL DISCREPANCIES.
- CONTRACTOR SHALL RECEIVE IN WRITING, AUTHORIZATION TO PROCEED BEFORE STARTING ANY WORK THAT IS NOT CLEARLY DEFINED BY THE CONTRACT DOCUMENTS.
- CONTRACTORS SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS UNLESS SPECIFICALLY, OR OTHERWISE INDICATED, OR WHERE APPLICABLE CODES OR REGULATIONS TAKE PRECEDENCE.
- ALL WORK PERFORMED AND MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES. CONTRACTOR SHALL GIVE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY BEARING ON PERFORMANCE OF THE WORK. MECHANICAL, ELECTRICAL SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS, LOCAL AND STATE JURISDICTIONS, ORDINANCES, AND APPLICABLE REGULATIONS.
- GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL SUPERVISE, AND DIRECT THE WORK. CONTRACTORS SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT, INCLUDING CONTACT AND COORDINATION WITH ALL AUTHORIZED OWNER REPRESENTATIVES.
- DETAILS ARE INTENDED TO SHOW THE END RESULT OF THE DESIGN AND PERFORMANCE. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT EXISTING CONDITIONS. SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.
- CONTRACTORS SHALL VERIFY LOCATIONS OF ALL UTILITIES AND SERVICES PRIOR TO PROCEEDING WITH THE WORK TO ENSURE PROPER COORDINATION, SEQUENCING AND INSTALLATION OF NEW WORK.
- PROVIDE FIRE SEALANT TO PERIMETER OF ALL PIPING, HVAC SLEEVING OR OTHER TYPE OF THRU-WALL PENETRATION.
- NOTIFY ARCHITECT IMMEDIATELY OF ANY UNFORESEEN CONDITIONS FOR DIRECTION BEFORE PROCEEDING WITH WORK.
- PAINT ALL EXPOSED SURFACES, EXCEPT WHERE ITEMS ARE SCHEDULED TO REMAIN NATURAL OR ARE OTHERWISE RESTRICTED BY LOCAL CODES, ORDINANCES, OR AUTHORITIES HAVING JURISDICTION.
- COORDINATE / VERIFY WITH ARCHITECT ALL LIGHTING MOUNTING HEIGHTS.
- CONTRACTOR SHALL PROVIDE AND INSTALL BLOCKING FOR ALL FURNITURE, FIXTURES, AND EQUIPMENT INDICATED HEREIN. FOR OWNER PROVIDED ITEMS SUCH AS AUDIO VISUAL AND INFORMATION TECHNOLOGY ITEMS, THE CONTRACTOR SHALL COORDINATE WITH THE OWNER AND SHALL INSTALL PER CODE MINIMUM.
- CONTRACTOR SHALL PROVIDE ALL FIRE EXTINGUISHERS, FIRE ALARMS, FIRE DAMPERS, AND LIFE SAFETY ITEMS AS REQUIRED BY THE AHJ.

PROJECT ABBREVIATIONS			
ABV ABOVE FINISH FLOOR	F.E. FIRE EXTINGUISHER	P.S.F. PER SQUARE FOOT	PER SQUARE FOOT
A.F.F. ABOVE FINISH FLOOR	F.E.B. FIRE EXTINGUISHER	P.S.I. PER SQUARE INCH	PER SQUARE INCH
ACOUS ACOUSTICAL	ON BRACKET	P PLATE	PLATE
AC AIR CONDITIONING	FIRE EXTINGUISHER CABINET	PLY PLWOOD	PLYWOOD
ALT ALTERNATE	F.H.C. FIRE HOSE CABINET	PP POWER POLE	POWER POLE
ALUM ALUMINUM	FLASH FLASHING	P.V.C. POLYVINYL CHLORIDE	POLYVINYL CHLORIDE
A.B. ANCHOR BOLT	FLOOR (ING)	P.C.C. PRE-CAST CONCRETE	PRE-CAST CONCRETE
ANGLE ANGLE	FCO FLOOR CLEANOUT	PFAB PREFABRICATED	PREFABRICATED
APPROX APPROXIMATE	F.D. FLOOR DRAIN	PT PRESSURE TREATED WOOD	PRESSURE TREATED WOOD
AIE ARCHITECT/ENGINEER	FRT FIRE RETARDANT TREATED	PL PROPERTY LINE	PROPERTY LINE
ARCH ARCHITECTURE (URAL)	FT FOOT OR FEET	Q.T. QUARRY TILE	QUARRY TILE
A.D. AREA DRAIN	FTG FOOTING		
@ AT	FDN FOUNDATION		
AHJ AUTHORITY HAVING JURISDICTION	GALV GALVANIZED	RAD RAD	RADIUS
	GA GAUGE	REF or RE: REFERENCE	REFERENCE
BM BEAM	GENE GENERAL CONTRACTOR	REIN REINFORCE D (ING)	REINFORCE D (ING)
BLW BELOW	GLS GLASS	RA RETURN AIR	RETURN AIR
B.G. BELOW GRADE	GLS BLK GLASS BLOCK	REV REVISION	REVISION
B.M. BENCH MARK	GLB GLUE LAM BEAM	REQD REQUIRED (ING)	REQUIRED (ING)
BLK BLOCK	GB GRAB BAR	R.O.W. RIGHT OF WAY	RIGHT OF WAY
BLKG BLOCKING	GRD GRADE GRADING	R RISER	RISER
BD BOARD	GYP BD GYPSUM BOARD	RF ROOF	ROOF
B.O.B. BOTTOM OF BEAM		RFG ROOFING	ROOFING
B.O.D. BOTTOM OF DECK		RD ROOF DRAIN	ROOF DRAIN
B.O.S. BOTTOM OF STRUCTURE	HC HANDICAPPED	RHF ROOF HATCH	ROOF HATCH
BOT BOTTOM	HDR HARDWARE	RTU ROOF TOP UNIT	ROOF TOP UNIT
BLDG BUILDING	HDR HEADER	RM ROOM	ROOM
B.U.R. BUILT-UP ROOFING	HVAC HEATING/ VENTILATION/ AIR CONDITIONING	R.O. ROOM OPENING	ROOM OPENING
	H.D. HEAVY DUTY	SCH SCHEDULE	SCHEDULE
CAB CABINET	HGT HEIGHT	SEC SECTION	SECTION
CRPT CARPET	H.C. HOLLOW CORE	SHTG SHEATHING	SHEATHING
CSMT CASEMENT	H.M. or HM HOLLOW METAL	SHT SHEET	SHEET
CLG CEILING	HORIZ HORIZONTAL	SIM SIMILAR	SIMILAR
CTR CENTER	H.B. HOSE BIBB (FROST-PROOF)	SL SLAB	SLAB
CL CENTER LINE	HR HOUR	SC SOLID CORE	SOLID CORE
CEM CEMENT		SOUTH SOUTH	SOUTH
CLR CLEAR	INCL INCLUDE	SPECS SPECIFICATIONS	SPECIFICATIONS
CLO CLOSET	INFO INFORMATION	SQ SQUARE	SQUARE
C.O. CLEAN OUT	INSI INSIDE DIAMETER	SS STAINLESS STEEL	STAINLESS STEEL
CFMF COLD FORMED METAL FRAMING	INSUL INSULATE, INSULATION	STD STANDARD	STANDARD
COL COLUMN	INT INTERIOR	STL STEEL	STEEL
COMB COMBINATION	INSTALL INSTALLATION	STOR STORAGE	STORAGE
CONC CONCRETE	JST JOIST	SD STORM DRAIN	STORM DRAIN
CMU CONCRETE MASONRY UNIT	JOINT JOINT	STRUCT STRUCTURAL	STRUCTURAL
COND CONDENSATE	SURF SURF	SUSP SUSPENDED	SUSPENDED
CONN CONNECTION	S.C. SUBCONTRACTOR	SA SUPPLY AIR SYSTEM	SUPPLY AIR SYSTEM
CONSTR CONSTRUCTION	KO KNOCKOUT	SYST SYSTEM	SYSTEM
CONT CONTINUOUS (ATION)	KP KICKPLATE	TEL TELEPHONE	TELEPHONE
C.F.O.I. CONTRACTOR FURNISHED, OWNER INSTALLED	L.B. LAG BOLT	TEMP TEMPORARY	TEMPORARY
C.F.O.I. CONTRACTOR FURNISHED, OWNER INSTALLED	LAM LAMINATE	THK THICK	THICK
	LWC LIGHTWEIGHT CONCRETE	T & G TONGUE AND GROOVE	TONGUE AND GROOVE
C.J. CONTROL JOINT	LVR LOUVER	T.O.B. TOP OF BEAM	TOP OF BEAM
CORR CORRUGATED	LVT LUXURY VINYL TILE	T.O.C. TOP OF CURB	TOP OF CURB
CF CUBIC FOOT		T.O.L. TOP OF LEDGER	TOP OF LEDGER
CYD CUBIC YARD	MGMT MANAGEMENT	T.O.P. TOP OF PARAPET	TOP OF PARAPET
	MFG MANUFACTURER	T.O.P.V. TOP OF PAVEMENT	TOP OF PAVEMENT
DEMO DEMOLITION	MAS MASONRY	T.O.PL. TOP OF PLATE	TOP OF PLATE
DEPT DEPARTMENT	MASONRY OPENING	T.O.S. TOP OF SLAB	TOP OF SLAB
DTL DETAIL	MAT MATERIAL	T.O.S. TOP OF STEEL	TOP OF STEEL
DIAG DIAGONAL	MH MANHOLE	T.O.T. TOP OF TRUSS	TOP OF TRUSS
DIAM DIAMETER	MAX MAXIMUM	T.O.W. TOP OF WALL	TOP OF WALL
DIM DIMENSION	MECH MECHANICAL	T TREAD	TREAD
DISP DISPENSER	MEP MECHANICAL, ELECTRICAL, PLUMBING	TYP TYPICAL	TYPICAL
DOOR DOOR	MBR MEMBER	U.G. UNDERGROUND	UNDERGROUND
DBL DOUBLE	MEMB MEMBRANE	UNF UNFINISHED	UNFINISHED
DN DOWN	MTL METAL	UNLESS NOTED OTHERWISE	UNLESS NOTED OTHERWISE
D.S. DOWNSPOUT	MTR METER	UR URINAL	URINAL
DWR DRAWER	MIN MINIMUM	U UTILITIES	UTILITIES
DWG DRAWING	MIR MIRROR	V.B. VAPOR BARRIER	VAPOR BARRIER
D DRAIN	MISC MISCELLANEOUS	V.I.F. VERIFY IN FIELD	VERIFY IN FIELD
	(N) NEW	VERT VERTICAL	VERTICAL
EA EACH	NSF NET SQUARE FEET	VEST VESTIBULE	VESTIBULE
EIFS EXTERIOR INSULATION AND FINISH SYSTEM	NOM NOMINAL	WB WALL BASE	WALL BASE
EL ELEVATION	N NORTH	W.H. WALL HUNG	WALL HUNG
ELEC ELECTRIC (AL)	N.I.C. NOT IN CONTRACT	W TO W WALL TO WALL	WALL TO WALL
ELEV ELEVATOR	N.T.S. NOT TO SCALE	NO. NUMBER	NUMBER
ENCL ENCLOSE (URE)		WC WATER CLOSET	WATER CLOSET
E.N. END NAILING		WH WATER HEATER	WATER HEATER
ENG ENGINEER (ING)	O.C. ON CENTER	WP WATERPROOF	WATERPROOF
EQU EQUAL	O.T.S. OPEN TO STRUCTURE	WR WATER RESISTANT	WATER RESISTANT
EQUIP EQUIPMENT	OPNG OPENING	WT WEIGHT	WEIGHT
EXH EXHAUST	OPH OPPOSITE HAND	W WEST	WEST
EXH EXHAUST	O.D. OUTSIDE DIAMETER	W/W WINDOW	WINDOW
E.J. EXPANSION JOINT	OVD OVERHEAD	W/ WITH	WITH
EXT EXTERIOR	O.VH OVERHANG	W/W WITHIN	WITHIN
	O.F.C.I. CONTRACTOR FURNISHED, OWNER INSTALLED	W/O WITHOUT	WITHOUT
F.O.C. FACE OF CONCRETE (CURB)	O.F.O.I. CONTRACTOR FURNISHED, OWNER INSTALLED	WD WOOD	WOOD
F.O.F. FACE OF FINISH		WI WROUGHT IRON	WROUGHT IRON
F.O.M. FACE OF MASONRY			
F.O.S. FACE OF STUD	PR PAIR		
FIN FINISH	PKG PARKING		
F.G. FINISH GRADE	d PENNY		
F.F. FINISH FLOOR	P.C.F. PER CUBIC FOOT		
F.F.E. FINISH FLOOR ELEVATION	P.L.F. PER LINEAL FOOT		
FA FIRE ALARM			

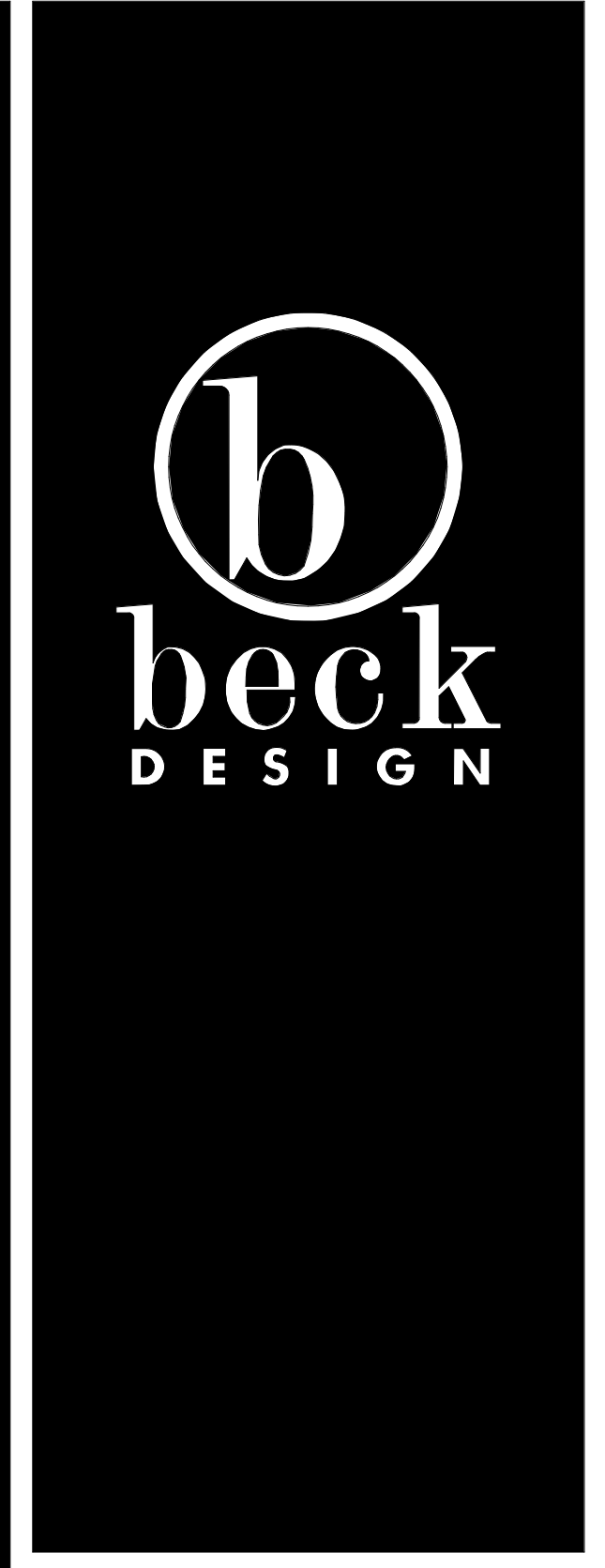


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### KEYNOTE LEGEND

	EARTH		GYP. BD.		MILLED WOOD		PLASTER ON METAL LATH
	BRICK		RIGID INSULATION		ROUGH WOOD		STEEL
	C.M.U.		BLANKET INSULATION		GLASS		GRAVEL
	CONCRETE		PLYWOOD		EIFS		CEMENT, GROUT, OR SAND



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**PROJECT:**  
**PROJECT #**  
**SP 23-2**  
**TULSA**  
**PERFORMING**  
**ARTS CENTER -**  
**PACKAGE No. 1**  
**AND No. 2**

**PROJECT NUMBER:**  
**202331.00**

**CONSULTANT:**

**REVISIONS:**

No	Description	Date
1	PERMIT SET	12.13.2023
2	PERMIT SET EXT. SIGNS	01.17.2024
3	ISSUE FOR BID	01.24.2024
4	ADDENDUM #1	03.05.2024

**SEAL:**

03.05.2024

**ISSUE DATE:**  
**01.24.2024**

**SHEET NUMBER:**

**G001**  
**DRAWING INDEX,**  
**LOCATION MAP,**  
**SYMBOLS,**  
**ABBREVIATIONS,**  
**KEYNOTES**



**SHEET NOTES - GLAZING TYPES**

1. NOT ALL GLAZING IN THE PROJECT IS REPRESENTED IN THESE GLAZING TYPE SHEETS. REFERENCE PLANS, ELEVATIONS, SECTIONS, AND DOOR FRAME SCHEDULE FOR ALL GLAZING IN PROJECT.
  2. ALL DIMENSIONS MUST BE VERIFIED IN FIELD PRIOR TO FABRICATION.
  3. TEMPERED GLASS SHALL BE PROVIDED WITHIN 2 FEET OF ALL EXITS, OR WHERE NOTED.
- T = TEMPERED SAFETY GLASS



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**PROJECT:**  
**PROJECT #**  
**SP 23-2**  
**TULSA**  
**PERFORMING**  
**ARTS CENTER -**  
**PACKAGE No. 1**  
**AND No. 2**

**PROJECT NUMBER:**  
**202331.00**

**CONSULTANT:**

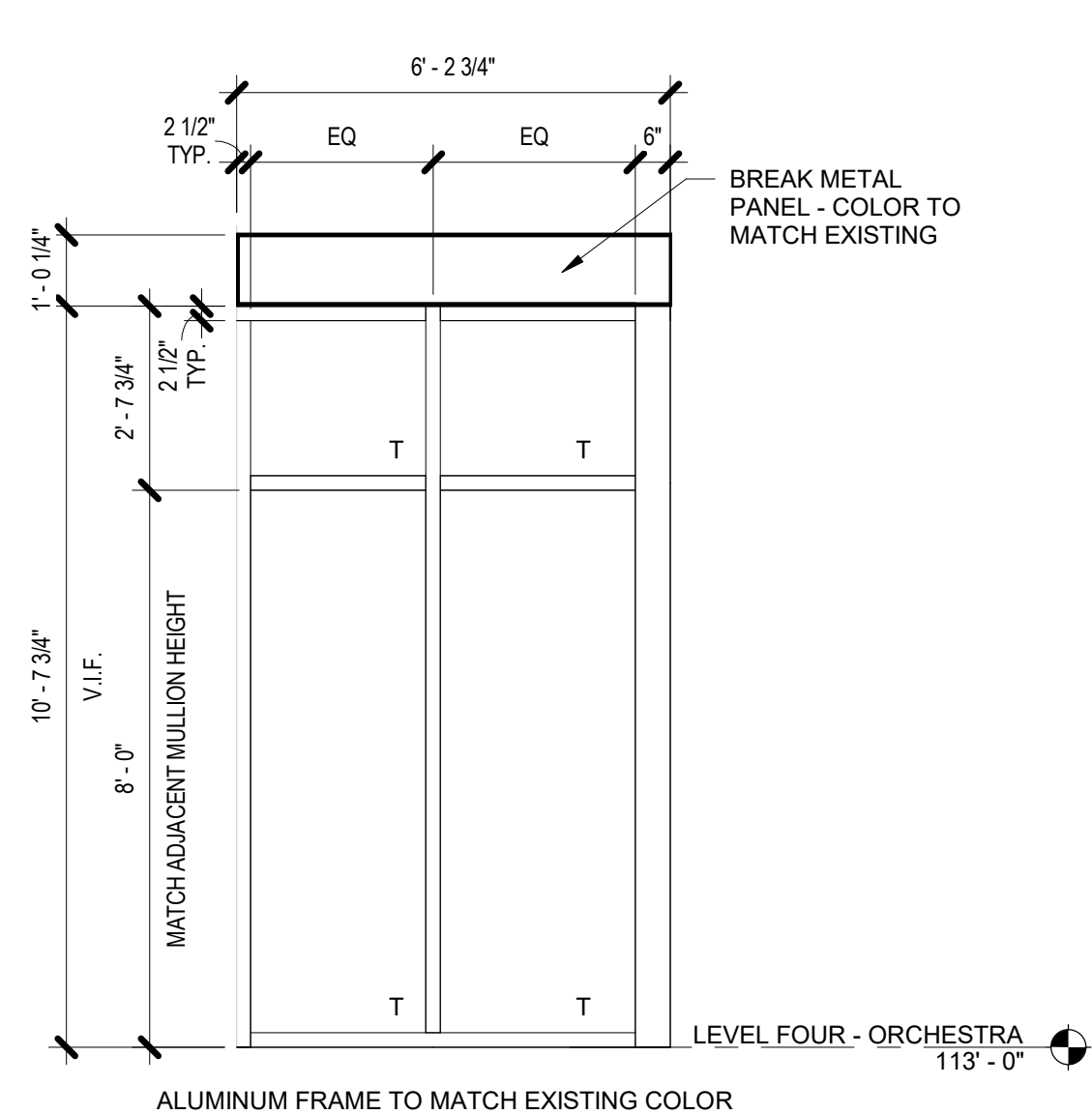
**REVISIONS:**

No	Description	Date
1	PERMIT SET	12.13.2023
3	ISSUE FOR BID	01.24.2024
4	ADDENDUM #1	03.05.2024

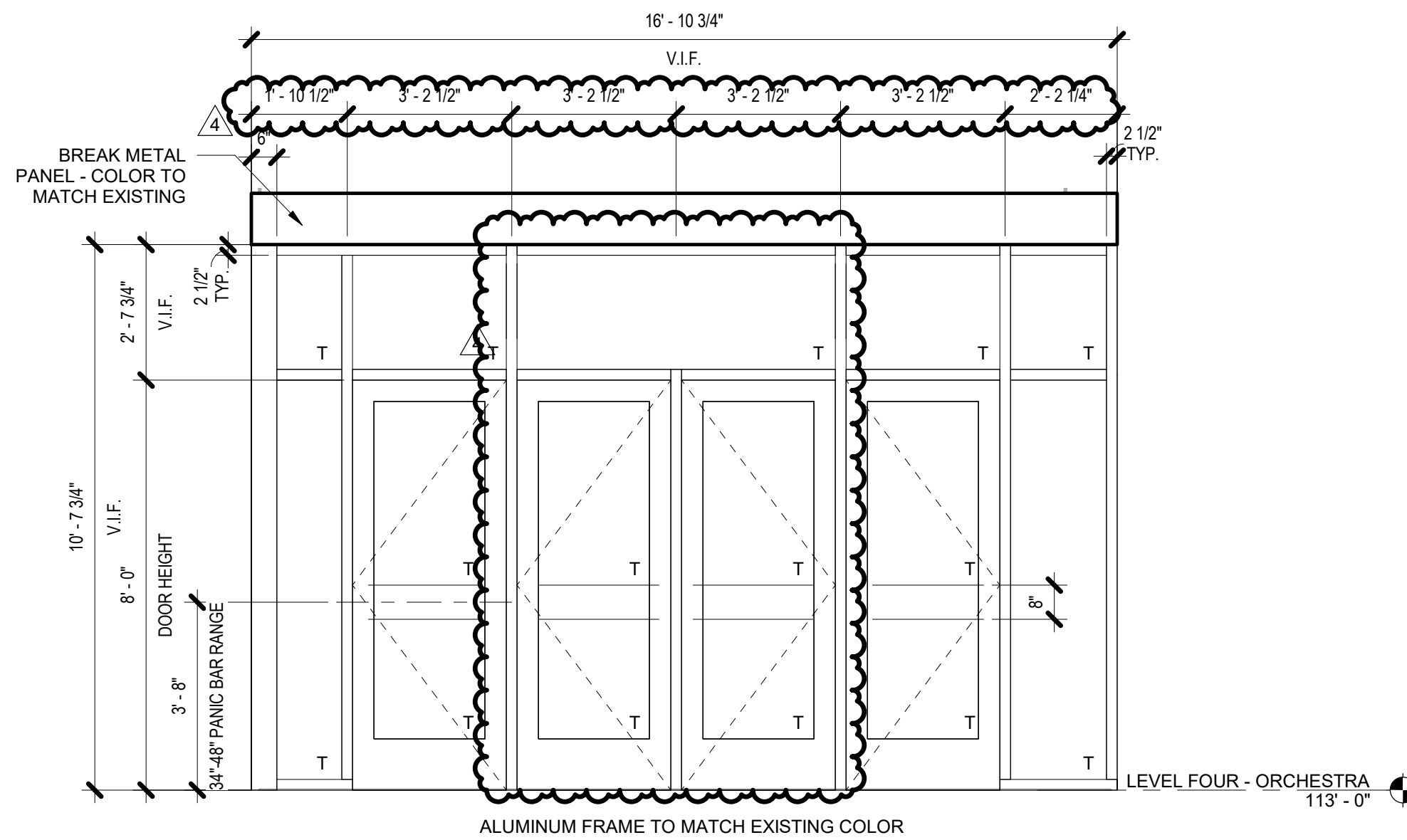
**SEAL:**

**ISSUE DATE:**  
**01.24.2024**

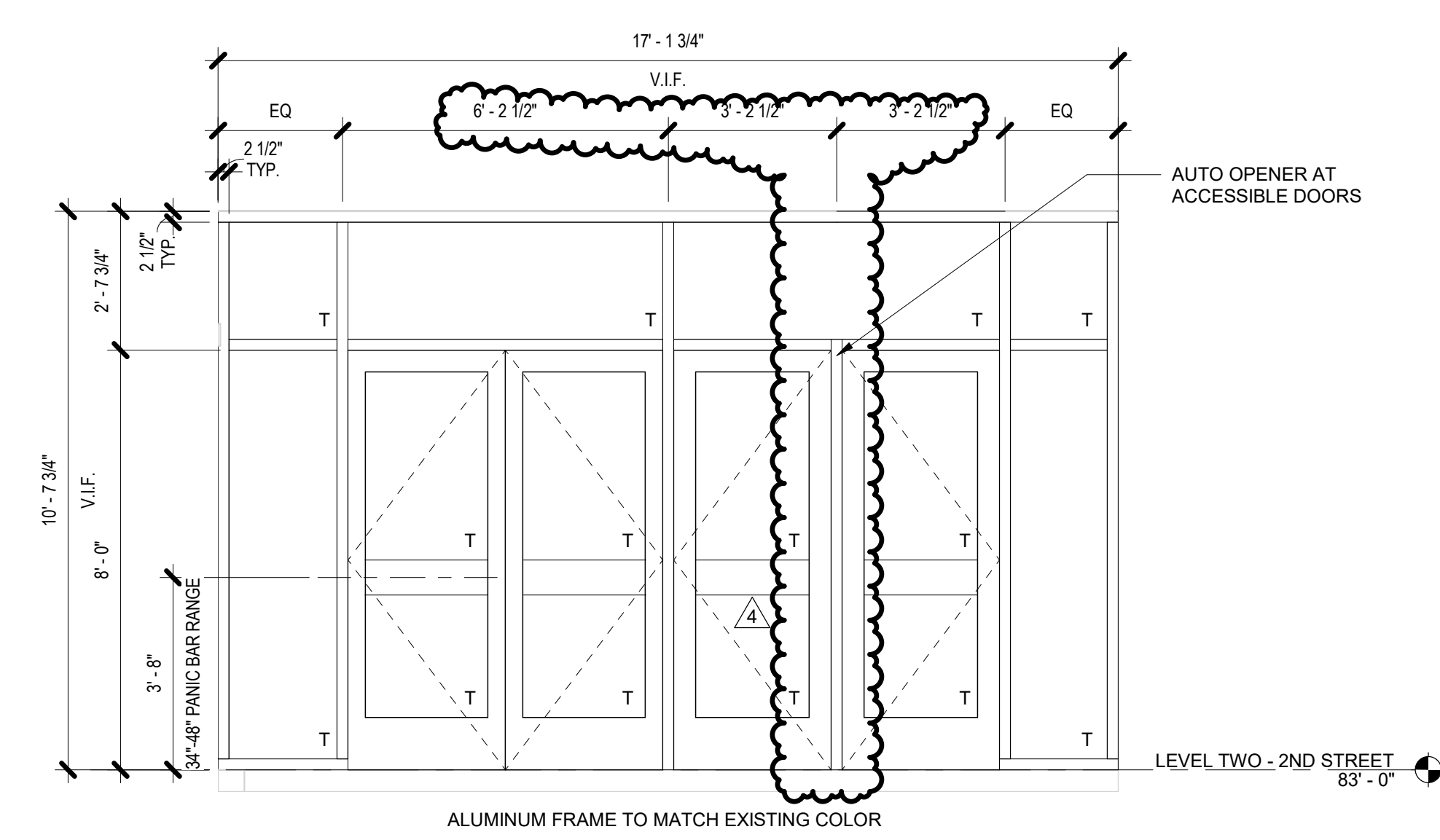
**SHEET NUMBER:**  
**A624**  
**ENLARGED PLANS**  
**STOREFRONT**  
**ENTRANCES**



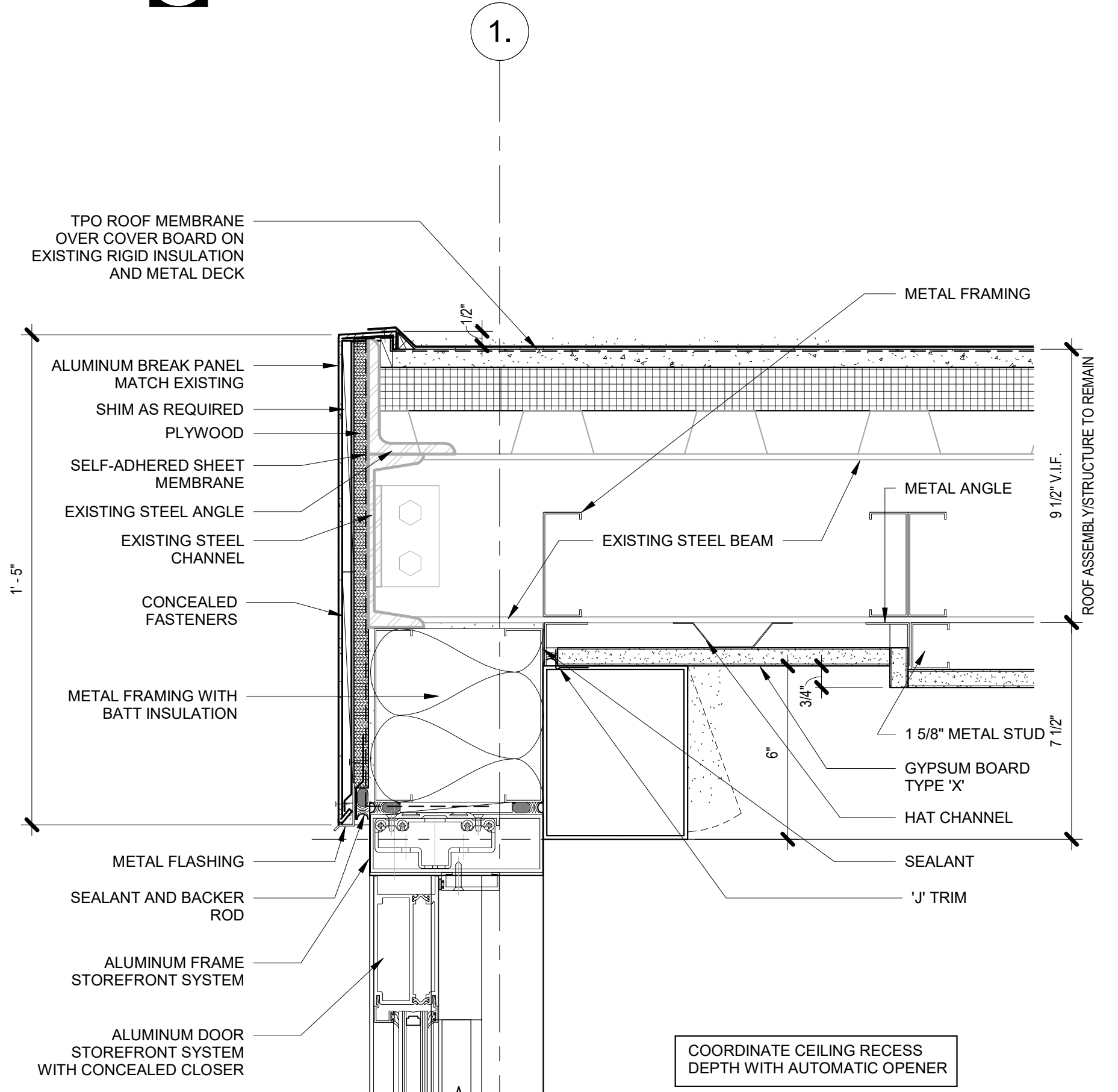
**8 INTERIOR STOREFRONT SYSTEM 2 DOOR ELEVATION**  
 3/8" = 1'-0" 2 / A624



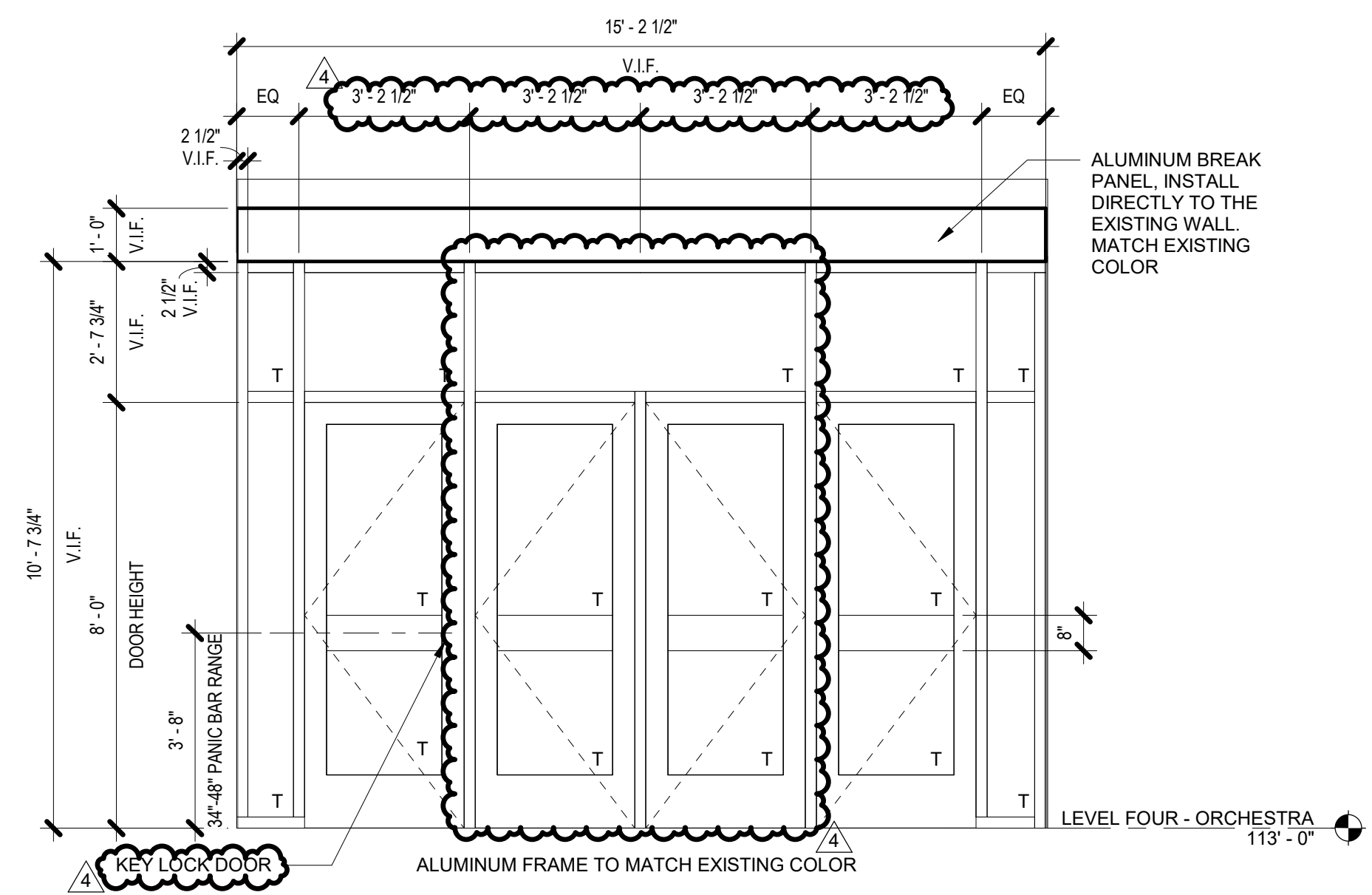
**7 INTERIOR STOREFRONT SYSTEM 2 DOOR ELEVATION**  
 3/8" = 1'-0" 2 / A624



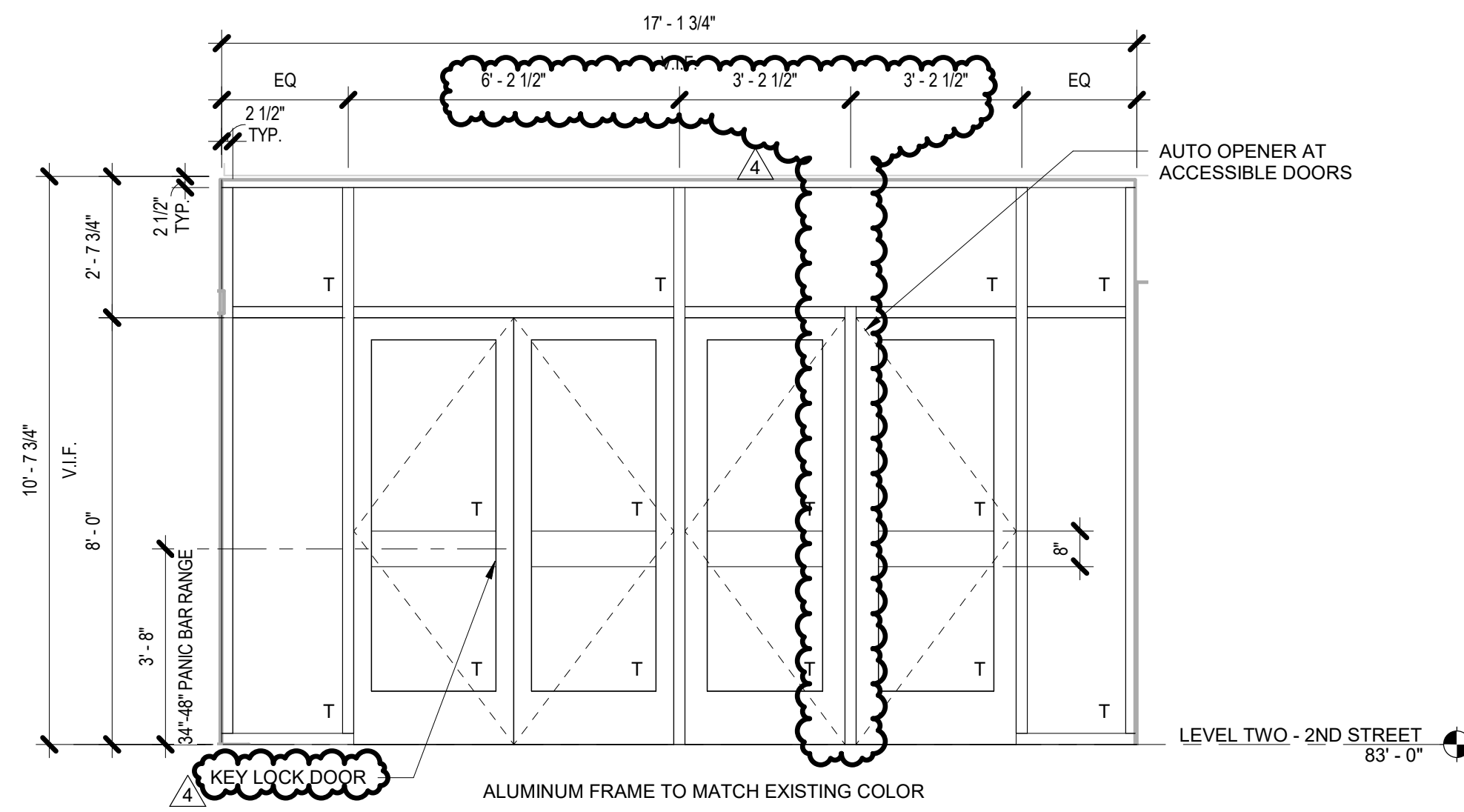
**6 INTERIOR STOREFRONT SYSTEM 2 ELEVATION**  
 3/8" = 1'-0" 1 / A624



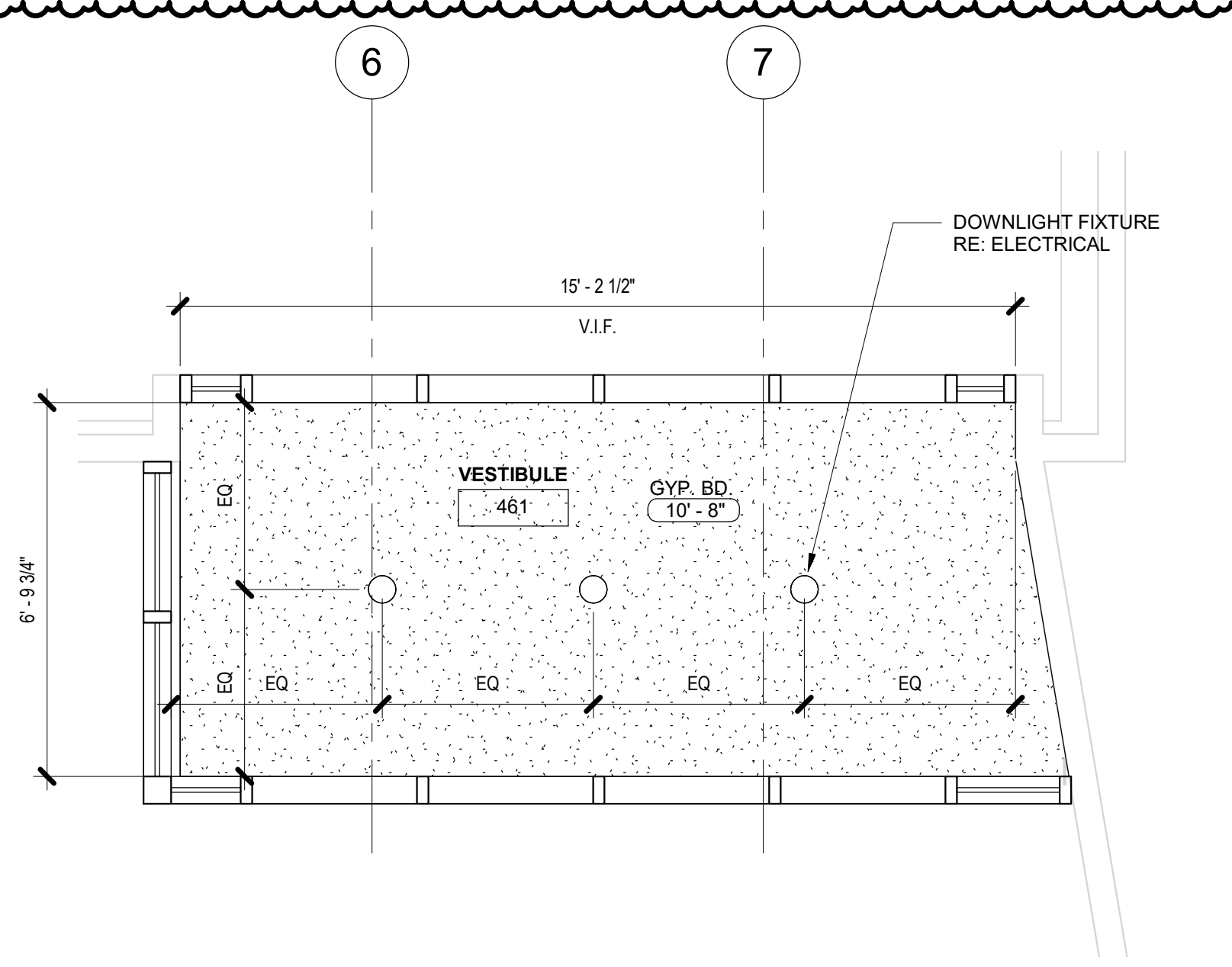
**9 SECTION DETAIL AT STOREFRONT HEAD - DOOR OPENER**  
 3" = 1'-0" 1 / A625



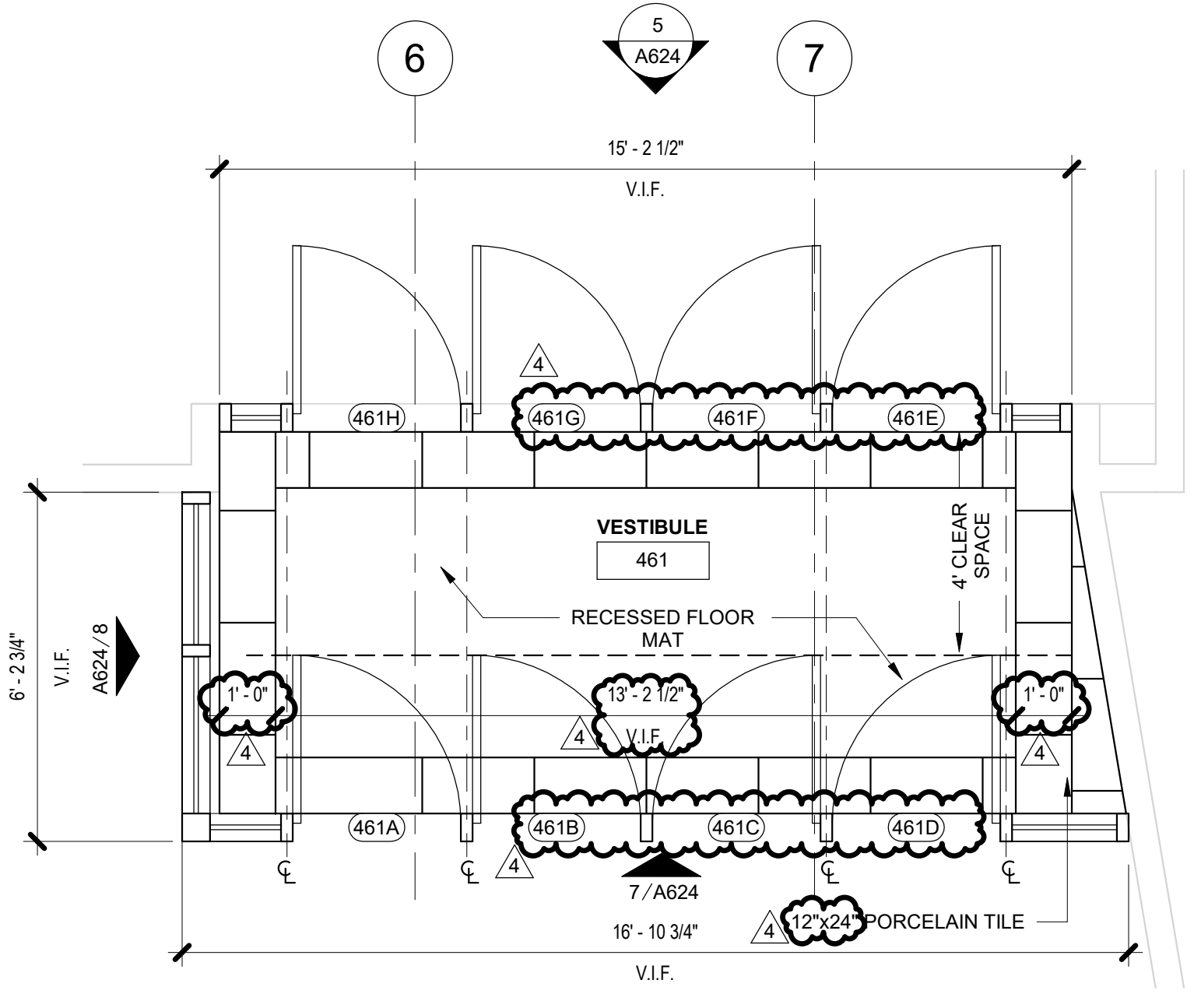
**5 EXTERIOR STOREFRONT SYSTEM 2 DOOR ELEVATION**  
 3/8" = 1'-0" 2 / A624



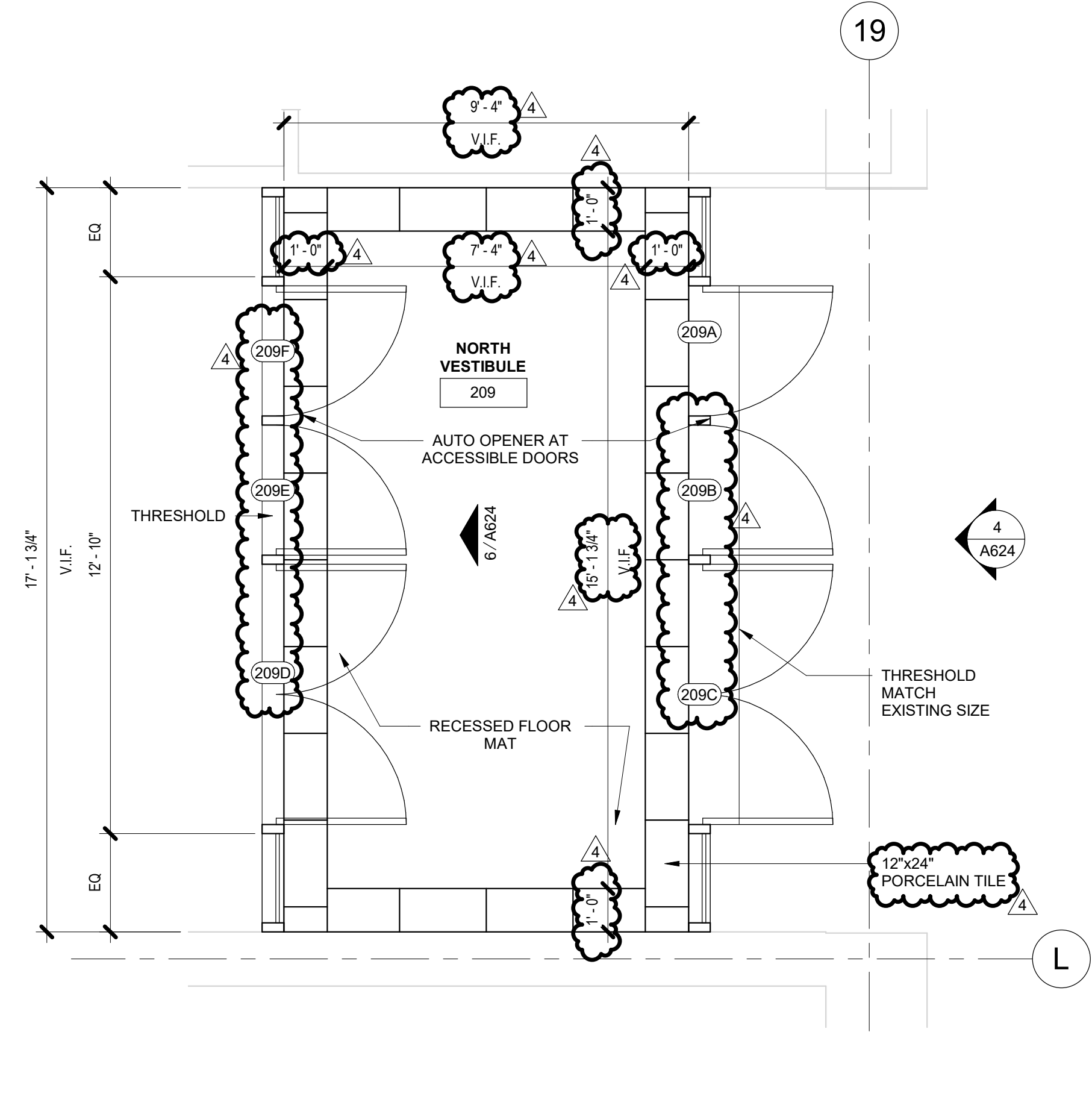
**4 EXTERIOR STOREFRONT SYSTEM 2 ELEVATION**  
 3/8" = 1'-0" 1 / A624



**3 04 -GALLERY RCP - ENL. WEST VESTIBULE**  
 3/8" = 1'-0" 1 / A624/B

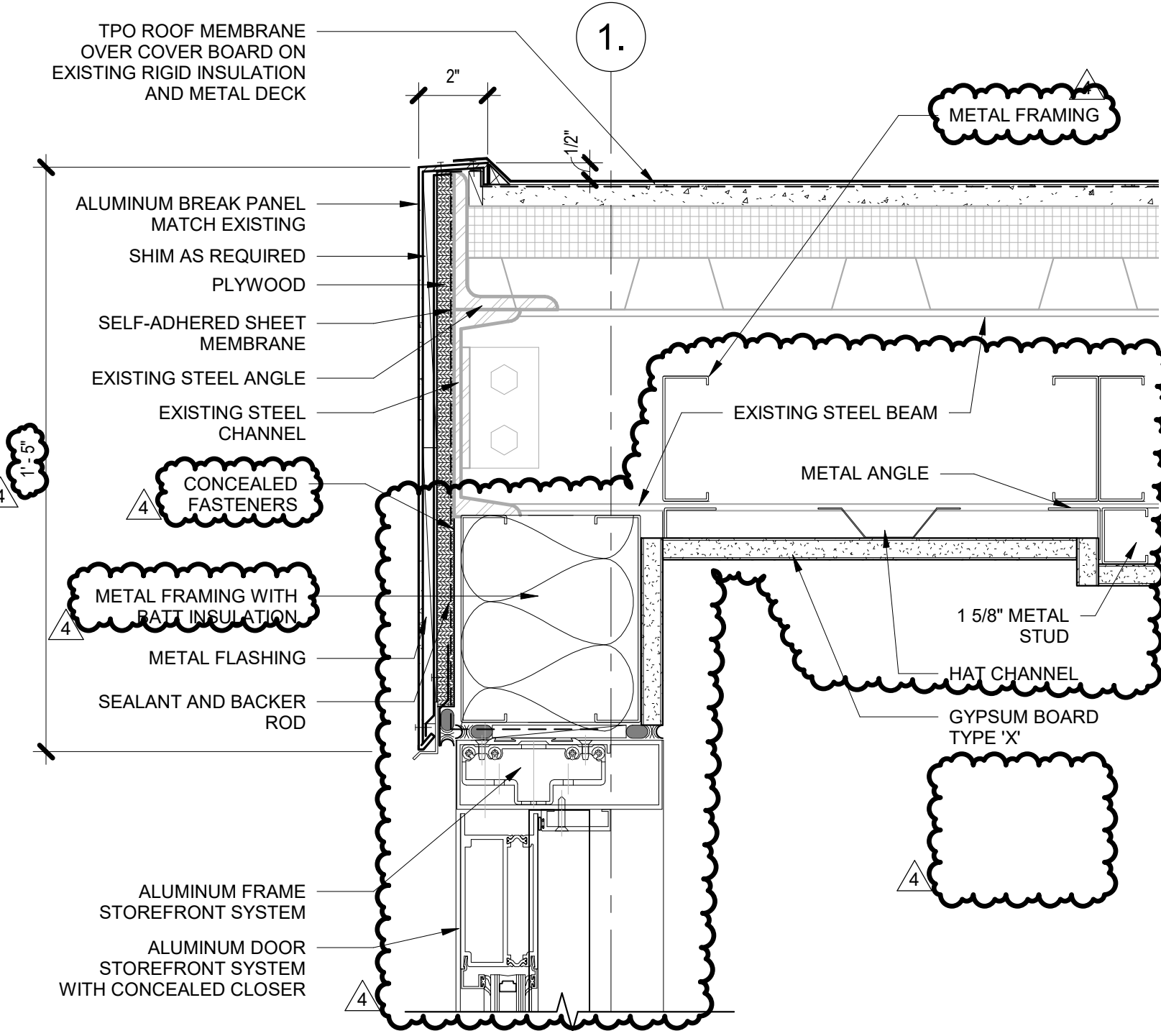


**2 04 - GALLERY STOREFRONT DOORS ENL. PLAN**  
 3/8" = 1'-0" 1 / A204

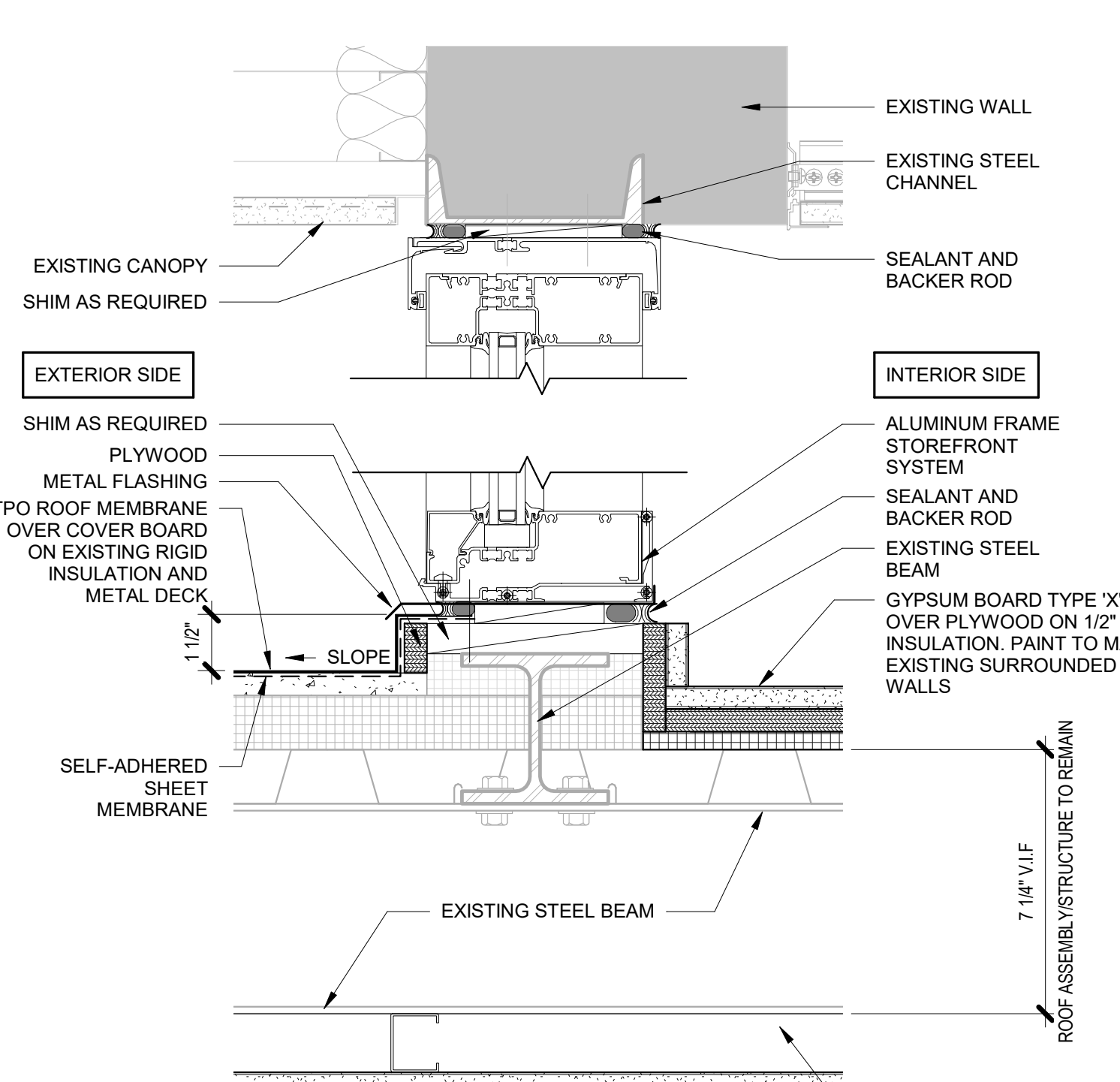


**1 02 - 2nd STREET NORTH VESTIBULE ENL. PLAN**  
 3/8" = 1'-0" 1 / A202

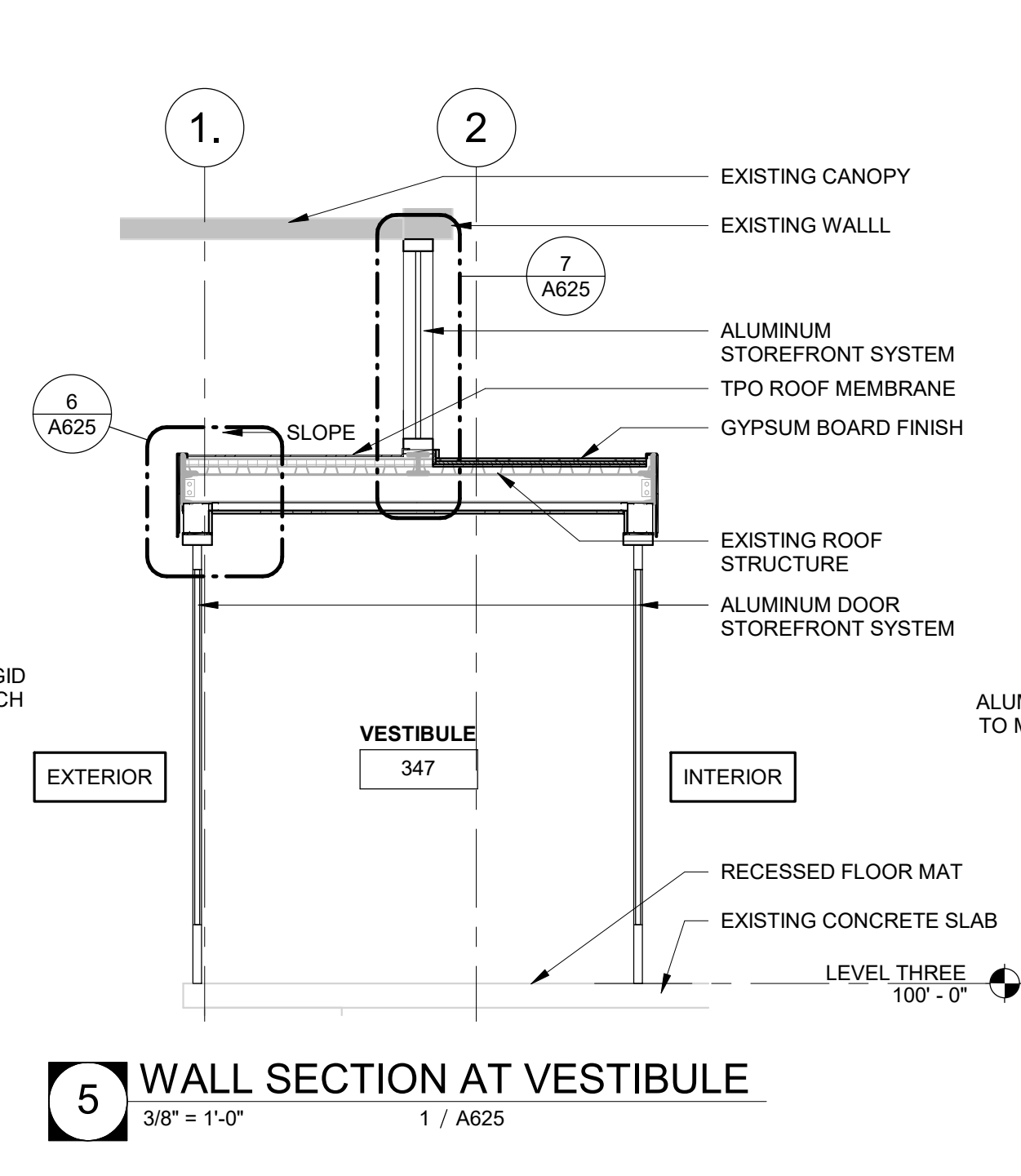




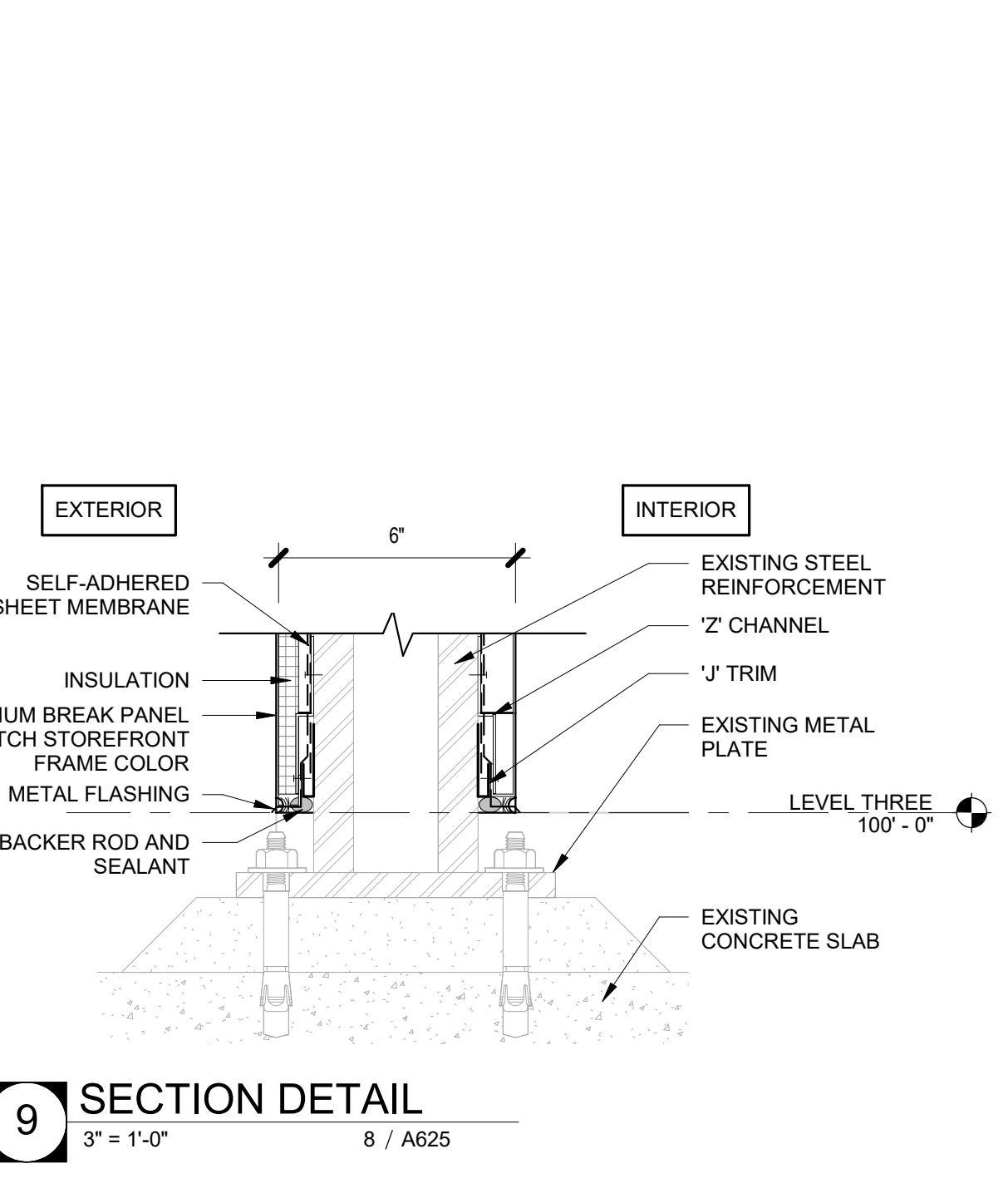
**6 SECTION DETAIL AT STOREFRONT HEAD - FASCIA**  
3/8" = 1'-0" 5 / A625



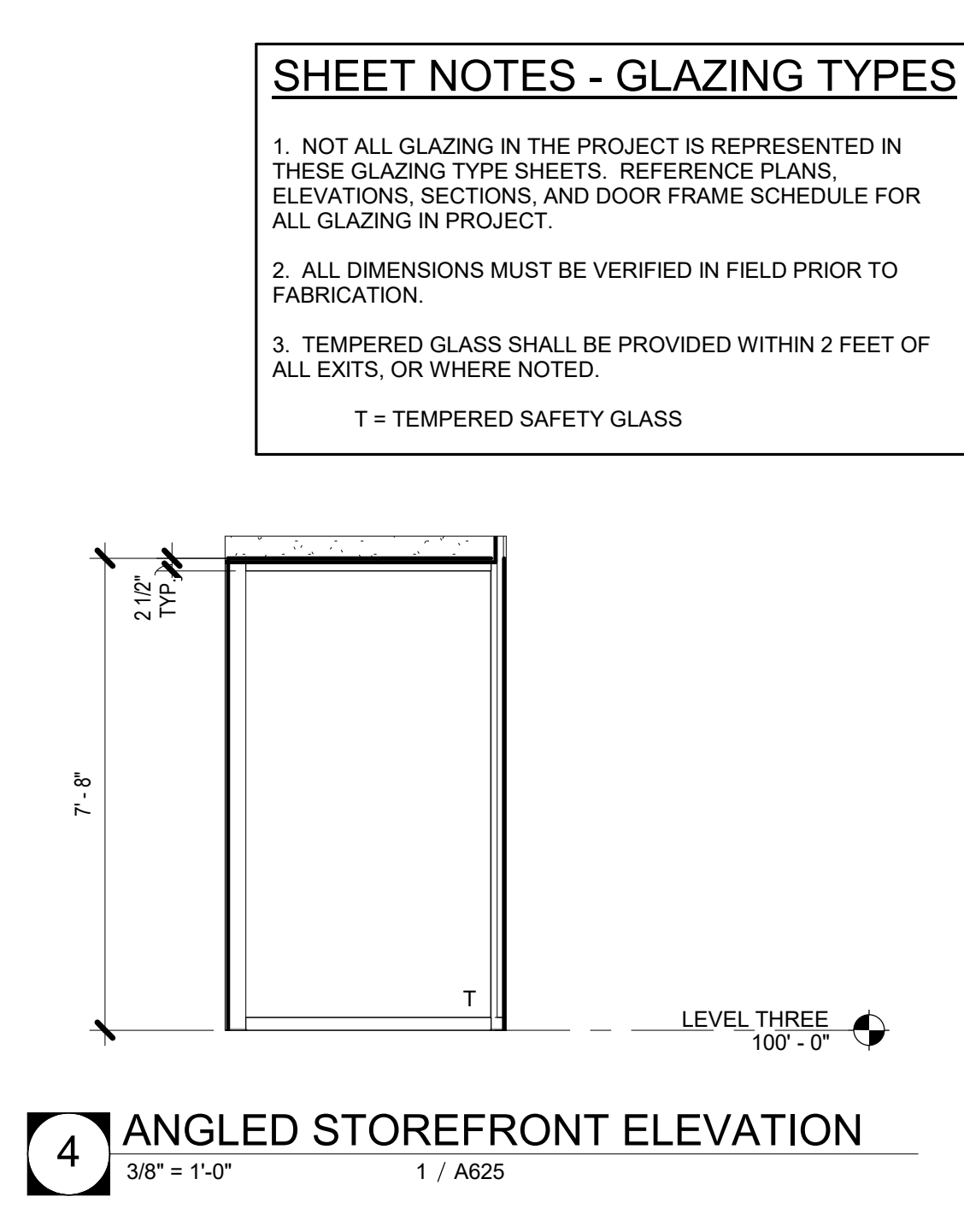
**7 SECTION DETAIL AT UPPER STOREFRONT**  
3/8" = 1'-0" 5 / A625



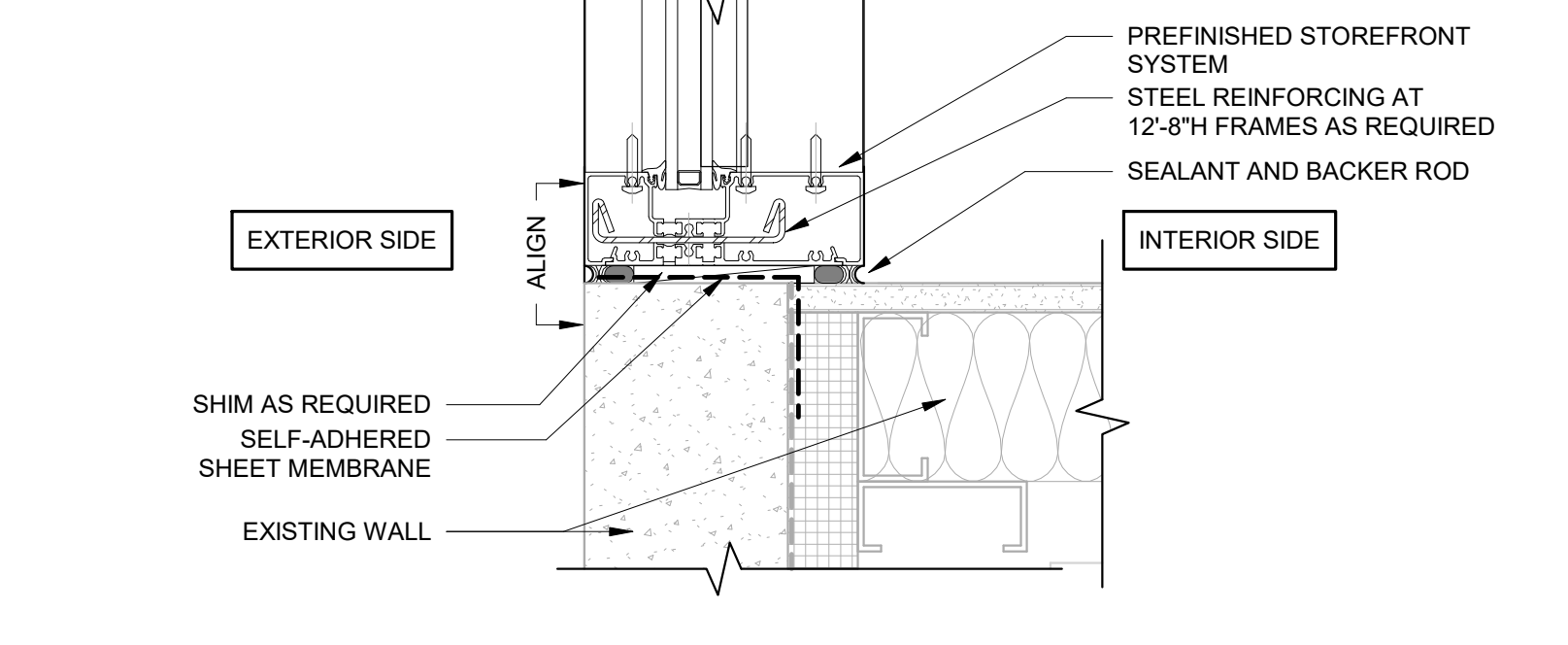
**5 WALL SECTION AT VESTIBULE**  
3/8" = 1'-0" 1 / A625



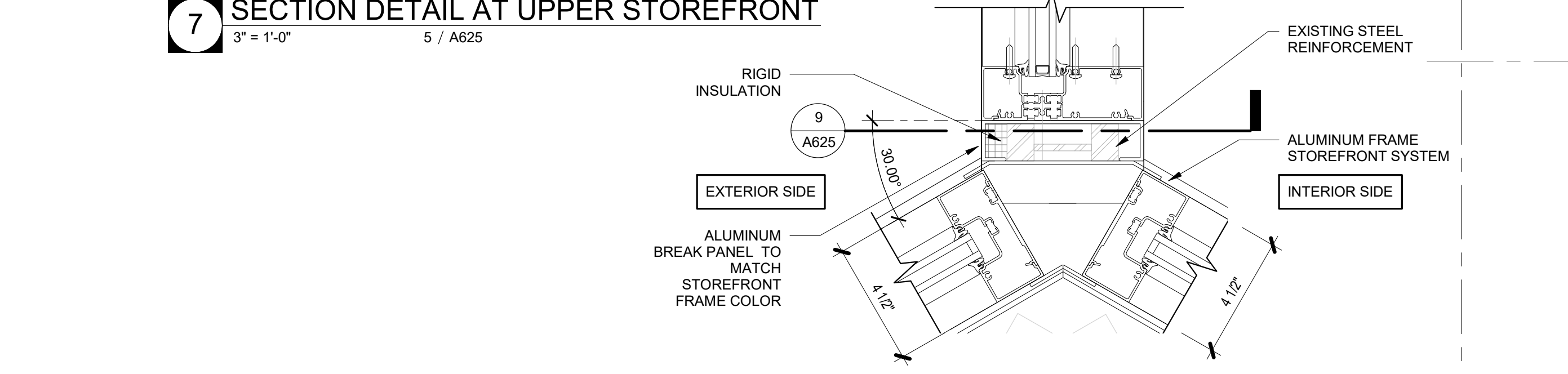
**9 SECTION DETAIL**  
3/8" = 1'-0" 8 / A625



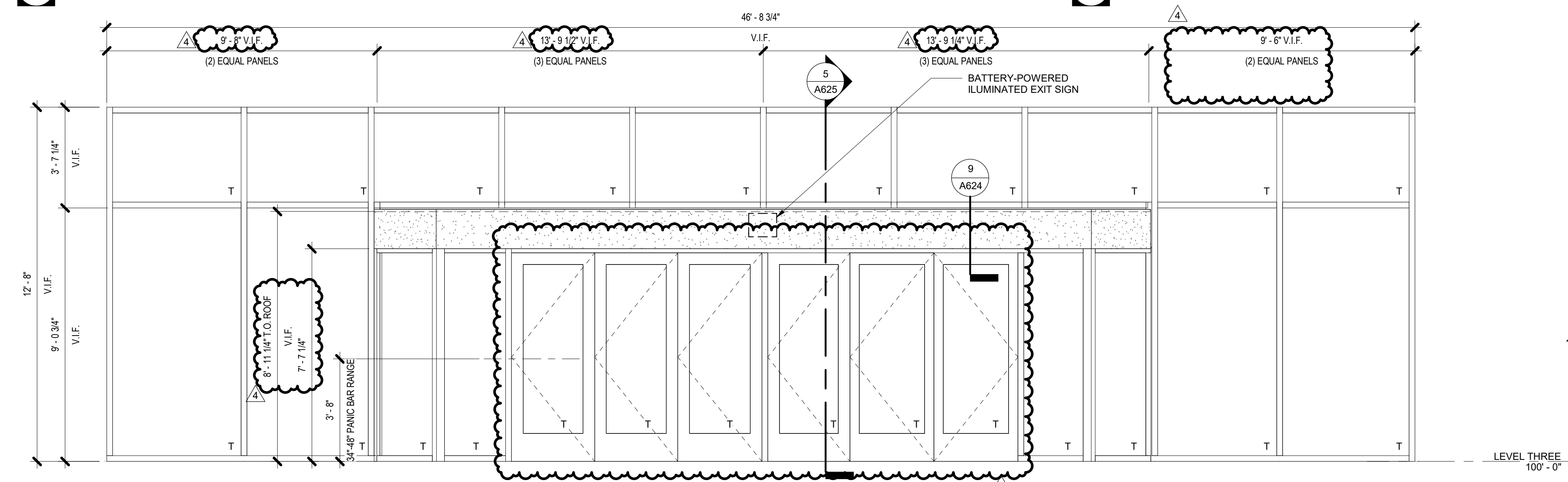
**4 ANGLED STOREFRONT ELEVATION**  
3/8" = 1'-0" 1 / A625



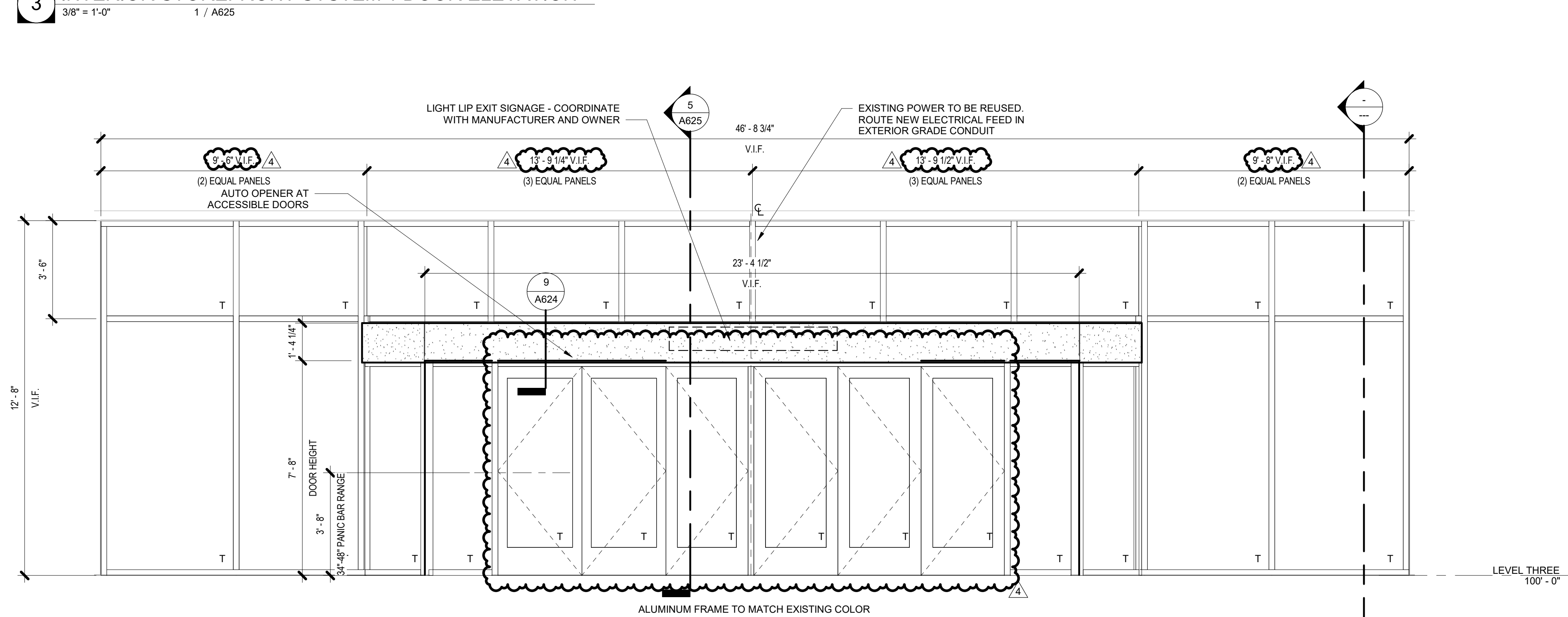
**11 PLAN DETAIL AT JAMB - EXT. WALL**  
3/8" = 1'-0" 1 / A625



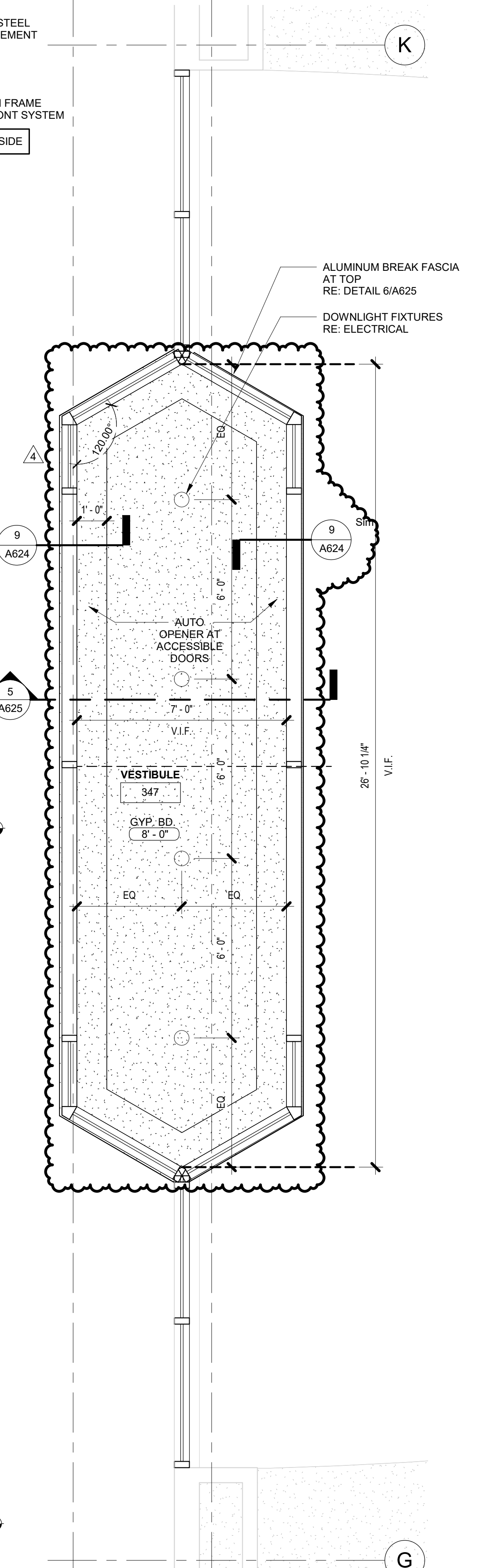
**8 PLAN DETAIL AT STOREFRONT CONNECTION**  
3/8" = 1'-0" 1 / A625



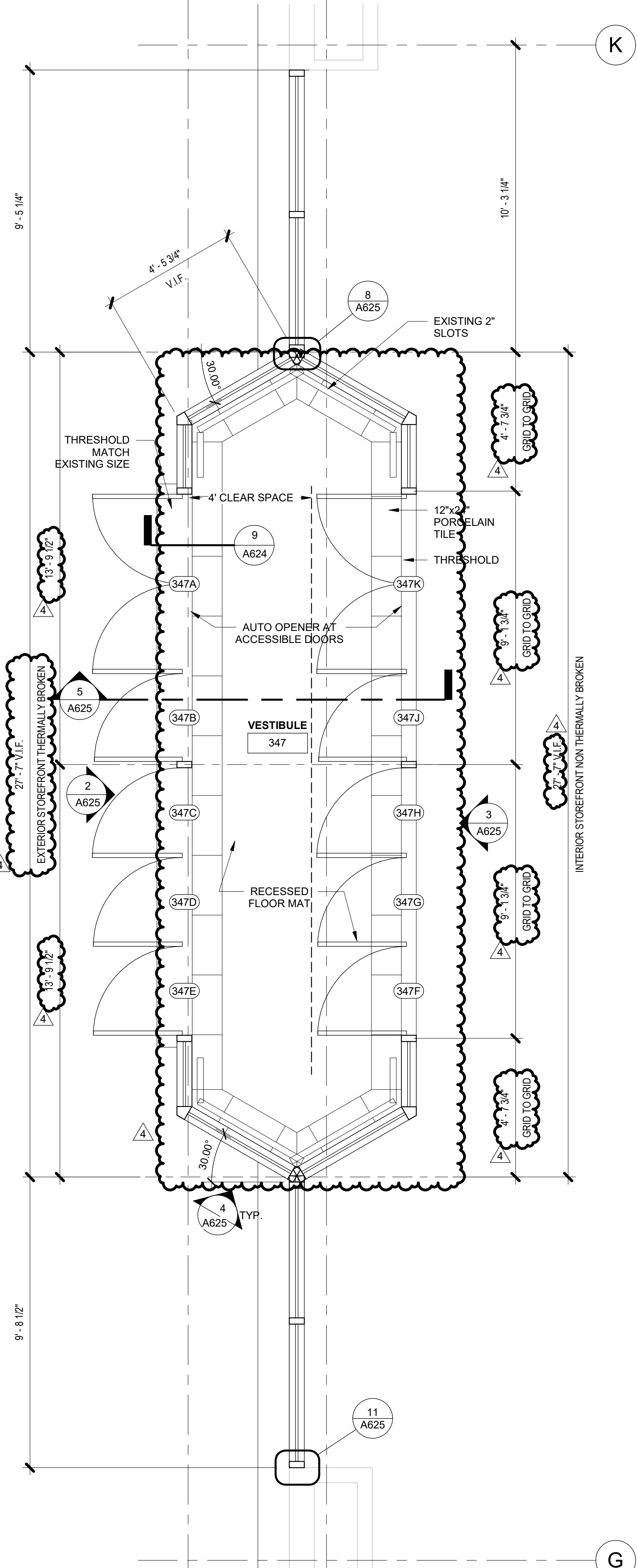
**3 INTERIOR STOREFRONT SYSTEM 1 DOOR ELEVATION**  
3/8" = 1'-0" 1 / A625



**2 EXTERIOR STOREFRONT SYSTEM 1 DOOR ELEVATION**  
3/8" = 1'-0" 1 / A625



**10 03 - 3RD STREET RCP - ENL. MAIN VESTIBULE**  
3/8" = 1'-0" 1 / A625



**1 03 - 3RD STREET MAIN VESTIBULE ENL. PLAN**  
3/8" = 1'-0" 1 / A203

**SHEET NOTES - GLAZING TYPES**

- NOT ALL GLAZING IN THE PROJECT IS REPRESENTED IN THESE GLAZING TYPE SHEETS. REFERENCE PLANS, ELEVATIONS, SECTIONS, AND DOOR FRAME SCHEDULE FOR ALL GLAZING IN PROJECT.
- ALL DIMENSIONS MUST BE VERIFIED IN FIELD PRIOR TO FABRICATION.
- TEMPERED GLASS SHALL BE PROVIDED WITHIN 2 FEET OF ALL EXITS, OR WHERE NOTED.

T = TEMPERED SAFETY GLASS



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**PROJECT:**  
**PROJECT #**  
**SP 23-2**  
**TULSA**  
**PERFORMING**  
**ARTS CENTER -**  
**PACKAGE No. 1**  
**AND No. 2**

**PROJECT NUMBER:**  
**202331.00**

**CONSULTANT:**

**REVISIONS:**

No	Description	Date
1	PERMIT SET	12.13.2023
3	ISSUE FOR BID	01.24.2024
4	ADDENDUM #1	03.05.2024

**SEAL:**

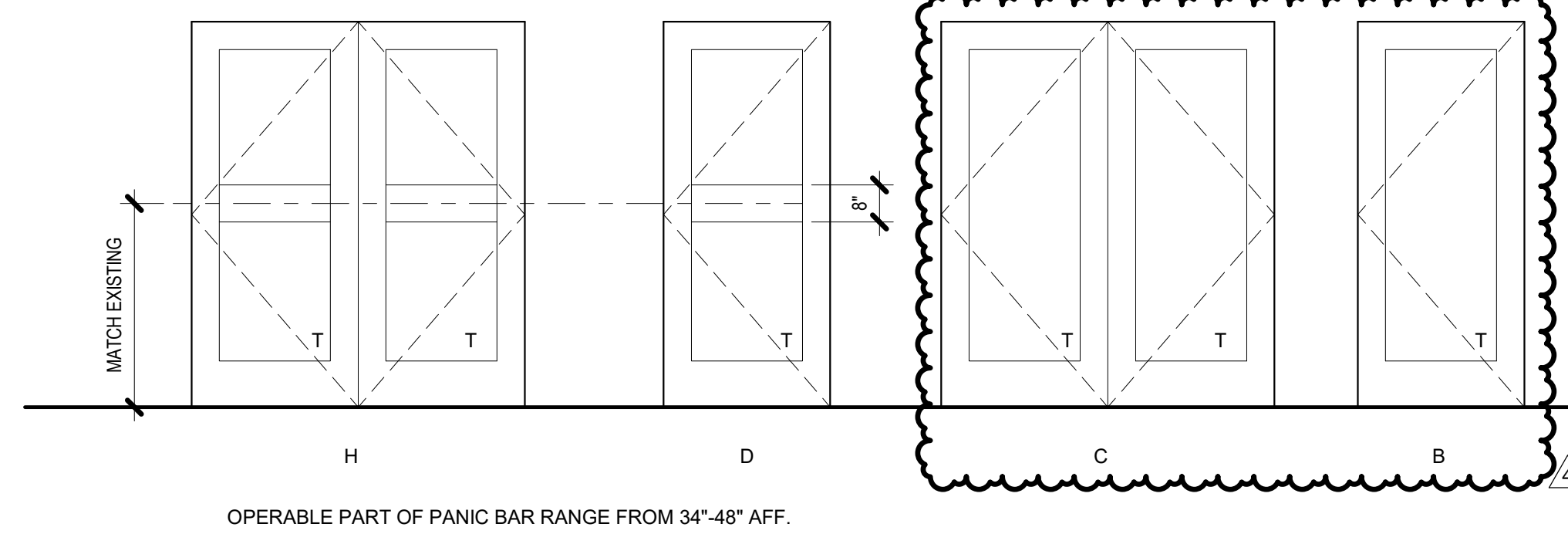
03.05.2024

**ISSUE DATE:**  
**01.24.2024**

**SHEET NUMBER:**  
**A625**

**ENLARGED PLANS**  
**STOREFRONT**  
**ENTRANCES**

DOOR SCHEDULE								REMARKS
DOOR NO.	DOOR		DOOR TYPE	DOOR MATERIAL	DOOR FINISH	FRAME		
	WIDTH	HEIGHT				FRAME MATERIAL	FRAME FINISH	
209A	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM, AUTO OPENER, ACCESSIBLE DOORS
209B	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM, AUTO OPENER, ACCESSIBLE DOORS
209C	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
209D	3'-0"	8'-0"	H	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
209E	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM, AUTO OPENER, ACCESSIBLE DOORS
209F	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM, AUTO OPENER, ACCESSIBLE DOORS
347A	3'-0"	7'-5 1/2"	C	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM, AUTO OPENER, ACCESSIBLE DOORS
347B	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347C	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347D	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347E	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347F	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347G	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347H	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347J	3'-0"	7'-5 1/2"	B	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
347K	6'-0"	7'-5 1/2"	C	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM, AUTO OPENER, ACCESSIBLE DOORS
461A	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
461B	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
461C	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
461D	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
461E	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
461F	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
461G	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM
461H	3'-0"	8'-0"	D	ALUM / GLS	FACTORY	ALUM	FACTORY	STOREFRONT SYSTEM



**11** DOOR ELEVATIONS - ENTRANCES  
3/8" = 1'-0"

**SHEET NOTES - DOORS**

- ALL HARDWARE SHALL CONFORM TO APPLICABLE PROVISIONS OF ICC A117.1, ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES.
- KEYING CRITERIA WILL BE ESTABLISHED BY THE OWNER AFTER BID. ALLOW FOR INDIVIDUAL LOCK KEYING AND MULTIPLE MASTERS AND SUBMASTERS. THE HARDWARE CONTRACTOR SHALL PREPARE A SEPARATE KEYING SCHEDULE BASED UPON THE OWNER'S CRITERIA.
- PROVIDE NON REMOVABLE PINS AT ALL DOOR HINGES WHERE THE HINGE IS EXPOSED TO THE LOCK SIDE OF THE DOOR.
- DOORS SHALL NOT BE LOCKABLE IN THE DIRECTION OF EXIT.
- PROVIDE UL LISTED HARDWARE AT ALL FIRE RATED DOORS.
- IN GENERAL DOOR CLOSERS SHALL BE LOCATED ON THE ROOM SIDE OF THE DOOR. PROVIDE REGULAR OR PARALLEL ARMS AS NECESSARY.
- PROVIDE HOLLOW METAL ASTRAGALS AT DOOR PAIRS WHERE REQUIRED TO ACHIEVE SPECIFIED UL LABEL.
- THE CONTRACTOR SHALL COORDINATE THE VARIOUS HARDWARE COMPONENTS FOR EACH DOOR AND MAKE NECESSARY MODIFICATIONS TO PROVIDE FOR A FULLY FUNCTIONING DOOR OPERATION.
- PROVIDE SEALANT AT JUNCTION OF ALL FRAMES AND PARTITIONS.
- WIDTH OF HOLLOW METAL FRAMES ARE ACTUAL PARTITION THICKNESS PLUS 1 INCH, EXCEPT FOR CMU PARTITIONS. PARTITION TYPES ARE KEYS ON FLOOR PLANS.
- PROVIDE SPECIFIED FRAME ANCHORS LISTED IN THE SPECIFICATIONS TO ACCOMMODATE PARTITION TYPES AND REQUIREMENTS FOR FIRE RATINGS.
- AT GYPSUM BOARD PARTITIONS PROVIDE DOUBLE METAL STUDS AT ALL DOOR OR BORROWED LITE JAMBS.
- PAINT ALL HOLLOW METAL DOORS UNLESS NOTED OTHERWISE.
- MAXIMUM DOOR OPERATING PRESSURES ARE 5 LBS. FOR INTERIOR DOORS AND 8 LBS. FOR EXTERIOR DOORS.
- ALL RATED DOORS SHALL BE SELF CLOSING.
- PROVIDE THRESHOLD AND WEATHERSTRIPPING AT ALL EXTERIOR DOORS, WHETHER SCHEDULED OR NOT.
- 90 MINUTE DOORS SHALL HAVE A MAXIMUM VISION LITE OF 100 SQUARE INCHES.



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**PROJECT:**  
**PROJECT #**  
**SP 23-2**  
**TULSA**  
**PERFORMING**  
**ARTS CENTER -**  
**PACKAGE No. 1**  
**AND No. 2**

**PROJECT NUMBER:**  
**202331.00**

**CONSULTANT:**

**REVISIONS:**

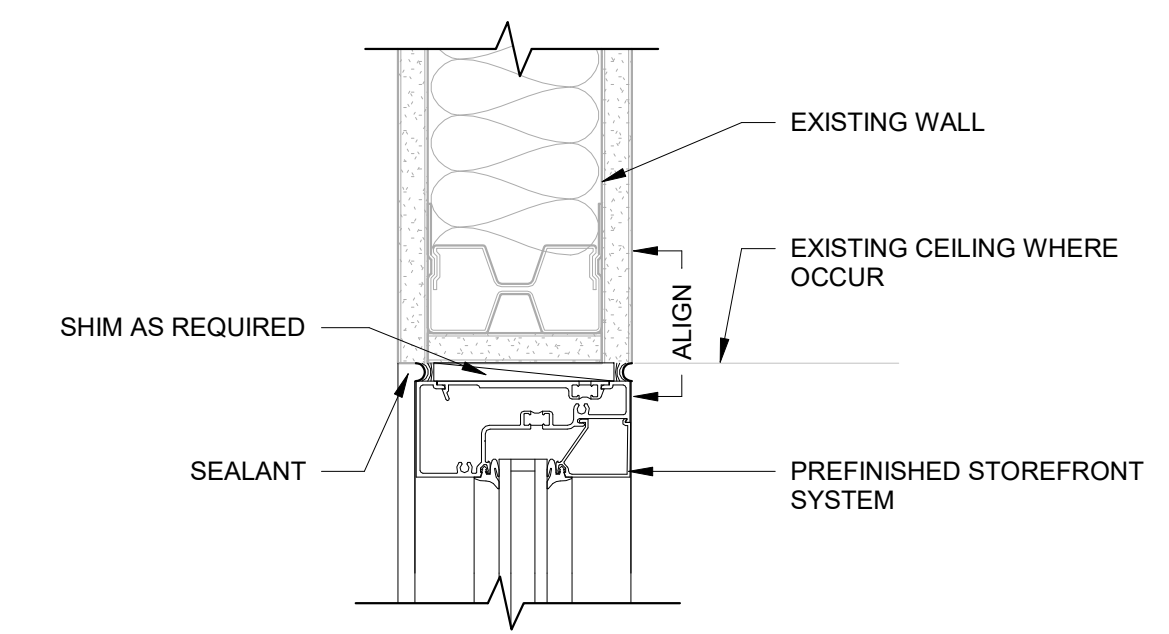
No	Description	Date
1	PERMIT SET	12.13.2023
3	ISSUE FOR BID	01.24.2024
4	ADDENDUM #1	03.05.2024

**SEAL:**

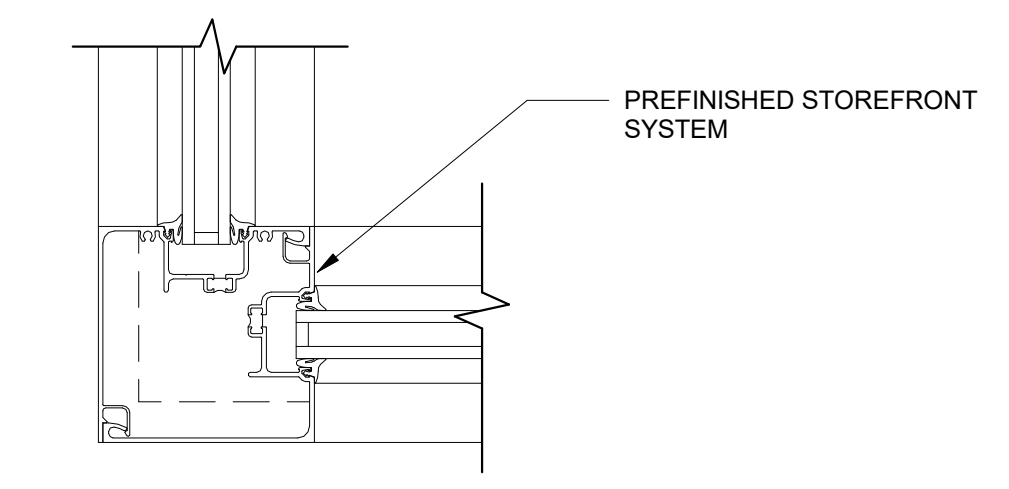
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**ISSUE DATE:**  
**01.24.2024**

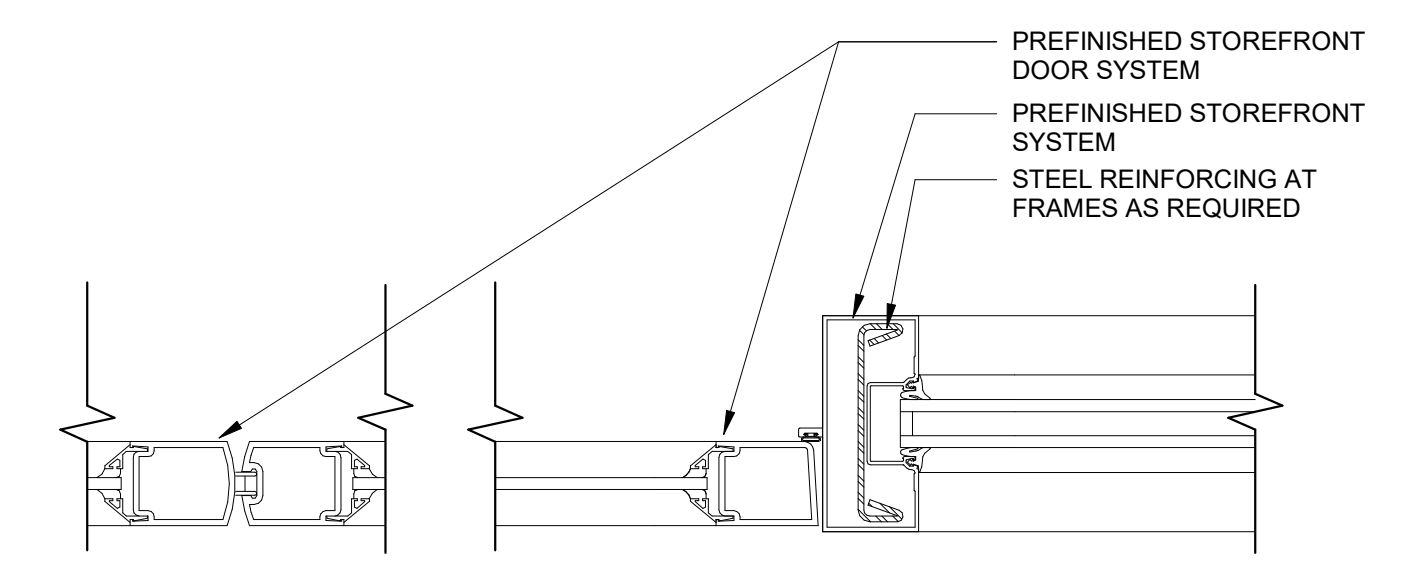
**SHEET NUMBER:**  
**A801**  
**DOOR SCHEDULE,**  
**DOOR ELEVATIONS,**  
**DOOR FRAME**  
**ELEVATIONS**



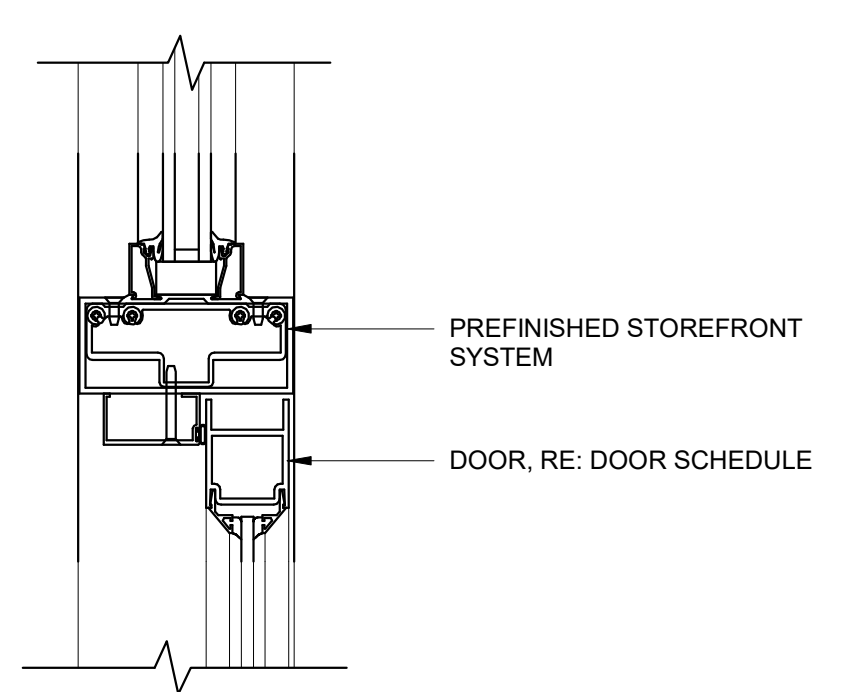
**10** TYPICAL STOREFRONT WINDOW HEAD @ GYP BD  
3" = 1'-0"



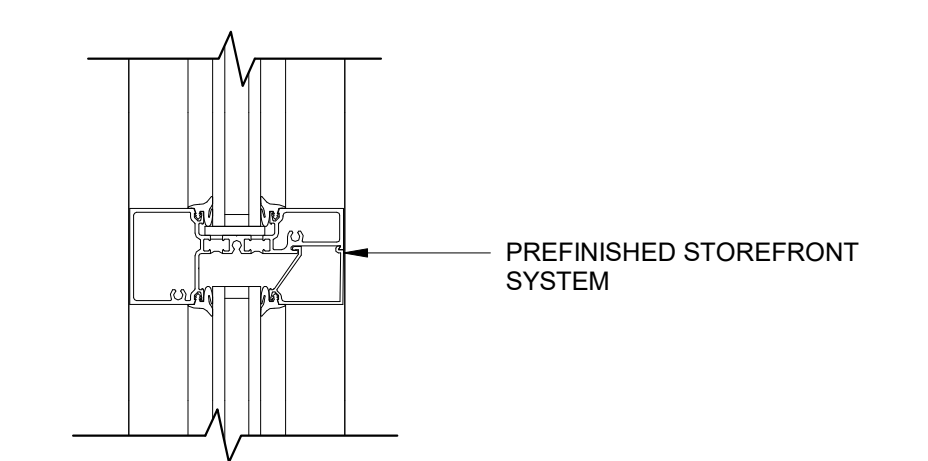
**9** TYPICAL STOREFRONT MULLION CORNER JAMB  
3" = 1'-0"



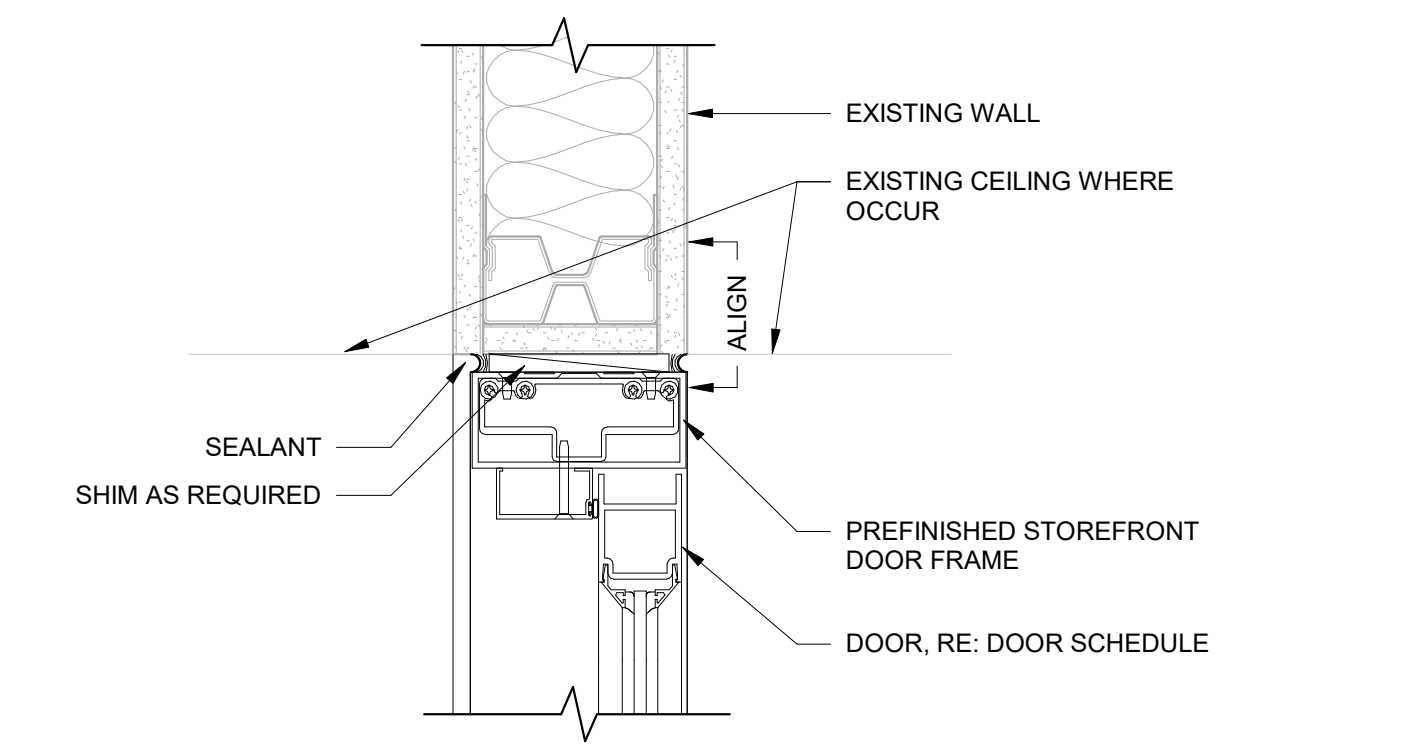
**8** TYPICAL STOREFRONT DOOR JAMB/SIDELIGHT  
3" = 1'-0"



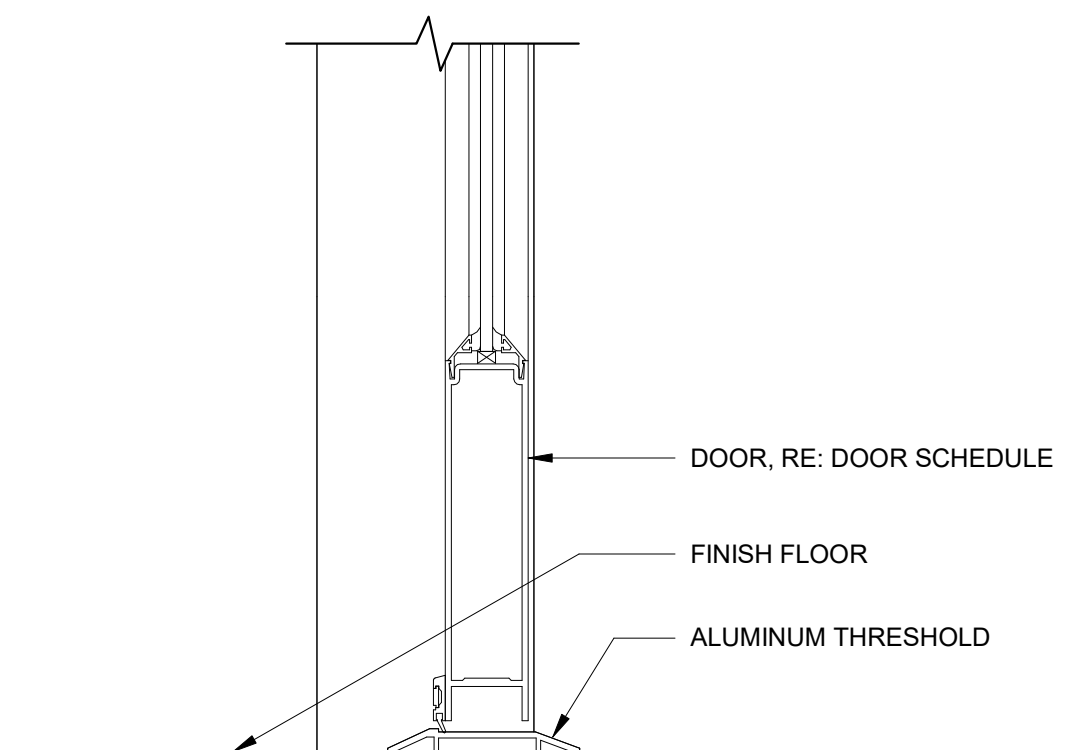
**7** TYPICAL STOREFRONT DOOR HEAD WITH TRANSOM  
3" = 1'-0"



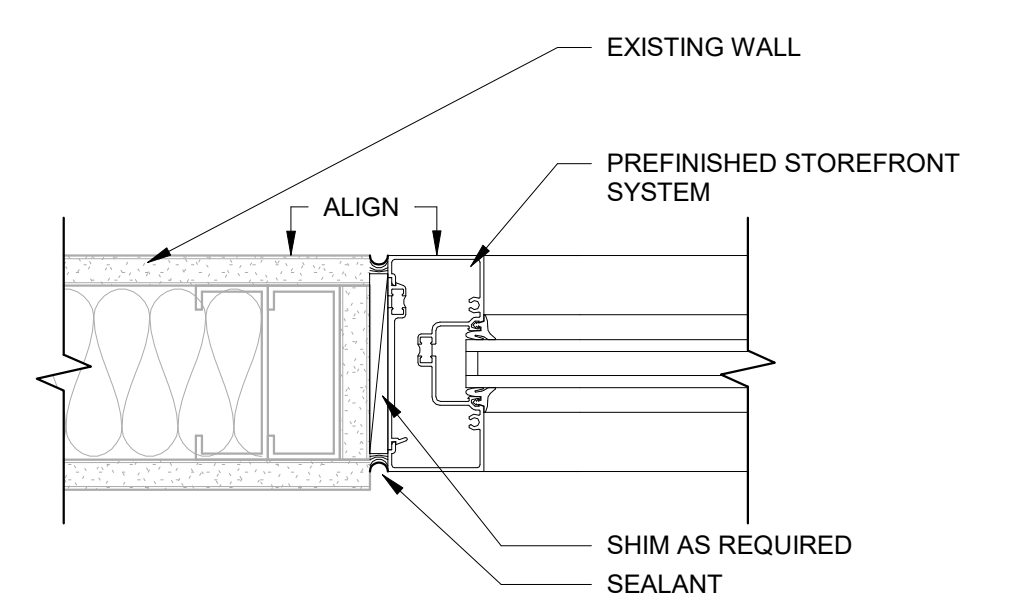
**6** TYPICAL STOREFRONT HORIZONTAL MULLION  
3" = 1'-0"



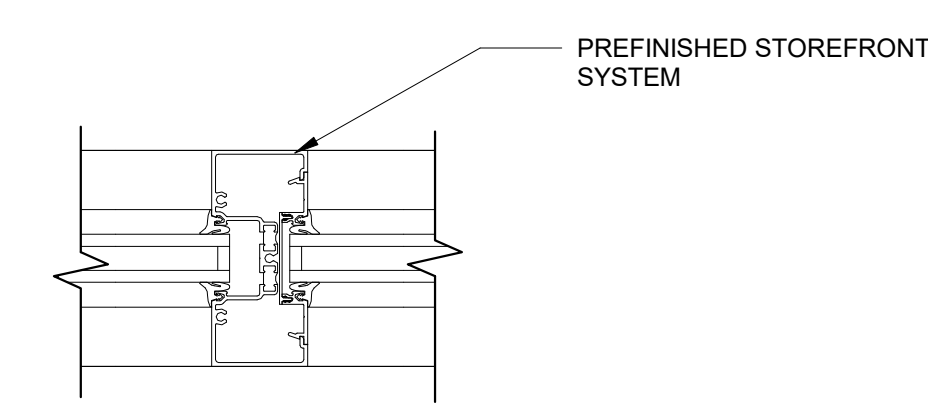
**5** TYPICAL STOREFRONT DOOR HEAD @ GYP BD  
3" = 1'-0"



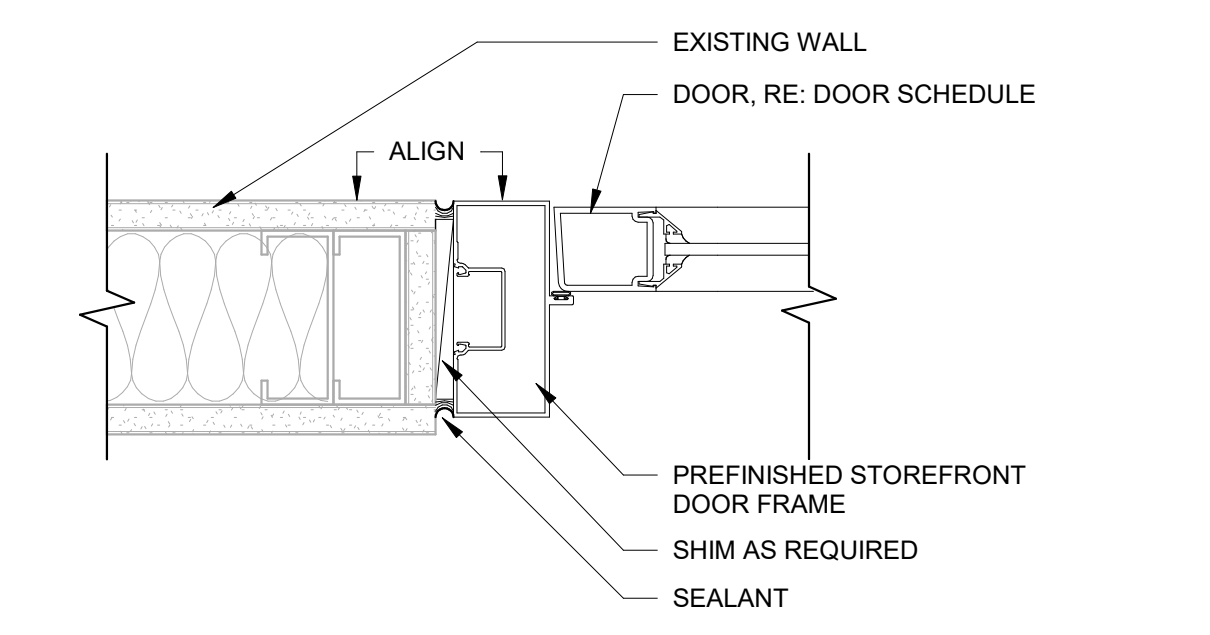
**4** TYPICAL STOREFRONT DOOR SILL  
3" = 1'-0"



**3** TYPICAL STOREFRONT WINDOW JAMB @ GYP BD  
3" = 1'-0"



**2** TYPICAL STOREFRONT VERTICAL MULLION  
3" = 1'-0"

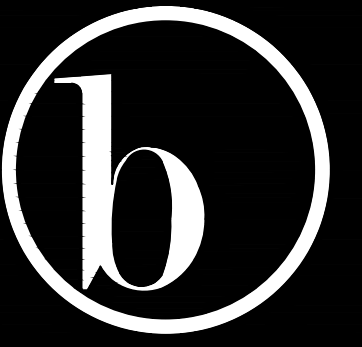


**1** TYPICAL STOREFRONT DOOR JAMB @ GYP BD  
3" = 1'-0"



THIS DRAWING INDICATES THEATRE EQUIPMENT LAYOUT AND DESIGN OF THEATRE SYSTEMS. REVIEW BY A QUALIFIED ENGINEER IS NECESSARY TO ASSURE SAFETY AND CODE COMPLIANCE.

REFER TO E-SERIES DRAWINGS FOR ELECTRICAL FEEDS, DISCONNECT SWITCHES, CONDUIT, AND WIRE FOR ALL RIGGING EQUIPMENT. DIVISION 26 CONTRACTOR SHALL PROVIDE AND INSTALL ALL ELECTRICAL EQUIPMENT AND CONTROL WIRING FOR A COMPLETE AND OPERABLE SYSTEM.



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**PROJECT:**  
**PROJECT #**  
**SP 23-2**  
**TULSA**  
**PERFORMING**  
**ARTS CENTER -**  
**PACKAGE No. 2**  
**MECH., AV AND**  
**THEATRICAL**  
**LIGHTING**  
**UPGRADES**

**PROJECT NUMBER:**  
**202331.00**

**CONSULTANT:**  
**Schuler Shook**  
THEATRE PLANNERS / LIGHTING DESIGNERS  
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schulershook.com

**REVISIONS:**

No	Description	Date
2	95% REVIEW SET	12.19.2023
3	ADDENDUM 1	03.04.2024

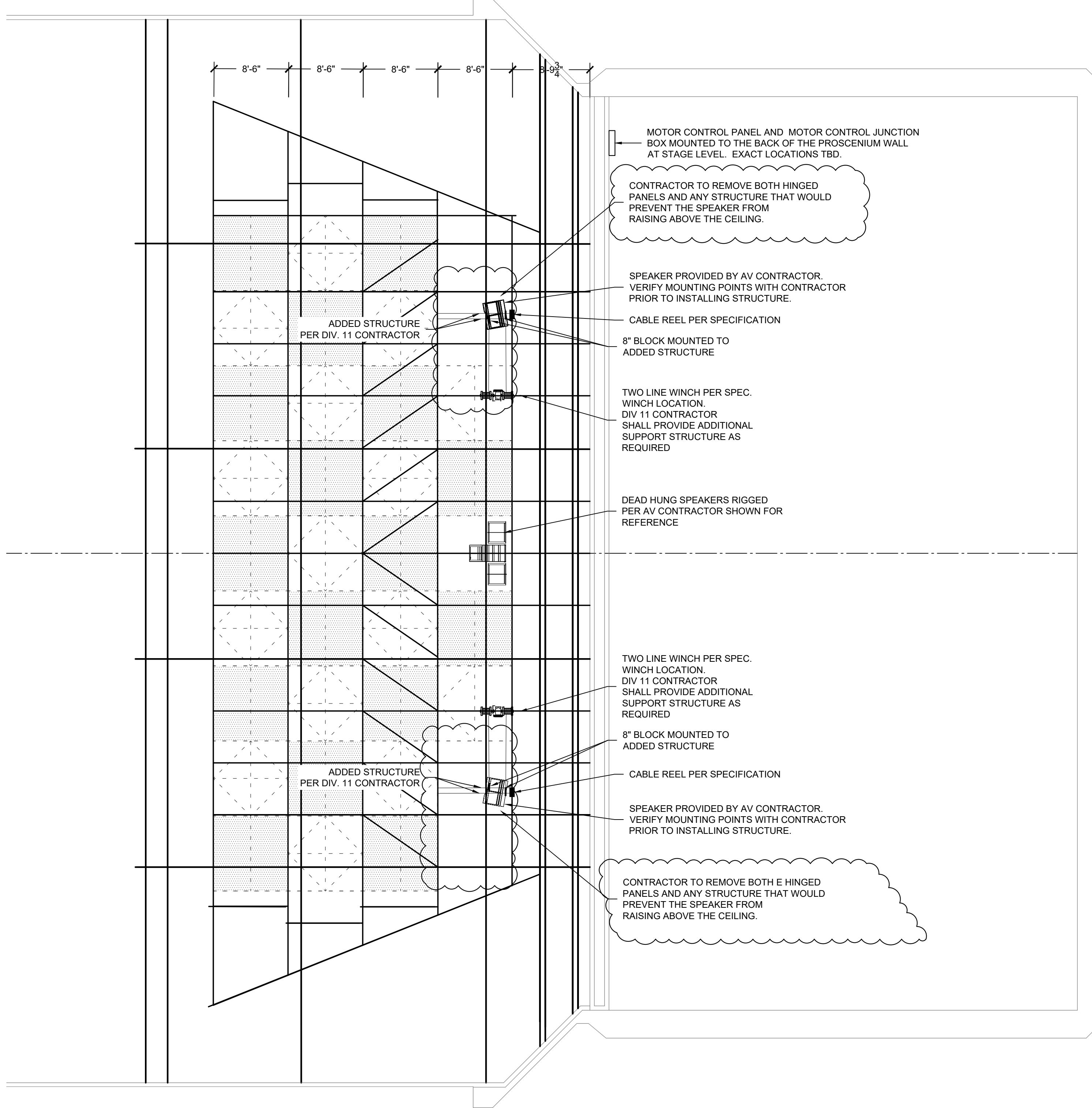
**SEAL:**

**ISSUE DATE:**  
**12.19.2023**

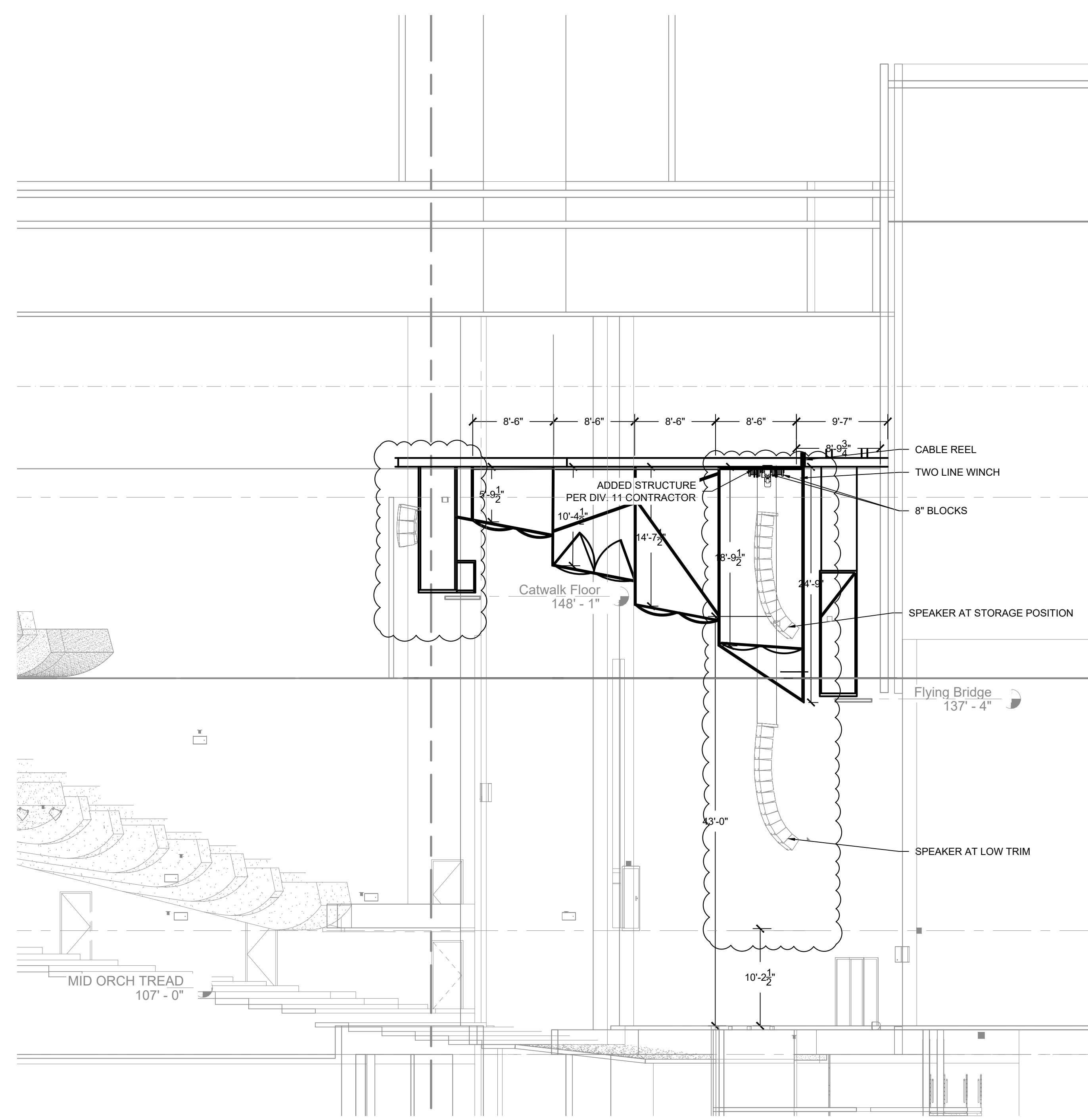
**SHEET NUMBER:**  
**TR101**  
**CHAPMAN**  
**SPEAKER RIGGING**

**GENERAL NOTES:**

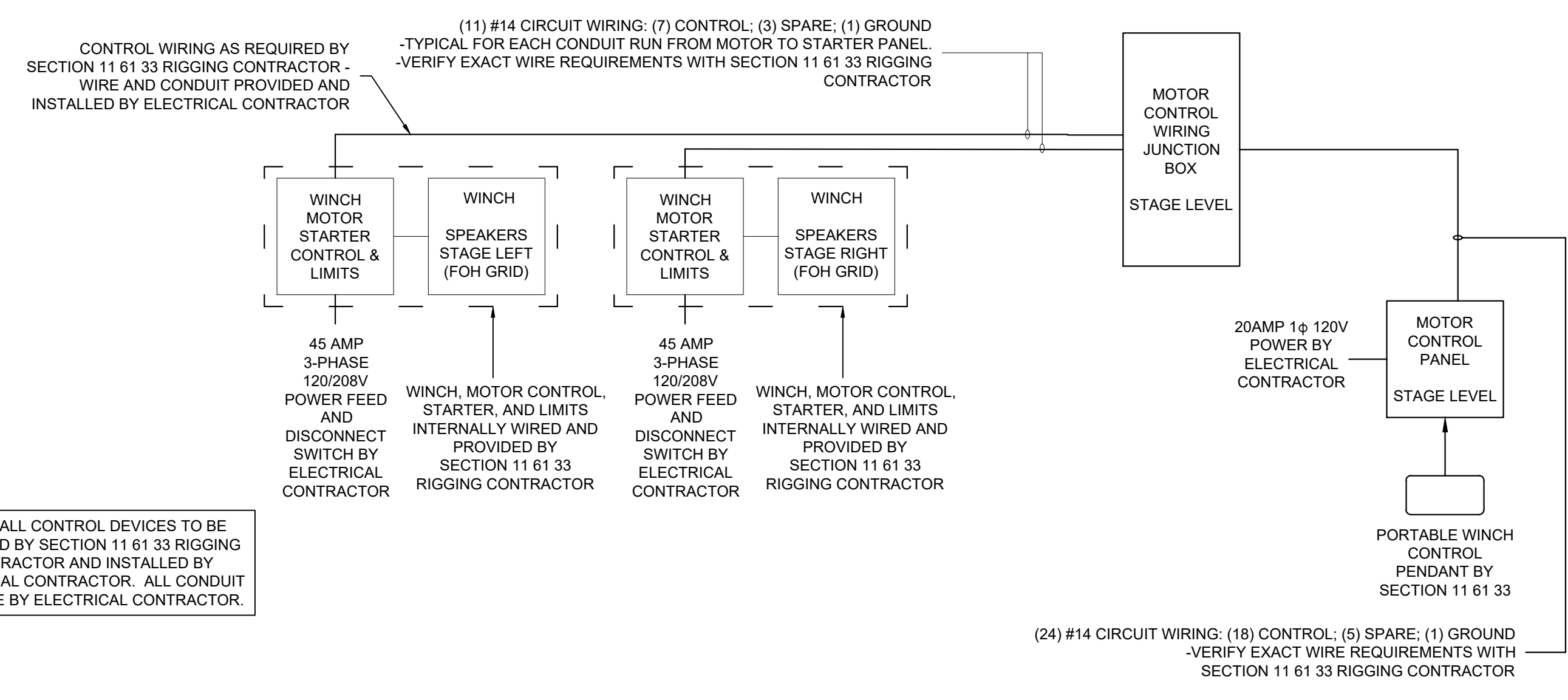
A. INSTALLATION SHALL CONFORM TO ALL APPLICABLE NEC, UL, STATE AND LOCAL CODES.  
B. STRUCTURAL MEMBERS ARE SHOWN FOR DESIGN INTENT ONLY.  
C. FIELD VERIFY ALL DIMENSIONS AND MOUNTING CONDITIONS PRIOR TO INSTALLATION.  
D. COORDINATE INSTALLATION OF SPEAKERS WITH AV CONTRACTOR. FINAL LOCATION OF ADDED STRUCTURE AND BLOCKS MUST BE COORDINATED ON SITE WITH AV CONTRACTOR.



**1 CHAPMAN SPEAKER RIGGING**  
SCALE: 1/8" = 1'-0"



**2 SECTION AT SPEAKER RIGGING**  
SCALE: 1/8" = 1'-0"



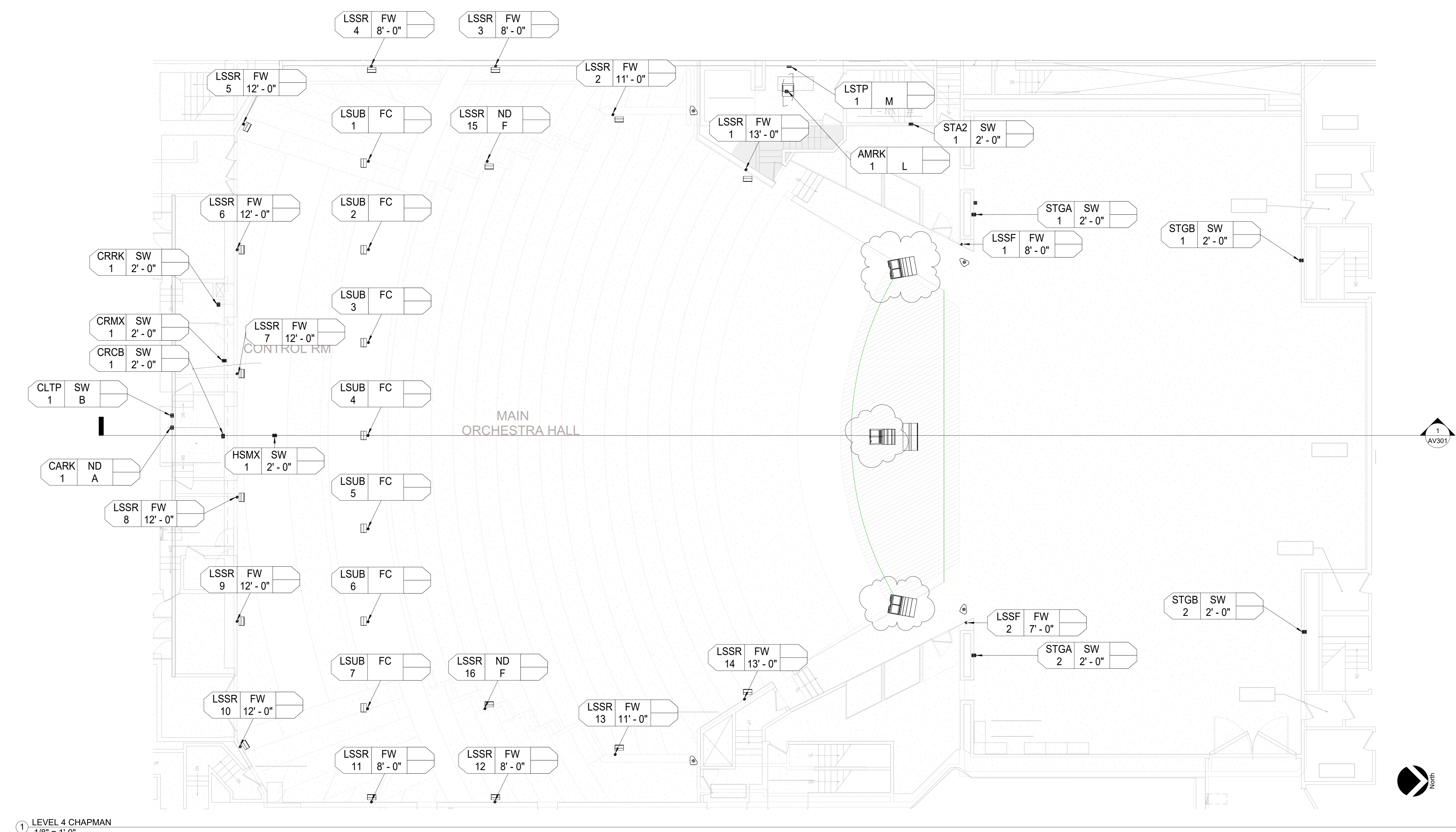
NOTE: ALL CONTROL DEVICES TO BE PROVIDED BY SECTION 11 61 33 RIGGING CONTRACTOR AND INSTALLED BY ELECTRICAL CONTRACTOR. ALL CONDUIT AND WIRE BY ELECTRICAL CONTRACTOR.

(24) #14 CIRCUIT WIRING: (18) CONTROL; (5) SPARE; (1) GROUND - VERIFY EXACT WIRE REQUIREMENTS WITH SECTION 11 61 33 RIGGING CONTRACTOR

**3 CHAPMAN SPEAKER RIGGING - MOTOR CONTROL RISER**  
SCALE: NO SCALE

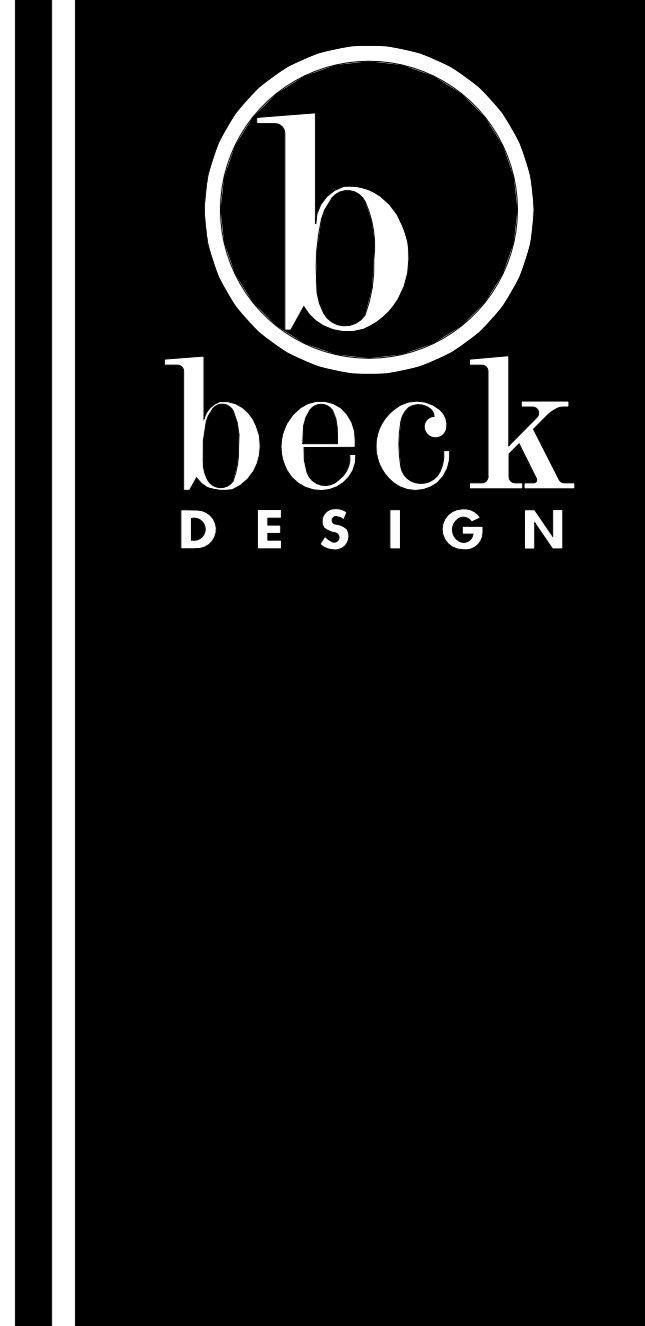


KEYED NOTES	
KEY	NOTE
A	SEE RACK ELEVATION FOR DETAILS
B	SEE STANDARD DETAIL
C	CUSTOM CABLE LOOM TO PIT RAIL SPEAKERS REQUIRED, PIT RAIL SPEAKER TO BE BUILT INTO FUTURE REBUILD OF PIT RAIL
D	CUSTOM CABLE LOOM TO STAGE LIP SPEAKERS REQUIRED
E	SITE VERIFY POSITION FOR PIT PANELS, POSSIBLY MATCH CURRENT ANALOG CONNECTION LOCATIONS
F	COORDINATE POSITIONS WITH ARCHITECT TO MINIMIZE AESTHETIC IMPACT
G	RCP UNAVAILABLE, SITE VERIFY CEILING CONDITION
H	SEE TR DRAWINGS FOR WINCH REQUIRED, ARRAY MUST FIT THROUGH THE ACOUSTIC PANEL
J	POSITIONS TO BE AT THE FRONT OF THE PLATFORM, PLATFORM MUST BE CLEAR
K	SITE VERIFY LOCATION
L	SEE RACK ELEVATION FOR DETAILS, LOCATED AT "THE ROCK"
M	SEE STANDARD DETAIL, LOCATED AT "THE ROCK"



1 LEVEL 4 CHAPMAN  
1/8" = 1'-0"

- NOTES:
- ALL SPEAKER LOCATIONS MUST BE FIELD VERIFIED TO CONFIRM LOCAL CONDITIONS.
  - SPEAKER HEIGHT ABOVE FINISHED FLOOR ARE GUIDELINES FOR CREATING SMOOTH COVERAGE ACROSS THE SEATING AREA, LOCAL CONDITIONS MAY REQUIRE VARIANCES.
  - IT IS THE INTENT OF THIS DESIGN TO REUSE AS MUCH EXISTING SPEAKER WIRING AS POSSIBLE. A FULL EVALUATION OF THE CURRENT TYPE, SIZE, ROUTING, AND AGE OF THE INSTALLED WIRE MUST BE PERFORMED.



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PROJECT:  
**TULSA PERFORMING ARTS CENTER**

PROJECT NUMBER:  
**202331.00**

CONSULTANT:  
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REVISIONS:		
No	Description	Date
1	ADDENDUM 1	03.05.24

SEAL:

ISSUE DATE:  
**1.24.2024**

SHEET NUMBER:  
**AV104**  
AV 4th FLOOR PLAN - CHAPMAN





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OKLAHOMA CITY, OK 73102  
T: 405.232.7007

PROJECT:  
**TULSA  
PERFORMING  
ARTS CENTER**

PROJECT NUMBER:  
**202331.00**

CONSULTANT:  
**Schuler Shook**  
LIGHTING DESIGN / THEATRE PLANNING / AUDIO VIDEO DESIGN  
218 BANN STREET SE, SUITE 200  
MINNEAPOLIS, MN 55414  
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REVISIONS:

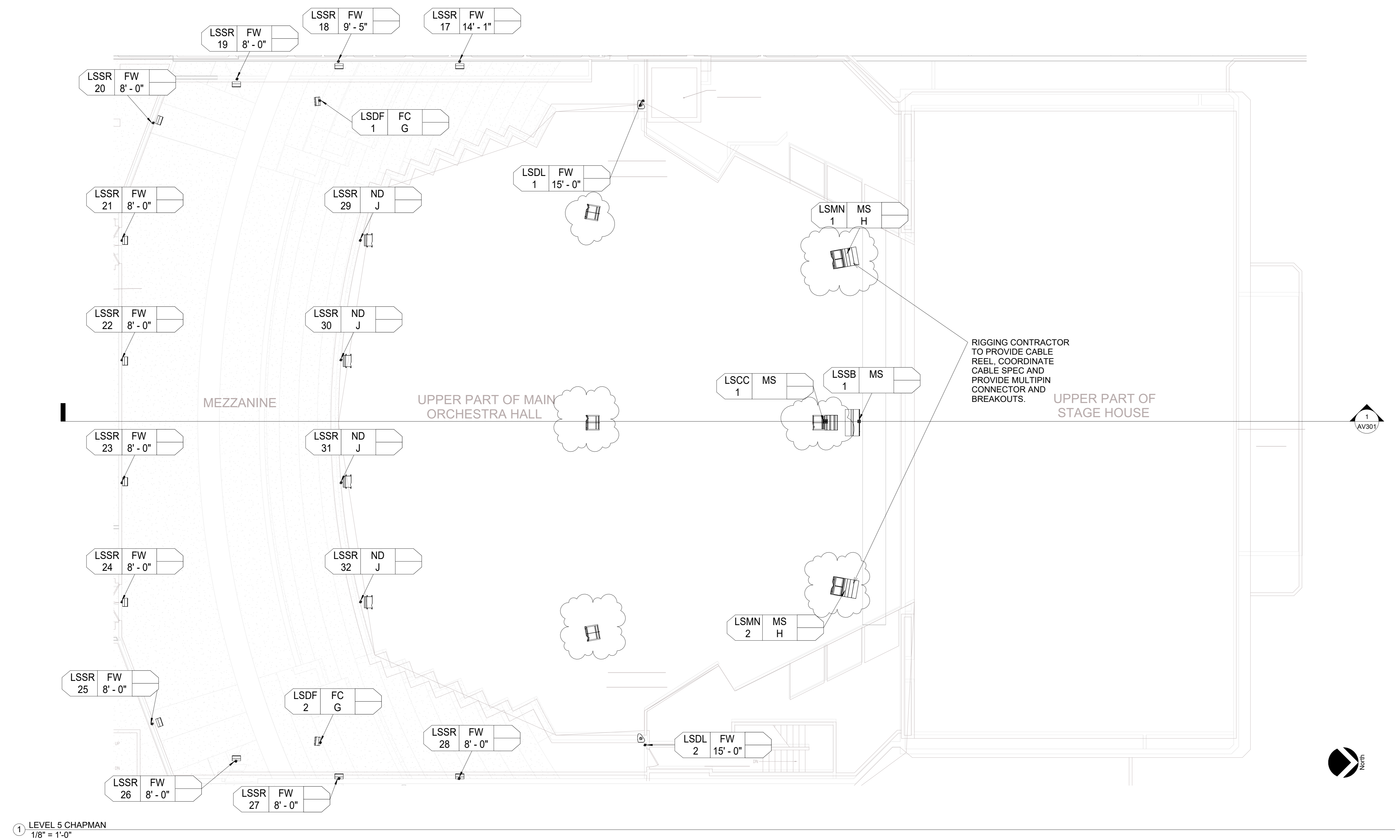
No	Description	Date
1	ADDENDUM 1	03.05.24

SEAL:

ISSUE DATE:  
**1.24.2024**

SHEET NUMBER:  
**AV105**  
AV 5th FLOOR PLAN -  
CHAPMAN

KEYED NOTES	
KEY	NOTE
A	SEE RACK ELEVATION FOR DETAILS
B	SEE STANDARD DETAIL
C	CUSTOM CABLE LOOM TO PIT RAIL SPEAKERS REQUIRED, PIT RAIL SPEAKER TO BE BUILT INTO FUTURE REBUILD OF PIT RAIL
D	CUSTOM CABLE LOOM TO STAGE LIP SPEAKERS REQUIRED
E	SITE VERIFY POSITION FOR PIT PANELS, POSSIBLY MATCH CURRENT ANALOG CONNECTION LOCATIONS
F	COORDINATE POSITIONS WITH ARCHITECT TO MINIMIZE AESTHETIC IMPACT
G	RCP UNAVAILABLE, SITE VERIFY CEILING CONDITION
H	SEE TR DRAWINGS FOR WINCH REQUIRED, ARRAY MUST FIT THROUGH THE ACOUSTIC PANEL
J	POSITIONS TO BE AT THE FRONT OF THE PLATFORM, PLATFORM MUST BE CLEAR
K	SITE VERIFY LOCATION
L	SEE RACK ELEVATION FOR DETAILS, LOCATED AT "THE ROCK"
M	SEE STANDARD DETAIL, LOCATED AT "THE ROCK"



1 LEVEL 5 CHAPMAN  
1/8" = 1'-0"

NOTES:  
1. ALL SPEAKER LOCATIONS MUST BE FIELD VERIFIED TO CONFIRM LOCAL CONDITIONS.  
2. SPEAKER HEIGHT ABOVE FINISHED FLOOR ARE GUIDELINES FOR CREATING SMOOTH COVERAGE ACROSS THE SEATING AREA, LOCAL CONDITIONS MAY REQUIRE VARIANCES.  
3. IT IS THE INTENT OF THIS DESIGN TO REUSE AS MUCH EXISTING SPEAKER WIRING AS POSSIBLE. A FULL EVALUATION OF THE CURRENT TYPE, SIZE, ROUTING, AND AGE OF THE INSTALLED WIRE MUST BE PERFORMED.

KEYED NOTES	
KEY	NOTE
A	SEE RACK ELEVATION FOR DETAILS
B	SEE STANDARD DETAIL
C	CUSTOM CABLE LOOM TO PIT RAIL SPEAKERS REQUIRED, PIT RAIL SPEAKER TO BE BUILT INTO FUTURE REBUILD OF PIT RAIL
D	CUSTOM CABLE LOOM TO STAGE LIP SPEAKERS REQUIRED
E	SITE VERIFY POSITION FOR PIT PANELS, POSSIBLY MATCH CURRENT ANALOG CONNECTION LOCATIONS
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M	SEE STANDARD DETAIL, LOCATED AT "THE ROCK"



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PROJECT:  
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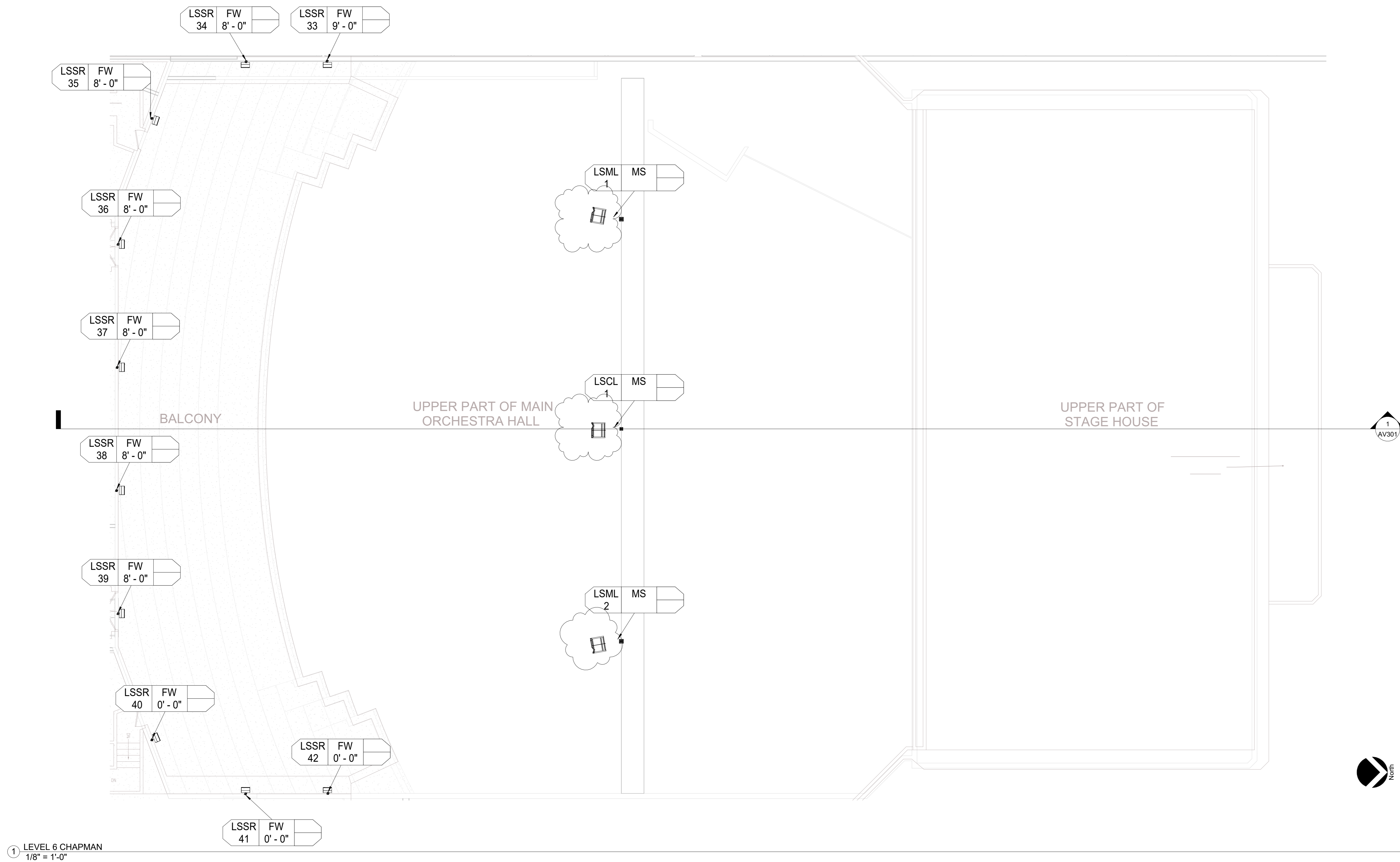
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No	Description	Date
1	ADDENDUM 1	03.05.24

SEAL:

ISSUE DATE:  
**1.24.2024**

SHEET NUMBER:  
**AV106**  
AV 6th FLOOR PLAN -  
CHAPMAN



- NOTES:
- ALL SPEAKER LOCATIONS MUST BE FIELD VERIFIED TO CONFIRM LOCAL CONDITIONS.
  - SPEAKER HEIGHT ABOVE FINISHED FLOOR ARE GUIDELINES FOR CREATING SMOOTH COVERAGE ACROSS THE SEATING AREA, LOCAL CONDITIONS MAY REQUIRE VARIANCES.
  - IT IS THE INTENT OF THIS DESIGN TO REUSE AS MUCH EXISTING SPEAKER WIRING AS POSSIBLE. A FULL EVALUATION OF THE CURRENT TYPE, SIZE, ROUTING, AND AGE OF THE INSTALLED WIRE MUST BE PERFORMED.



**PROJECT:**  
**TULSA**  
**PERFORMING**  
**ARTS CENTER**

**PROJECT NUMBER:**  
**202331.00**

**CONSULTANT:**



**REVISIONS:**

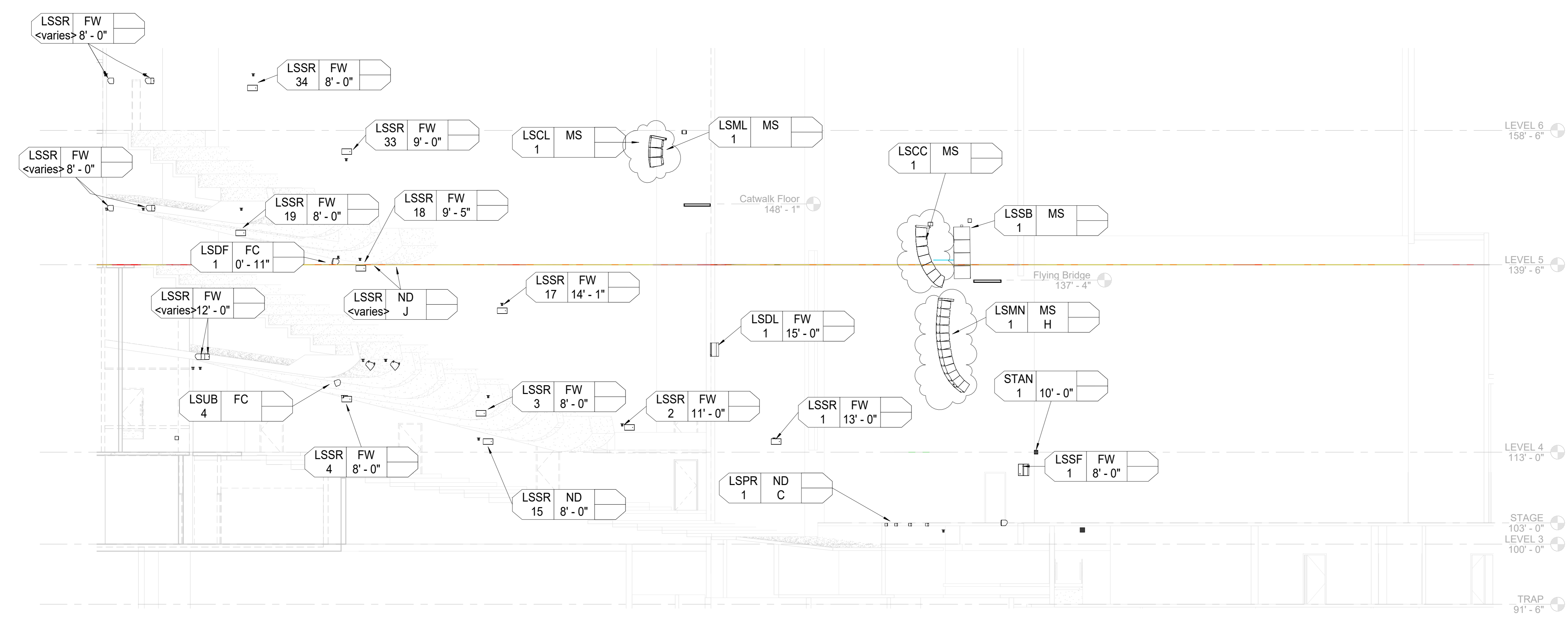
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1	ADDENDUM 1	03.05.24

**SEAL:**

**ISSUE DATE:**  
**1.24.2024**

**SHEET NUMBER:**  
**AV301**

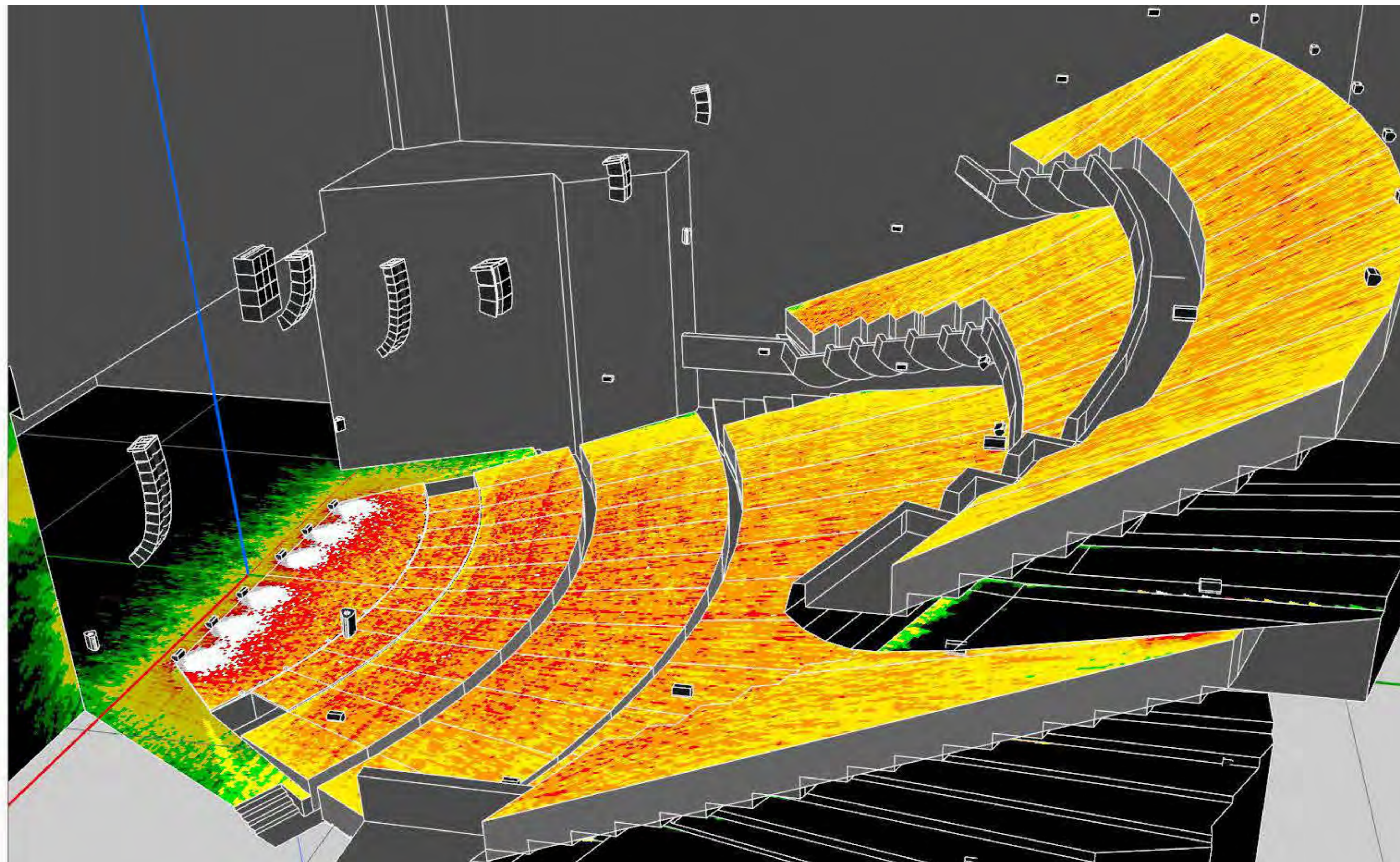
**AV SECTION -**  
**CHAPMAN**  
**CENTERLINE**



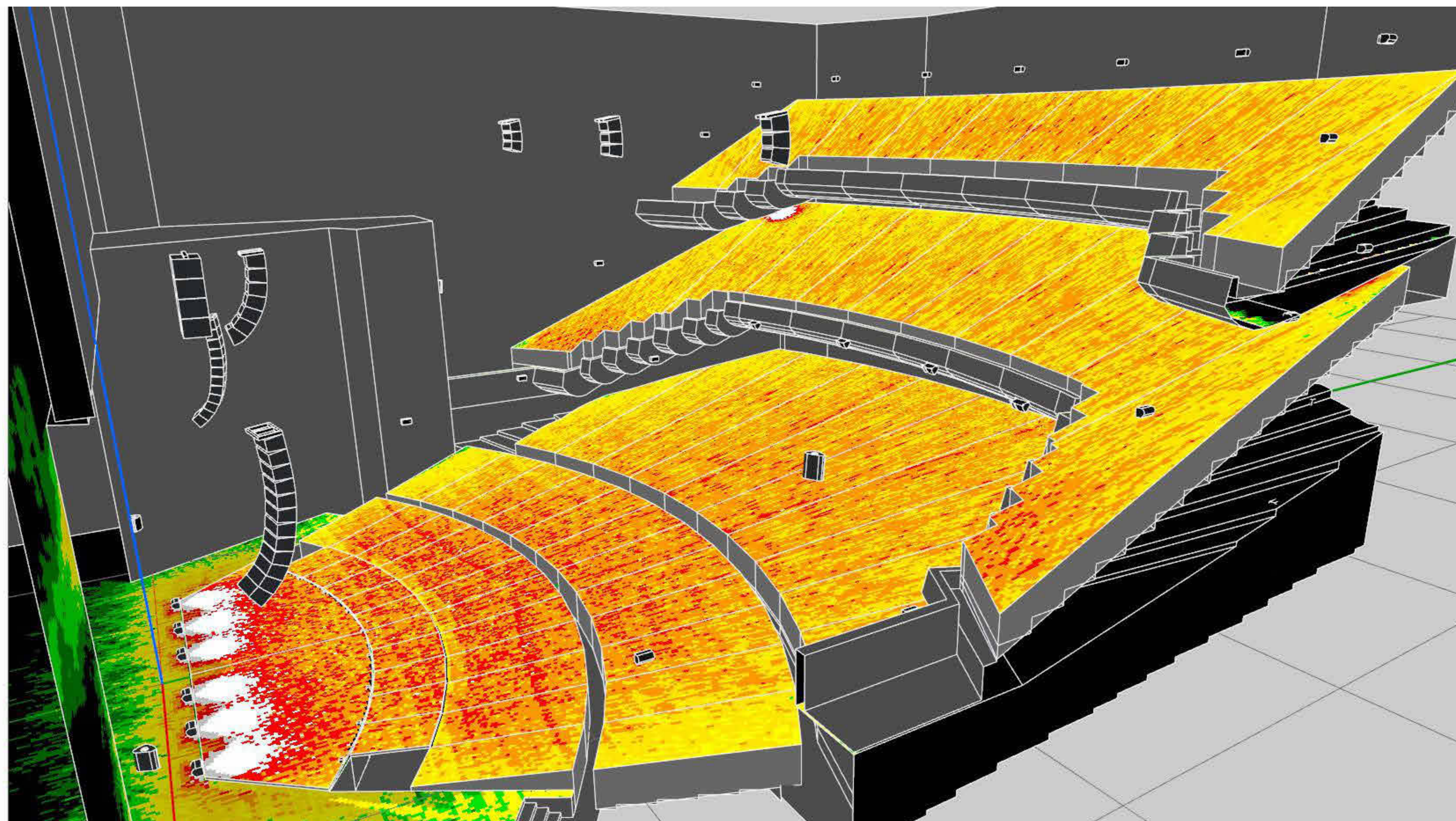
① CHAPMAN CENTERLINE SECTION  
 1/8" = 1'-0"



Length: ft.in  
 Weight: lb  
 Delay: ms  
 Scale: 1/1  
 Air absorp.: ON  
 Full Range A  
 dB(A) SPL scale  
 > 110  
 108  
 106  
 104  
 102  
 100  
 < 98



Length: ft.in  
 Weight: lb  
 Delay: ms  
 Scale: 1/1  
 Air absorp.: ON  
 Full Range A  
 dB(A) SPL scale  
 > 110  
 108  
 106  
 104  
 102  
 100  
 < 98



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**REVISIONS:**

No	Description	Date
1	ADDENDUM 1	03.05.24

**SEAL:**

**ISSUE DATE:**  
**1.24.2024**

**SHEET NUMBER:**  
**AV901**

**AV SPEAKER**  
**PREDICTIONS**



## SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SCOPE

- A. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:
  1. Verification of dimensions and conditions at the job site.
  2. Preparation and submission of complete shop drawings and samples for approval prior to fabrication.
  3. Shipment of equipment to job site and the secured storage of all non-fixed equipment.
  4. Installation and completion, in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
  5. The inspection, demonstration, and necessary adjustment of the completed installation by the Contractor's engineering personnel.
  6. Preparation and submission of complete record drawings and operational and maintenance data and certificates.

#### 1.03 WORK INCLUDED

- A. Motorized winches and winch controls.
- B. The above is for reference only and is not intended to define the limits of the work for a complete installation.

#### 1.04 WORK NOT INCLUDED

- A. Principal structural steel work, except as herein indicated.
- B. Electrical wiring, conduit, and connections.
- C. The above is for reference only and is not intended to define the limits of the work for a complete installation.

#### 1.05 RELATED WORK IN OTHER SECTIONS

- A. General electrical work.
- B. Sound and communications systems.
- C. Section 26 09 61 – Theatrical lighting system.

#### 1.06 QUALIFICATIONS

- A. All equipment and installation shall be the responsibility of a single contractor who shall own and operate his own full-time, staffed shop and sewing room for the fabrication and assembly of stage equipment. This contractor shall assume complete responsibility for the engineering, fabrication, transportation, and installation of the work in this Section, and shall hold the Owner, Architect, Schuler Shook, and all their Employees and Consultants harmless for any costs for errors

## SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

or omissions associated with the work of this Section and any action arising therefrom.

- B. Approved contractors may, at their option, arrange for sub-contract field and special shop work to be done by others. Bid submissions must identify such subcontractors and indicate the work they are to do.
- C. The contractor shall have at least ten (10) years' experience in the installation of similar equipment and systems. If requested, the contractor shall submit a representative list of installations during the above period.
- D. Other contractors may be considered with the prior review of Schuler Shook. Contractors seeking approval to bid must contact Schuler Shook and provide the following information not less than ten (10) days prior to the bid date:
  - 1. List of projects of similar scale and complexity completed in the last five (5) years. Provide project name, location, completion date, and description of equipment installed. Provide contact name, title and phone number for references familiar with contractor's work on each project listed.
  - 2. Samples of shop drawing submittals for projects of similar scale and complexity completed in the last five (5) years.
  - 3. Technical data sheets for any product proposed for use on this project.
  - 4. Samples of any products requested by Schuler Shook.
  - 5. Name, resume and number of years of employment for contractor's Project Manager assigned to this project.

### 1.07 SUBMITTALS

- A. Ten (10) days prior to bid.
  - 1. A list of any and all proposed deviations or exceptions from the contract Drawings and Specifications. Any deviations or exceptions from the Drawings or Specifications proposed after this time shall not be accepted.
- B. With bid.
  - 1. Proof of qualifications as listed above.
  - 2. A list of any and all formally pre-approved deviations or exceptions from the contract Drawings and Specifications. Any deviations or exceptions from the Drawings or Specifications proposed after bid shall not be accepted.
  - 3. A schedule for the anticipated completion of the following:
    - a. Shop drawings.
    - b. Delivery of all equipment.
    - c. Installation of all systems.
- C. With Bid Award
  - 1. Immediately after bid is awarded contractor shall make arrangements to come to the site and verify the allowable space for the line arrays with the A/V contractor. Lead times for A/V equipment are long. To order the line arrays the A/V contractor must verify the allowable space for the speakers immediately.
- D. Shop drawings.
  - 1. Shop drawings shall be produced by the primary rigging equipment manufacturer. Where multiple manufacturers are providing equipment, the rigging contractor shall assemble all shop drawing submittals into a single,

## SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

complete package with internal coordination. Shop drawings produced by an equipment dealer / vendor shall not be accepted. Partial shop drawing submittals shall not be accepted.

2. Prepare all shop drawings under the supervision of professional electrical and structural engineers so licensed by the State of Oklahoma. All shop drawings shall be stamped and certified by those engineers. Structural Engineer's review shall include, but not be limited to, all elements related to overhead lifting, all elements suspended overhead, and structural support of all elements provided by the Rigging Contractor.
  3. Within thirty (30) days of contract award, the Contractor shall submit one (1) complete set of computer-generated drawings in PDF format to the Architect for approval prior to fabrication:
    - a. Floor plan and section of stage in scale equal to 1/4" = 1'-0".
    - b. Complete, fully dimensioned shop drawings of all major components.
    - c. Requisite plans, sections, schematics, and details indicating assembly and installation of components.
    - d. Quantities of each component and sub-assembly.
    - e. Load ratings of all bearings, blocks, trim chains, lift lines, and purchase lines within the system.
    - f. Certification that all steel cable and rope is certified to meet Federal Standard RR-W-410E or ASTM 1023/A 1023M and to meet the required breaking strength.
    - g. Indication of all supplementary structural support to be supplied and installed as part of the work of this Section.
    - h. Complete descriptions, including manufacturer and model number, of all bearings, motors, and transmissions.
    - i. Complete descriptions, including manufacturer and model number, of all electrical components. All control panel switches and pilot lights shall be described by the manufacturer's catalog sheet.
    - j. Power requirements and installation wiring diagrams for all electrical components.
    - k. Indication by boxed caption of any and all deviations or exceptions from the contract Drawings and Specifications, whether or not these variations have been formally or informally accepted by Schuler Shook.
- E. Final submittal.
1. Within thirty (30) days of final tests, and as a condition for final approval, the Contractor shall submit three (3) bound sets to the Architect and one (1) bound set to Schuler Shook:
    - a. Receipts for delivery of all non-installed items, i.e., all items designated, "deliver to Owner."
    - b. "As built and approved" drawings and wiring diagrams showing all systems and components as installed, including all field modifications.
    - c. Operation and service manuals, schematics, and parts lists for each unit of equipment installed or provided.
    - d. Flameproofing certificates.

## SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

- e. Load testing record.
- f. Certificates of warranty, as set forth below.

### 1.08 TESTING AND INSTRUCTION

- A. The primary rigging equipment manufacturer shall conduct a preliminary site inspection and notify Schuler Shook in writing that the installation is complete and ready for punch list inspection. The manufacturer site inspection may be waived in writing by Schuler Shook prior to bid.
- B. Upon completion of all installation work and manufacturer inspection, the Contractor shall certify in writing to the Architect that the work is complete and ready for final inspection. Final inspection shall be scheduled by the Owner, the Architect, and Schuler Shook within fourteen (14) days following the Contractor's notice of completion.
- C. Final inspection shall be conducted by a knowledgeable representative of the Contractor, in the presence of the Owner, the Architect, and Schuler Shook, and shall include the following:
  - 1. Visual examination of all components.
  - 2. Operation of all components.
  - 3. Sightline check of masking curtains.
  - 4. Full failure condition test of all safety brakes.
- D. Necessary adjustments or modifications shall be made as required.
- E. Contractor's representative shall instruct Owner's designated staff or representatives in the safe operation and maintenance of all equipment, including the storage and cleaning of all fabrics. This instruction session shall be scheduled to last a minimum of four (4) hours.
- F. The contractor shall provide to the Owner video-recorded instructions on the operation and maintenance of the system. Information contained in the video shall include all points of operation and maintenance covered in the instruction session with the Owner's staff. A recording of the actual instruction session is acceptable. Provide two (2) DVDs each containing full copies of the video instruction.

### 1.09 GENERAL REQUIREMENTS

- A. General Conditions of the project contract, work schedules, and site regulations apply to this work.
- B. This work shall comply with local codes and applicable NEC and UL standards, and all components shall carry pertinent UL labels.
- C. Equipment shall comply with applicable UL standards including:
  - 1. UL 508A Industrial control panels.
  - 2. UL 924 Emergency lighting and power equipment.
  - 3. UL 1640 Portable power distribution equipment.
- D. All equipment shall be fully insured against loss or damage during shipment, job site storage, installation, and testing. The Contractor shall have and assume full responsibility for the safety of every unit of equipment, components, wiring, and plans during delivery, installation, and testing. Certification of such coverage shall be furnished to the Architect within 30 days of award of contract.

## SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

- E. Warranty.
  - 1. The Contractor shall unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance of all work of this Section.
  - 2. All repairs and service during the warranty period shall be performed at the job site. Labor, materials, and transportation of replacement materials, parts and service personnel to and from the job site shall be included hereunder at the Contractor's expense.
  - 3. Appropriate additional equipment or draperies to replace equipment, devices, or draperies removed for repair, service, or cleaning shall be provided at the job site at no expense to the Owner.
  - 4. Warranty service shall be performed by personnel in the employ of the Contractor and shall not be sub-contracted or assigned to another company, service, or individual unless the Owner has approved such assignment in writing, in which event the Contractor shall nevertheless be responsible to the Owner for such work.

### **PART 2 PRODUCTS**

#### 2.01 GENERAL

- A. All components shall be new and of first quality.
- B. Machinery and component parts shall comply with all applicable tests, ratings, specifications, and code requirements and bear appropriate labels of conformity and acceptability.
- C. All components shall bear pertinent flameproofing certificates and UL labels. All components shall bear labels identifying the manufacturer, model number, and serial number. All such labels and certificates shall be permanently attached in a conspicuous location.
- D. Operating parts of all equipment shall be machine finished, and tolerances, finishes, fit, etc., where not specified, shall conform to good trade practices.
- E. All items necessary for a complete, operational system shall be provided, including bolts, nuts, washers, fittings, anchors, supports, hinges, and all other items required for completeness and operational safety. Where not specified elsewhere in this Section, all bolts shall be Grade 5 or better.
- F. Where not specified elsewhere in this Section, all rope and wire rope shall be selected using a minimum safety factor of 8 to 1. All chain, shackles, and all other hardware shall be selected using a minimum safety factor of 3 to 1. These safety factors apply to dynamic loading conditions.
- G. Where not specified elsewhere in this Section, sheaves and drums shall have a tread diameter of at least 30 times the diameter of the wire rope employed.
- H. Unless specifically shown otherwise in the drawings, the contractor shall run all lift lines directly from the winch to the loftblocks without muling. Contractors wishing to add muling may do so only with the approval of Schuler Shook, such proposals to be made at least ten (10) days prior to bid date. Muling to accommodate unforeseen site conditions must be approved by Schuler Shook prior to installation.

## SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

- I. Contractor is responsible for all supplemental structure.
  - J. Coordinate all lift line and supplemental structure locations with A/V contractor.
  - K. All control panel faceplates shall be black anodized aluminum or black painted steel, and all labels and legends shall be permanently engraved directly into the faceplate. Engravings shall be filled with white enamel. Lamicoid labels may be used if mechanically fastened. Dry transfer, decals, plastic "dymo," or other types of adhesive labels shall not be used. Silk-screened legends shall not be used. All control panel faceplates shall have beveled edges and rounded corners.
  - L. Where specification allows for "approved equal," substitutions shall be proposed to Schuler Shook at least ten (10) days prior to bid date.
  - M. Equipment and hardware are specified on the basis of performance and minimum acceptable quality. Materials manufactured by any of the following companies that equals or surpasses the performance and quality specified will be acceptable:
    - 1. Automatic Devices Company, Allentown, Pennsylvania.
    - 2. J. R. Clancy, Syracuse, New York.
    - 3. H & H Specialties, South El Monte, California.
    - 4. I. Weiss Theatrical Solutions, Fairview, NJ.
    - 5. Stagecraft Industries, Portland, Oregon.
    - 6. Texas Scenic, San Antonio, Texas.
    - 7. Thern, Winona, Minnesota.
  - N. Imported steel cable and rope shall be tested and certified as specified herein. Cable or rope provided by any of the following vendors that equals or surpasses the performance and quality specified will be acceptable. Other vendors seeking approval to provide imported cable or rope must contact Schuler Shook not later than ten (10) days prior to bid date.
    - 1. J. R. Clancy, Syracuse, New York.
    - 2. H & H Specialties, South El Monte, California.
    - 3. I. Weiss Theatrical Solutions, Fairview, NJ.
    - 4. Stagecraft Industries, Portland, Oregon.
    - 5. Texas Scenic, San Antonio, Texas.
    - 6. Thern, Winona, Minnesota.
- 2.02 8-INCH UNDERHUNG LOFT BLOCKS
- A. Sheaves shall have an outside diameter of at least 8 inches, made of Class 30 gray iron conforming to ASTM specification A-48. Sheaves shall be grooved for 1/4" wire rope, with a groove diameter clearance of .015 inch.
  - B. Hubs shall be min. 2" diameter, machine faced, bored for and press-fitted with double sealed precision ball bearing assemblies. Each bearing shall be designed for a dynamic radial loading of at least 1,000 pounds at 500 rpm.
  - C. Shafts shall be min. 1/2 inch diameter cold finished steel shafting. One end shall be locked to the side plate by a keeper pin; the other end shall be threaded and drilled for a castellated lock nut and cotter pin.
  - D. Side plates shall be min. 12 gauge cold rolled steel plate, flame cut to latch over one-half of structural member bottom flange. Side plates shall be attached by at least five (5) min. 5/16" bolts through ungrooved pipe spacers sized to space side

SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

plates for proper sheave clearance. Locate spacers where appropriate to retain cables in sheave grooves.

- E. Locking adjustment shall be high-tensile cast iron angle clip on min. 3/4" threaded rod with two (2) nuts to lock in place OR notched side plates and 3/4" draw bolt with steel clip.
- F. Basis of design for blocks shall be Clancy 200-40855C25.
- G. Attachment, location and quantity as shown in the Drawings. Coordinate with A/V Contractor.

2.03 STEEL CABLE

- A. All steel cable shall be certified to meet Federal Standard RR-W-410E or ASTM 1023/A 1023M and to meet the required breaking strength. Imported steel cable will only be accepted if provided by a vendor pre-approved in article 2.01.M above.
- B. Counterweight set lift lines. 7 x 19 pre-formed galvanized aircraft cable of right regular lay. Cables larger than 3/8" diameter are permitted to be of 6x37 XIPS construction. Minimum breaking strength shall be not less than indicated below:

Cable Diameter	Minimum Breaking Strength
3/16"	4,200 lbs.
1/4"	7,000 lbs.
5/16"	9,800 lbs.
3/8"	14,400 lbs.
7/16"	17,600 lbs.
1/2"	22,800 lbs.

- C. All wire rope connections shall employ thimbles of the proper size and compressed oval sleeve fittings as manufactured by National Telephone ("Nicopress"). All fittings shall be malleable copper. Aluminum fittings shall not be acceptable. All connections shall be selected and installed to develop the full tensile strength of the cable. Contractor shall maintain and inspect all swaging equipment on a daily basis to ensure the integrity of swaged fittings.
- D. Drop-forged steel cable clips may be used only in specific locations as directed by this Specification, or in locations approved in advance in writing by Schuler Shook or the Owner. Clips shall meet or exceed Federal Specification FF-C-450 and shall produce a termination equal to at least 80% of the breaking strength of the wire rope. The saddles of the clips shall be in contact with the load end of the rope. One clip shall be tight against the thimble to retain the cable in the thimble. Quantity of the clips shall be according to the following:

SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

Cable Diameter	Quantity of Clips
3/16"	2
1/4"	2
5/16"	2
3/8"	2
7/16"	2
1/2"	3

E. Sizes and connections per Drawings and Schedules.

2.04 MOTORIZED DRUM WINCH

- A. Winch assembly shall be designed and installed to lift and hold the auditorium left and right speaker arrays by others.
- B. The winch set shall be dual drum, motorized, with a rated capacity of 2000 pounds per set and a fixed hoisting speed of 18 to 24 feet per minute. All cables shall run continuously from the batten to the drum without clueing. Each winch drive unit assembly shall consist of a motor, brake, gear reducer, limit switch assembly, and drum. All drives shall be direct.
- C. All winch sets shall be "soft start" and "soft stop", accomplished by means of a high-inertia flywheel or fan associated with the motor.
- D. All winch sets shall be mounted on sound and vibration isolation pads to significantly reduce noise transferred to building structure during operation.
- E. Drums.
  - 1. Drums shall be machined from ASTM A48-83 Class 30 gray iron castings having a minimum tensile strength of 30,000 psi and a Brinell Hardness of at least 187. Drums shall have a tread diameter of at least 10 inches and shall be machine grooved for 1/4" wire rope, with a groove diameter clearance of .015 inch and a minimum groove depth of .125 inch. Drums shall have sufficient cable capacity in one layer for maximum travel plus three (3) dead wraps. One 17/64-inch diameter hole shall be drilled through the root of the groove for the cable end. This hole shall have an axis which, in section, is angled 45 degrees from a radial line drawn from the shaft to the center of the hole.
  - 2. Drums shall be closely supported by tapered roller bearings. Each bearing shall be designed for a dynamic radial loading of at least 2,000 pounds at 500 rpm.
  - 3. Adjustable steel rollers shall be provided to prevent cable from jumping out of grooves. These rollers shall be adjusted so that they do not bear on the cable when the cable is correctly seated in the groove. These rollers shall be supported at both ends by precision ball bearings.
- F. Gear Reducers.
  - 1. Gear reducers shall be combination helical-worm reducer, directly flange-mounted to the motor/brake assembly. The reducer shall have two gear stages; the first stage shall be helical and the second stage shall consist of



## SECTION 11 61 33 – THEATRE RIGGING, CURTAINS AND TRACKS

- a worm and worm wheel. The worm shaft shall be milled, hardened, and ground to insure maximum efficiency and long life.
  2. Gear reducers shall be enclosed in high-strength gray cast iron housings with precisely located gear set bearing supports. Each housing shall have sufficient capacity for lubricant, and surface area for adequate heat dissipation.
  3. Gear reducers shall incorporate a high inertia flywheel at the motor stage for "soft start" and "soft stop" capability.
  4. Gear reducers shall be SEW-Eurodrive "Helical-Worm Gear", or approved equal.
  5. Gear reducers shall be selected to safely transmit specified torque and horsepower and shall have a load classification service factor equal to or greater than 1.3.
- G. Primary Brakes.
1. Brakes shall be directly coupled to the drive train.
  2. Brakes shall be fail-safe disc brakes, spring set and electrically released. Brakes shall stop and hold 200% of the full load torque.
- H. Secondary Brakes.
1. The secondary brakes shall be a fully mechanical over speed brake, directly mounted to the drum drive shaft. These brakes shall function independently of all other systems, and it shall not require any external sensors, controls, or power sources.
  2. The over speed brakes shall engage automatically when the preset speed threshold has been exceeded. It shall be possible to preset the brake tension to adjust the stopping distance, so that it brings the load to a controlled stop without shock.
  3. The over speed brakes shall stop and hold 200% of the full load torque.
- I. Motors.
1. Motors shall be properly sized for the application.
  2. Motors shall be polyphase, general purpose with open drip-proof enclosures. Motors shall be equipped with double sealed ball or roller bearings. Motors shall have a minimum load classification service factor of 1.3 for intermittent operation.
  3. Each motor shall be provided with a magnetically operated, mechanically and electrically interlocked, reversing motor starter. Starter shall be sized to match the motor horsepower and rated for intermittent duty. Each motor shall include a thermal overload relay, sized to trip at 115% to 120% of "full load amps" as stamped on the motor nameplate.
  4. Each motor shall include an electrical junction box and disconnect switch with terminals of sufficient size and properly labeled, for all external connections.
- J. Limit Switches.
1. Limit switches shall be of the rotary type, connected by steel drive chain to the shaft. The input shaft and drive chain shall be fully guarded, and the sprockets shall be keyed to the shafts.

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2. Each limit switch shall include a gear-driven, ball bearing supported cam shaft and associated precision, snap-action type contact mechanism.
  3. Provide four adjustable limit switches for each winch assembly, as follows:
    - a. Upper limit over-travel backup.
    - b. Upper limit of travel.
    - c. Lower limit of travel.
    - d. Lower limit over-travel backup.
  4. Normal travel limit switches, when struck, shall not permit operation of the unit, except in the direction away from the limit switch. Over-travel limit switches, when struck, shall de-energize the motor, and shall not permit travel in any direction until specifically reset at the limit switch enclosure.
  5. Lower limit of travel (low trim) shall be +3'-0" above stage floor and upper limit of travel (high trim) shall be the maximum attainable.
- K. Provide all required mounting hardware pair with speaker mounting hardware provided by AV contractor.
- L. Device provided and installed by the Stage Rigging Contractor.
- M. All required power disconnects, feeds, wire and conduit provided and installed by the Electrical Contractor. All power and control connections by the Electrical Contractor.
- N. Install as shown in the Drawings.

### 2.05 HOIST CONTROL SYSTEM

- A. The system described below is based upon general performance criteria common to the products listed below. No other system shall be considered unless specifically approved by Schuler Shook at least ten (10) days prior to the bid date:
1. J.R. Clancy "Vantis Pendant system."
  2. Approved equal.
- B. The control system shall be designed for the safe and reliable control of for a minimum of two (2) automated rigging hoists or linesets.
- C. Physical requirements:
1. The system will be a hand held pendant solution with a dedicated control receptacle mounted to the wall. Provide 25' cable.
  2. The control system shall have an emergency stop "E-STOP" circuit that shall place the system into a "safe-state" condition and remove power to all hoists / axes controlled by the system. E-STOP buttons shall be located at the control console and in remote locations as indicated in the drawings. E-STOP buttons shall be configured as follows:
    - a. Buttons shall be red mushroom style, minimum 1.6 inch diameter.
    - b. Buttons shall be internally illuminated when in E-STOP condition.
    - c. Buttons shall employ turn release mechanism.
    - d. All remote or portable buttons shall include switch guard, minimum 2 inch diameter, to prevent nuisance activation of E-STOP buttons. Switch guard is not required at control console.
    - e. Label: Rigging Control Emergency Stop.
  3. Dead man operation.

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- a. The control console shall have an integrated “dead man switch” that requires the presence of an operator to physically hold a momentary switch for the duration of any automated rigging movements.
  - b. Release of the “dead man switch” shall immediately stop all movements and cue sequences.
  - c. Systems that allow hoists / axes to operate without an operator actively present shall not be acceptable.
  - d. Touchscreen “Hold-to-Run” operation shall not be accepted for “dead man” operation.
4. The control console shall include one (1) integrated touch screen for display and selection of cue lists and hoists / axes.
  5. The control console shall include integrated “Up”, “Down”, and “Go” buttons or macro buttons that may be assigned these functions.
  6. The control system shall run on industrial computer components and shall be embedded in non-volatile memory.
  7. All programming or cueing shall be recordable to backup media.
  8. The control system shall include a UPS power supply for operation of the control console for a period of ten (10) minutes in the event of power loss.
- D. Operational requirements:
1. The control system shall include a graphical user interface (GUI) for ease of use and clear understanding of system operation. The control system shall provide a graphical representation of programmed moves. The system shall allow for the representation of the stage and generic scenic elements. The control system shall provide a visual status of motor operating and fault conditions.
  2. The control system shall have multiple password protected access levels for maintenance (least access), operator, supervisor, and installer (greatest access).
  3. The operator shall be able to create, store, modify and delete preset positions as a combination of simple up/down movements, preset position targets, speed, time, acceleration, and deceleration.
  4. The operator shall be able to group hoists / axes for synchronized operation.
  5. The control system shall allow soft load and trim limits to be set by the operator. Soft load and trim limits shall only be permitted within the maximum limits set by the system manufacturer.
  6. The control system shall have inherent interlocks and rules-based interlocking to prevent system component conflicts.
- E. Provide all necessary control racks and mounting hardware.
- F. Devices provided and installed by the Rigging Contractor.
- G. All required power disconnects, feeds, wire and conduit provided and installed by Division 26. All power and control connections by Division 26.
- H. Exact locations to be determines in the filed on the stage right proscenium wall.

### 2.06 CABLE REEL

- A. Provide cable reels and all required hardware for automated extension and retraction of electrical power and data cables.

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- B. Speaker cable reels.
  - 1. Circuit quantity.
    - a. Dedicated Speaker wiring. Provide thirty-two (32) #12 AWG conductors for each speaker plus a minimum. Coordinate with A/V contractor.
  - 2. Cable length: maximum 60'-0" cable required, field verify.
  - 3. Strain relief: provide Kellems style cable grips at end of every cable for connection to junction box by others.
- C. General requirements.
  - 1. Color: Cable reel housing, cable and sheaves shall all be "black."
  - 2. Size: Verify that cable reel assemblies may be located as shown on the Drawings. Cable reels shall be mounted to structure. All cable reels shall be located to facilitate future service. Blocks can be added if it facilitates service.
- D. Manufacturer:
  - 1. Basis of design to be conductix Wampfler "GafferReel" or approved equal.
- E. Devices provided and installed by the Stage Rigging Contractor.
- F. All required power disconnects, feeds, wire and conduit provided and installed by the Electrical Contractor. All power and control connections by the Electrical Contractor.
- G. Quantities, locations and circuits as shown on the Drawings and in the Schedules.

### PART 3 EXECUTION

#### 3.01 FABRICATION

- A. This Contractor is responsible for becoming familiar with and verifying all pertinent dimensions and conditions, both in the Drawings and in the field, before proceeding with any work.
- B. Coordinate the design, planning, and scheduling of the work of this Section with the work of all other trades. Notify the Architect of any difficulties in coordinating work with other contractors. Failure to do so shall constitute acceptance of construction as suitable in all ways to receive the work of this Section.
- C. All electrical components shall be fully assembled and internally wired, with terminals of the proper rating and clearly labeled, provided for external feeder and control wiring.
- D. All metal fabricated items shall be given at least one coat of primer and one coat of finish paint. Color: black.
- E. Where specifically called out in the Drawings and Specifications, tracks and fittings shall be painted or anodized black.
- F. All equipment shall be fabricated and installed to facilitate maintenance and future replacement.
- G. Machinery and equipment supplied under this Section shall be designed, constructed, and installed so that sound pressure levels measured at a distance of 5'-0" shall not exceed 50 decibels at any load or any speed.

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### 3.02 INSTALLATION

- A. Contractor shall employ only experienced stage riggers for the installation of work of this Section. A competent supervisor shall be maintained on this Project during the entire installation. A change of supervisor shall not be acceptable unless by written authorization of the Architect.
- B. Coordinate installation with all other trades doing adjoining work.
- C. Examine all existing conditions at the job site prior to beginning installation.
- D. Provide protection for all stage flooring, regardless of whether flooring has been stained or sealed. Flooring shall be protected from both structural damage and cosmetic damage.
- E. Provide and install all supplementary structural support as required for the installation and safe operation of equipment and materials supplied under this Section.
- F. Do all required cutting, drilling, tapping, and welding necessary for proper installation. Cut no structural members unless specifically shown in the Drawings or indicated in the Contractor's shop drawings, or unless written approval is obtained from the Architect.
- G. Install all items in conformity with standard trade practices and manufacturers' recommendations. Position all items accurately and true to plumb line and level. Maintain maximum headroom and clearances at all locations.
- H. Ropes and cables shall enter rigging blocks and drums at a fleet angle not exceeding  $\pm 2$  degrees.
- I. Steel cables shall be cut just above cable clips or swaged fittings. All cable ends shall be sealed with a bead of heavy-duty silicone adhesive.
- J. All turnbuckles shall be wired shut after adjustment. All and screw-pin shackles shall be wired shut or secured with plastic cable ties after adjustment.
- K. Install all winches, winch motor starter panels, and winch control panels with the exception of the electrical power and control connections between devices. All winch power feeds, disconnects, conduit and wire shall be provided and installed by the Division 26 Electrical Contractor.
- L. Advise the Division 26 Electrical Contractor as required on the installation of electrical equipment related to the work of this Section.

### 3.03 PROTECTION AND CLEANING

- A. Provide protection for any theatre rigging equipment, panels and faceplates installed prior to the completion of construction and painting. Remove any debris or paint from equipment that was not adequately protected. Panels and faceplates not appearing "like new" shall be replaced.
- B. No curtains or rigging accessories shall be installed until construction and painting are complete and the building has been cleaned. Any curtains or accessories delivered to the job site prior to their installation shall be stored in a clean area in dustproof bags.
- C. Upon the completion of the work of this Section, dispose of all packing materials, debris and remnants which result from the work of this Section.

**END OF SECTION**

## SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS

### PART 1 - GENERAL

#### 1.1 GENERAL CONDITIONS

- A. For the sake of brevity these specifications shall omit phrases such as "(Sub)Contractor shall furnish and install", "unless otherwise indicated or specified", etc., but these phrases are nevertheless implied. Mention of materials and operations requires the (Sub) Contractor to furnish and install such materials and perform such operations complete to the satisfaction of the Systems Designer. Exceptions are noted herein or shown on the drawings.
- B. No representative of the Owner shall have power to waive the obligations of this Contract for the furnishing of good materials or of performing good work, as herein described, in full accordance with the Contract Documents. The failure of any representative of the Owner to condemn any defective work or materials shall not release the obligation to at once tear out, remove, and properly replace the same at any time prior to final acceptance and upon discovery of said defective work or material. However, when requested, the Owner's representative shall observe and accept or reject any material furnished; and in the event the material has been once accepted by the Owner's representative, such acceptance shall be binding on the Owner unless it can be clearly shown that such material does not meet the specifications for this work.
- C. Definitions of terms in this specification section are as follows:
1. "Owner" or "End User" is Tulsa Performing Arts Center
  2. "Architect" is the architect of record for this project, Beck Design
  3. "Systems Designer" is the designer of the systems in this specification section, Schuler Shook.
  4. "Electrical Engineer" is the engineer and designer of the associated electrical systems, Phillips+Gomez
  5. "General Contractor" or "Contractor" is the Construction Manager or General Contractor, or other entity contractually responsible for the construction of the project and the full and proper completion of this specification section.
  6. "Systems Contractor" is the Sub-Contractor, responsible to the General Contractor, who is responsible for performing the scope of work described in this specification section, and in the related contract drawings (see 1.2.B).
  7. "Systems" are the audio, video, control, and network systems described in this specification section and in the related contract drawings (see 1.2.B).
- D. The written specification and the large format audio video drawings are collectively referred to as the contract documents. System components and criteria may be indicated in one location, or possibly in several locations in the contract documents. It is the systems contractor's responsibility to obtain clarification from the Systems Designer, prior to submitting bid documents, if the Contractor believes that there is conflict within the documentation, or if clarification of any kind is required. If the systems contractor fails to obtain said clarification(s), the systems contractor agrees to abide by the interpretation of the Systems Designer, without remedy for additional compensation.

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### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, other General Requirement Sections, apply to work of this section.
- B. All work shown on Contract Drawings AV series is provided under this section.
- C. Switches, switchboards, contactors, panel boards, transformers, conduit, wire, outlets, connectors and other electrical devices specified herein or on accompanying drawings shall conform to provisions of other sections of Division 26 of the Contract Documents unless otherwise noted. Refer to 1.11 Division of Responsibility Table for additional detailed division of scope.

### 1.3 SCOPE OF WORK

- A. Work under this section shall include the furnishing of all labor, materials, tools, transportation services, and supervision necessary to complete the installation of the systems and other items as herein listed, all as described in these specifications, as illustrated on the drawings, and as directed by the Systems Designer. Work is comprised of, but not limited to, the following principal Systems:
  - 1. Performance Audio Systems
  - 2. AV Infrastructure
  - 3. Portable AV Systems
  - 4. Portable AV Loose Equipment
- B. The contract documents show design intent and signal flow and are not meant to be fully detailed installation drawings. It is the responsibility of the Systems Contractor to provide fully detailed installation drawings for review and approval by the Systems Designer (see submittal requirements below). It is understood and agreed to by the systems contractor that the work described in the contract documents shall be fully and properly installed and must be a complete and working system per the requirements indicated in these contract documents.
- C. Consistent with the detailed information contained in this specification, it is the responsibility of the systems contractor to supply complete and functional overall systems. Verify complete parts lists, the accuracy of the type numbers and the overall suitability of the equipment to provide functional systems coordinated and interfaced with related work. Provide repeaters, additional switches, and similar equipment as needed for cable length limitations. Other items that are included in the scope of work but may not be fully detailed in the contract documents include, but are not limited to, hardware, rigging devices and supplies, transformers, distribution amplifiers, signal format converters, connectors, patch cords, jumpers, network, or other device SFP modules, and other devices necessary for device interfacing, isolation, installation, or gain structure.
- D. Minor items of equipment needed to meet the requirements stated above, even if not specifically mentioned herein or on the drawings, shall be provided in quality equivalent to other conditions on the project with no claim for additional payment.
- E. Furnish Shop Drawings (see details in Submittals sections below) to the Systems Designer and Architect for review. All purchase of equipment, and/or fabrication or installation work performed without fully approved shop drawings is done so at the Contractor's risk. Any at risk work as described above may be rejected and if

## SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS

so, all cost associated with the removal of unapproved work, and replacement with approved work is not eligible for reimbursement or additional charge. This includes Division 26 electrical systems and conduit that is required to be provided to support the work described in this section. Conduit drawings related to this scope of work are required to be submitted by the Division 26 sub-contractor, with input and coordination from the Systems Contractor, and approved by the Systems Designer and Electrical Engineer, prior to any of the work described above being performed. Any work done prior to approval of the conduit drawings submittal is at risk and any remedial work or replacement work required by the Systems Contractor and/or Electrical Engineer to correct deficiencies in unapproved work must be performed at the systems contractor's cost and is not eligible for reimbursement or additional charge.

- F. Furnish and install complete Systems with all necessary apparatus and equipment, wiring, etc., required to ensure complete systems in excellent working order as specified herein and on the attached diagrams.
- G. Furnish all back boxes and enclosures for audio video systems panels and control devices, to be installed by Division 26 sub-contractor. Coordinate with Division 26 sub-contractor to verify proper location, orientation, and installation conditions of all back boxes and enclosures to meet project requirements. Refer to 1.11 Division of Responsibility Table and to project documentation for details.
- H. Furnish, install, and terminate all low voltage wire and cable included in this specification section. This does not include AC power system distribution and terminations, except as expressly called out in these specifications or in the audio video drawings.
- I. Systems Contractor is responsible for frequency scanning and coordination of any existing audio video systems devices, or audio video systems devices provided by Owner, with any new wireless transmitters and receivers. Coordinate with Contractor and Owner as necessary accounting for local frequencies already in use by other entities, and accounting for available spectrum. Provide Owner with a complete listing of all wireless equipment referenced above, and the frequencies assigned to the devices, as well as providing a list of available open frequencies for all devices that are tunable.
- J. Systems Contractor must provide Control System and Digital Signal Processing (DSP) system programming and graphical user interface designs, along with any other specialized programming requirements listed or indicated in the drawings, and/or specifications, including specification appendices. Systems Contractor will provide a full set of said programming, fully tested, installed, functioning and ready for inspection prior to Systems Commissioning and Testing. Systems Contractor will then provide a full set of changes, adjustments, and additions to address any deficiencies, or changes requested by the Systems Designer during Systems Commissioning and Testing prior to turnover to the Owner. Systems Contractor will also provide one additional full set of changes and adjustments to meet requests and notes from the Owner during the last third of the initial warranty period. All of this work is part of the base scope of work covered by these contract documents. Changes required to support additional equipment added to the systems during warranty period, that is not part of the work in these contract documents is not included in the work described above. Any such work should be



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proposed to the Owner with the costs for that work for the Owner to approve prior to work being performed.

- K. Perform all initial systems settings and required Systems Contractor testing (see paragraphs 3.10, 3.11, and 3.12 below) and submit all required test reports, and a Declaration of Audio Video Systems Completion.
- L. Provide any required manufacturer training or commissioning (see paragraphs 3.14 below)
- M. Participate, along with manufacturer's representatives (if required), in Systems Designer Commissioning, Testing, and Systems Adjustments.
- N. Remedy all outstanding punch list items prior to Owner training.
- O. Provide training sessions, as required in paragraph 3.14 below, to the Owner's Designated Staff.
- P. Provide systems documentation, as required in paragraph 3.15 below, to the Systems Designer for review and approval.
- Q. Provide systems documentation to the Owner, as required in paragraph 3.15 below, corrected per any notes from the Systems Designer.
- R. Warranty all equipment, components, and workmanship per the warranty requirements in paragraph(s) 1.7 below.
- S. Contract documents for work in this section includes references to supporting work to be provided by other divisions and specification sections. That work is NOT included in this scope of work and is only referenced to show related work to assist in coordination. Refer to the Division of Responsibility Table in paragraph 1.11 for detailed information on division of related labor between sub-contractors. The systems contractor is ultimately responsible for completion of all this scope of work and any related supporting scopes of work.

### 1.4 JOB CONDITIONS

- A. Verify all conditions on jobsite applicable to this work. Coordinate with scheduled work of other trades. Notify Systems Designer in writing of discrepancies, conflicts, or omissions prior to commencement of work or correct same at Contractor's expense.
- B. The drawings show diagrammatically the cables, conduit, wiring, and so far as possible, the arrangement of equipment, which fit into the spaces available without interference. If conditions exist at the jobsite which make it impossible to install work as shown, prepare and submit drawings to the Systems Designer for approval showing how the work may be installed and, on approval, install the work without additional cost to the Owner.
- C. Contractor and their sub-contractors shall take care not to damage any equipment or to disconnect any wiring other than as required to interface new system. Any contractor-damaged equipment shall be repaired or replaced by the Contractor at no cost to the Owner.
- D. The Systems Contractor must keep the job adequately staffed at all times.

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- E. For no reason other than illness, loss of personnel, or other circumstances completely outside the control of the Systems Contractor, the Project Engineer, Project DSP and Control Systems Programmers, and the Lead Installer shall remain with the project from beginning through completion. In cases where a change must occur, the same pre-bid requirements for CTS-D and CTS-I certification apply to the new staff members, and in anything other than a catastrophic and immediate loss, there must be a minimum of a one week overlap between personnel on the project. The Systems Contractor MUST provide the Systems Designer, notice of any change, including a general reason for the change, and a detailed plan as to how the continuity of information will be achieved. This requirement does not apply to staff other than those directly named above.
- F. The systems contractor is responsible to perform all cutting, patching, and painting or other work necessary to match finish treatments during installation of the systems and to repair any damage done as a result of installation of the systems. The systems contractor is responsible for all cleanup and trash removal from all systems work areas.
- G. The Systems Contractor will cooperate with the Contractor and any or all sub-contractors and the Owner, Owner's Representative, and all other appropriate parties to comply with the overall construction schedule. Watch for conflicts with work by other contractors on the job. Without claim for additional payment, make moderate moves or changes as are necessary to accommodate other equipment or to maintain aesthetic appearance.
- H. The systems contractor will provide and maintain fully finished, dust free and conditioned spaces for all control rooms and rack locations prior to any installation of systems racks or electronics. In addition the systems contractor must provide adequate protection to installed loudspeakers, displays, projectors, cameras, and other systems equipment to protect them from damage and from dust or exposure to other contaminants, such as water or paint overspray.

### 1.5 SUBMITTALS

- A. Pre-Bid Submittals
  - 1. All Systems Contractors providing bid responses for the systems specified in this section must provide the following documentation for review no later than ten (10) days prior to the bid due date, and must be deemed qualified, in writing, by the Systems Designer.
    - a. A list of projects performed within the last four years of comparable size, and scope (minimum four projects). For each project provide the project name and address, dates of construction start and completion, and a name and phone number for a contact representing the Owner or User.
    - b. A description of the Systems Contractor's facilities used for, and capabilities in the following areas:
      - i. Shop fabrication
      - ii. Rack assembly and wiring
      - iii. Equipment repair
      - iv. Systems servicing
      - v. Creation of CAD, REVIT, or other graphics documentation for shop drawings and as-built drawings



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- b. The names of all proposed sub-contractors and a statement of their qualifications (see 1.5.A.1 in its entirety above) must be included in the bid response package.
- 6. All bid response packages must include the following information, in its entirety, or they will be rejected, in whole, as unresponsive:
  - a. An itemized list of all equipment and materials to be used in the installation of the systems in this scope of work. This list must include a short item description, item name, and manufacturer's name, quantity of items included, and a unit price for that item. Lot prices may be used instead of unit prices only for miscellaneous items not included in the list of specified equipment. Any manufacturer quotes referenced in the equipment list in this specification section must be broken out into unit descriptions as described above.
  - b. A labor breakdown as follows:
    - i. Pre-installation engineering (includes shop drawings and other documentation as well as submittals)
    - ii. Coordination meetings, site coordination, and supervision
    - iii. Shop engineering and assembly
    - iv. Shop programming time
    - v. Site installation work
    - vi. Site programming time
    - vii. Systems Contractor verification of systems
    - viii. Systems Designer commissioning and tuning
  - c. Total contract price for the base project as designed
  - d. Total contract price for any pre-approved alternate system as designed
  - e. For each of any proposed options provide the following:
    - i. Itemized list of equipment from the design that will be replaced by the option with the same information required in 1.5.B.6.a above.
    - ii. Lump sum labor cost attached to the list of equipment from the design that will be replaced by the option.
    - iii. Itemized list of equipment that will replace the equipment listed above in item I, with the same information required in 1.5.B.6.a above.
    - iv. Lump sum labor cost attached to the list of equipment from the option.
    - v. Total Add or Deduct amount from the Base Bid if this option is selected.
- C. Pre-Installation Submittals
  - 1. IMMEDIATELY after bid is awarded Systems contractor shall make arrangements to come to the site and verify the allowable space for the line arrays with the Rigging contractor. Lead times for A/V equipment are long. To order the line arrays the Systems contractor must verify the allowable space for the speakers immediately.
  - 2. The following guidelines must be adhered to for all submittals to be reviewed:

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- a. All shop drawings must be sized such that the paper size matches that of all other project construction drawings. All drawings must be legible when printed at ½ actual size.
  - b. Drawings should be done in black and white. Color may only be used to indicate specific signal types in single-line drawings, but in that case, they must still be legible with all information clearly seen if printed in black and white.
  - c. Drawings and all other submittal documentation should be provided in PDF format. DWG files and Revit models must be provided upon request. All drawings shall be produced in AutoCAD or Revit or in a compatible software that can produce accurate files that are compatible with AutoCAD or Revit.
  - d. Submittal of contract drawings, or copied portions of contract drawings as shop drawings is not allowed and they will be rejected. Use of electronic files generated by other parties (Systems Designer drawings or architectural backgrounds, for example) does not release the Systems Contractor from the responsibility to provide accurate, fully engineered, coordinated, and functional systems and complete solutions. The Systems Contractor must provide systems that meet or exceed all contract document requirements.
  - e. All revised submittals must include a revision number and date. All changed drawings or documents must clearly indicate the revision number and date, and all changed items must be clouded and tagged with the revision number. All subsequent revisions must have prior revisions clouds and tags removed for clarity. Drawings or documents included in a revised submittal that have NOT changed must not be marked as revised. Revisions that are not properly tagged may not get reviewed. This does not release the Systems Contractor from the responsibility to provide all revisions as are indicated in submittal responses.
  - f. All submittals must reflect the project awarded, as a whole, including all Owner accepted add/deduct alternates, all Systems Designer approved, Owner accepted Systems Contractor options proposed at bid, and all Systems Designer approved, Owner accepted post-bid, pre-installation, Systems Contractor proposed substitutions.
3. Every Submittal must include, as the first sheet, a table of contents of what all is provided within that particular submittal.
  4. Submittal submissions must follow the following schedule:
    - a. Within 30 days of award the Systems Contractor must provide work effort documentation that includes:
      - i. List of activities that require coordination with the Owner
      - ii. List of activities that require coordination with the Architect
      - iii. List of activities that require coordination with the Systems Designer
      - iv. List of activities that require coordination with the Contractor and other trades.
      - v. List of all key procurement items and drop-dead dates for procurement and delivery to maintain schedule.

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- vi. Schedule indicating all of the items listed in items a. through e. above and indicating critical path.
- vii. All activities related to coordination listed in a. through d. above must be examined and agreed upon by all other parties prior to submittal.
- b. Within 30 days of award the Systems Contractor must submit all post-bid, pre-installation period substitution requests per the following requirements:
  - i. Substitutions may only be incorporated into the design upon acquiring written consent and stamped approved substitution submittal documents from the Systems Designer.
  - ii. Substitution products/systems must be equivalent or better than specified products/systems in quality, performance, function, warranty, and conformance to system requirements.
  - iii. After the 30 day period mentioned above, the only Systems Contractor proposed substitutions that will be reviewed for approval are those required to replace discontinued products or products that cannot be procured in time to avoid project delays.
  - iv. No substitution may be approved without providing the following information for review:
    - a) List of any advantages to the Owner
    - b) List of any disadvantages to the Owner or lost functionality, whether that functionality is required by the systems design or not.
    - c) Printed specifications and/or laboratory test data for the substitution product AND the original product.
    - d) Description of previous field use and successes and failures.
    - e) Global cost savings reflecting total cost of equipment and labor and other costs incurred by changes in other Contractor's scope of work to support the substitution.
    - f) Unit price of each proposed item, and of the item being replaced.
    - g) In rare instances, the Systems Designer may request a sample of a proposed substitution for evaluation to determine acceptability as a substitute. In this situation, the Systems Contractor will procure and ship the sample to the Systems Designer, at the Systems Contractor's cost. The Systems Designer will evaluate the sample and then return it to the Systems Contractor. If the Systems Designer agrees, the sample may be provided by the manufacturer directly, at their cost, for evaluation.
  - v. The Systems Designer is the only party that may determine if a proposed substitution is acceptable. If the Systems Designer determines that the substitution is not acceptable,

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- the Systems Contractor must provide the specified product from the contract documents.
- vi. Where a substitute material or method is approved, the systems contractor must make all changes to accommodate the substitution with no claim for additional payment beyond that included in item iv. e) above.
  - vii. The Systems Designer reserves the right to substitute new products for products specified in the contract documents provided there is no material cost increase to the Contractor and the Contractor has not purchased the originally specified equipment.
- c. Within 30 days of award the Electrical Contractor and Systems Contractor must provide the conduit riser diagrams submittal. This submittal is the responsibility of the Electrical Contractor to create and submit, with input from the Systems Contractor. Any conduit installed prior to receiving a stamped approval of the riser submitted is at risk, and if it is found to be deficient, it must be removed and properly installed per specifications and per the approved riser, at the sole cost of the Contractor.
  - d. Within 30 days of award the Systems Contractor must provide the following in a single PDF format document:
    - i. Itemized list of all equipment and materials to be used in assembling the system.
    - ii. Catalog cut sheets or data sheets for each listed item.
      - a) Product data sheets must not be web page captures of specifications, unless there is no other recourse.
      - b) Product data sheets with multiple options or part numbers must clearly be marked with the selection to be used for this project. All options must be called out. Anything the Contractor is not supplying that is shown on the sheet must be called out as an exclusion.
  - e. Within 30 days of award the Systems Contractor must provide the following in a single PDF format document:
    - i. Plan and RCP drawings indicating the location of equipment and termination panels.
    - ii. A complete list of all cabling, wire by wire. Each entry in the list must include the unique wire number for that cable, and the termination locations of each end
    - iii. Detailed 3-wire schematic diagrams for any custom circuitry
    - iv. Detailed 3-wire schematic diagrams for typical connections between audio lines, patch bays, and rack mounted equipment.
    - v. Drawings of any custom items in a scale suitable for fabrication. The drawings must detail materials, colors, finishes, and any lettering or other markings. All lettering must be shown in the size and typeface to be used. These drawings include custom plates, rack panels, termination plates and any other custom manufactured equipment.

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- vi. All custom panels in the direct view of the general public may require a custom finish. Provide a list of all panels in the direct view of the general public and their location so that the architect may respond with any custom finish requirements. The Architect may request samples of each custom finish required. The Contractor must provide these samples to the Architect upon request, for approval. Costs for the samples and shipping the samples to the Architect shall be the sole responsibility of the Contractor. Submitted samples will not be returned.
- vii. Rack elevation drawings indicating equipment locations within the rack, power distribution and any cabling routing information. Elevate the front and rear of all racks. Notate any equipment in the rack that must have a security cover, per the rack specifications below.
- viii. Patchbay layout drawings at 1:1 scale showing labeling and indicating any normal connections and the type of normal connection.
- ix. Mechanical drawings showing mounting and/or rigging of all permanently installed AV Systems equipment, including but not limited to projectors, projection screens, displays, loudspeakers, cameras, and other AV devices that mount to architecture or structure. Additionally provide drawings for any permanently installed mounting plates designed to support portable AV systems equipment. Any mounting systems that are not provided as a single manufactured product from a single approved rigging and mounting manufacturer must be a fully engineered solution, must be approved in concept by the Systems Designer, and each drawing sheet must be stamped by a licensed structural engineer selected by the Contractor. Each custom solution must be shown separately and verified and stamped independently.
- f. Within 30 days of award the Systems Contractor must provide the following in a single PDF format document:
  - i. In coordination with the Owner's IT department, provide a networking plan for the AV systems networks. This plan must include:
    - a) Narrative description of the network design and function including but not limited to information describing all LAN's, VLAN's, and QOS plan.
    - b) Physical network diagram
    - c) Logical network diagram
    - d) IP Address table and addressing protocol, including fixed IP addresses for all AV systems devices. This document must be updated for the as-built submittals to indicate the corresponding MAC address for each device.
  - ii. Provide a written plan for EDID and HDCP management for all video signals and interconnection between devices.



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- g. Within 60 days of award the Systems Contractor must provide the following in a single PDF format document:
  - i. A mockup of all graphical user interface screens for touchpanels, computer displays, portable devices and any other display format, including but not limited to all loudspeaker control software, Digital Signal Processing software, Video routing and switching software, and control systems software.
  - ii. Source code and configuration files for any and all devices, as required for proper systems operation.
- h. Every two weeks after award, the Systems Contractor must provide to the Contractor and Owner a progress report that includes:
  - i. Overall status of the project and work completed by percentage
  - ii. Schedule changes
  - iii. Detailed Three week work plan
  - iv. Procurement updates:
    - a) Procurement problems
    - b) Concerns needed to be addressed by others
    - c) Value of materials procured and stored on site, or if allowed, in the Systems Contractor facility as a dollar value and a percentage of total project materials cost.
  - v. List of outstanding submittals indicating document number and date of submittal, in order from most recent to first submittal.
  - vi. List of outstanding RFI's indicating document number and date of submittal, in order from most recent to first submittal.
  - vii. Indicate any items in v. and vi. above that are overdue and whether or not they are affecting schedule. If they are affecting schedule provide information as to why and how they are affecting schedule.
- i. 30 days prior to any equipment purchase the Systems Contractor must request line item authorization from the Systems Designer to purchase equipment. This is to avoid procurement of equipment that may already be outdated by the time of procurement. The Systems Designer shall respond to the Systems Contractor within 15 days of receipt of the procurement request with approvals and/or replacement products. There will be no allowance for schedule extension based on this requirement.
- j. At completion of installation and Systems Contractor testing (see 3.10, 3.11, and 3.12 for testing requirements), the Systems Contractor must provide the following in a single PDF format document:
  - i. Written Statement of Completion that verifies the installation is 100% complete and has been tested as required, and is ready for the Systems Designer to perform testing and commissioning of the systems.
  - ii. A Testing Report that includes:

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- a) ALL test data from all tests, including failed tests and subsequent passing tests after rectifying the problem that caused failure
  - b) Usage of any spare cabling to replace cabling that was damaged during installation. Include the wire numbers of the failed cable and the spare used to replace it.
  - c) A listing of any and all portable equipment, cabling, racks, etc. that is not located on site, a reason for that, and a date as to when it is expected on site.
- k. Within 30 days of completion of Systems Designer testing and commissioning, Owner training, delivery of any missing equipment, and resolution of any and all punch items including software programming changes, the Systems Contractor must provide the following on five separate USB storage devices (three to the Owner, and two to the Systems Designer):
- i. Systems Documentation:
    - a) Table of contents
    - b) Written Guarantee and service policy
    - c) Copies of all shop drawings which have been updated to include any changes made during the installation process.
    - d) Single-line signal diagrams identifying all cable runs and patchbay points with the associated cable number
    - e) Complete Systems Contractor Testing report
    - f) Complete and updated conduit riser diagram to match installed conduit.
    - g) Final system settings for all settings adjusted during Systems Designer testing and commissioning
    - h) Updated network documentation as listed above
    - i) All updated and current system software files, source code, GUI designs, and any other software files for all of the AV Systems
    - j) All available manufacturers' operation and service literature for each major system and system component.
    - k) Systems operational procedures including power on sequences, power off sequences, recovery from power failure sequences, emergency procedures, and any other procedures needed to operate the systems properly in any and all states.
    - l) In addition to the above, provide to the Owner, two printed copies of items j) and k) above.
    - m) In addition to the above, provide to the Owner one laminated copy of each sheet of each Single-Line signal diagram for each venue as per item d) above.

### 1.6 QUALITY ASSURANCE

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- A. All parts shall be provided complete per manufacturer's specifications and with all necessary accessories required to meet the intent of the design and provide fully functional systems, including but not limited to any mounting devices, software licenses, SFP modules, etc.
- B. All materials shall be new and shall meet or exceed all applicable requirements and standards of Underwriters Laboratories and the American Standards Association.
- C. Systems Contractor is responsible for obtaining and paying for all permits, licenses and inspections, for meeting any requirements of permits and licenses, and for remediating any work called out as incorrect or not meeting code or other standards during inspections.
- D. Systems Contractor must act in accordance with applicable federal, state, local, and union labor regulations.
- E. Installation shall conform to latest federal, state and local electrical and safety codes or those of other authorities having jurisdiction (AHJ). Where conflicts exist, the most stringent code or regulation shall apply.
- F. If additional work by the Systems Designer is required as a direct result of deviations from approved drawings and specifications during construction, the systems contractor will be liable for those additional costs that the Owner may incur.
- G. Government Standards: The Systems Contractor is to comply with all government regulations, standards, and laws that apply to the installation and use of the AV equipment and/or other scope of work specified in this section. The following agencies have laws and rules that apply:
  - 1. Federal Communications Commission (FCC): FCC rules are located in Title 47 of the Code of Federal Regulations. The following is a partial list of the FCC regulations that apply to equipment specified in this section of work:
    - a. Part 15: Radio frequency devices
    - b. Part 22: Public mobile services.
    - c. Part 24: Personal communications services.
    - d. Part 25: Satellite communications.
    - e. Part 27: Wireless communications service.
    - f. Part 51: Interconnection.
    - g. Part 74: Experimental radio, special broadcast, and other program distribution services.
    - h. Part 95: Personal radio services.
  - 2. Occupational Safety and Health Administration (OSHA) – Follow all applicable standards for health and safety particularly sound pressure level exposure.
  - 3. ANSI Standards: American National Standards Institute (ANSI) standards cover safety, fabrication, assembly, installation, rigging, equipment handling, and testing.
  - 4. Contributing Organizations – The Organizations listed below have published standards used to establish the technical references to be followed under this scope of work.
    - a. Acoustical Society of America (ASA) (ASC S1)

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- b. Alliance for Telecommunications Industry (ATIS) (ASC T1)
  - c. American Society of Safety Engineers (ASSE) (ASC A1264)
  - d. Audio Engineering Society (AES) (ASC S4)
  - e. Electronics Industry Alliance (EIA) (CEMA)
  - f. Entertainment Services and Technology Association (ESTA) (ASC E1)
  - g. Institute of Electrical and Electronics Engineers (IEEE) (ASC C136) (802.1)
  - h. International Cable Engineers Association (ICEA) Formerly IPCEA
  - i. International Standards Organization (ISO)
  - j. National Electrical Manufacturer's Association (NEMA) (ASC C119)
  - k. National Fire Protection Associations (NFPA)
  - l. National Safety Council (NSC) (ASC A10)
  - m. Photographic and Imaging Manufacturer's Association (PIMA)
  - n. Society of Motion Picture and Television Engineers (SMPTE)
  - o. Telecommunications Industry Association (TIA)
  - p. Underwriters Laboratories (UL) (ASC C101) (CE)
  - q. NTSC
  - r. BICSI
  - s. National Association of Broadcasters (NAB) – System technical standards for video and RF compliance are listed in the most recent edition of the NAB Handbook
5. Safety Standards – Contractor will adhere to the following Safety Standards for all work identified in Division 27 41 00 and as part of the General and Supplementary sections of the Division-1 Specifications.
- a. ANSI A14.2-2000: Safety Requirements for Portable Metal Ladders
  - b. ANSI A14.7-2000: Safety Requirements for Mobile Ladder Stands and Mobile Work Platforms.
  - c. ANSI C2-2002: National Electrical Safety Code
  - d. ANSI Z136.1-2000: Safe Use of Lasers and laser systems
  - e. ANSI Z136.2-1997: Safe Use of Optical Fiber
  - f. ANSI Z359.1-1992 (R1999): Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.
  - g. ANSI/PIMA IT7.101-1999: Recommended Practice for the Safe Handling and Operating of Audiovisual Equipment.
  - h. IEEE 142-1991: Grounding of Industrial and Commercial Power Systems
  - i. UL 514A: Scrub Water exclusion from AV Floor Boxes
  - j. UL 1419-1995: Standard for Safety for Professional Video and Audio Equipment
  - k. in accordance with the National Electrical Code, ANSI/NFPA 70
  - l. UL 1492-1994: Standard for Safety for Audio-Video Products and Accessories
  - m. UL 1651-1997: Standard for Safety for single and multiple Optical Fiber Cable
  - n. UL 1667-1996: Audiovisual Systems Safety Standard for Tall AV Institutional Carts for use with Audio, Video, etc.
  - o. ANSI E1.1-1999: Construction and Use of Wire Rope Ladders to prevent most injuries

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- p. ANSI A10.8-2001: Safety Requirements for Scaffolding
- q. ANSI A10.42-2000: Rigging Qualifications and Responsibilities
- 6. Applicable Performance Standards – Execute all Division work in accordance with the following standards:
  - a. ANSI S4.48-1992 (R1998): Recommended Practice for the Application of Connectors, Part 1, XLR-Type polarity, and gender
  - b. ANSI S4.55-1997: Recommended Practice for conservation of the Polarity of Audio Signals
  - c. ANSI S4.56-1997: Recommended Practice for the subjective evaluation of Loudspeakers
  - d. ANSI S12.2-1995 (R1999): Criteria for Evaluating Room Noise
  - e. ANSI T1.217-1991 (R1998): Integrated Services Digital Network (ISDN)
  - f. Management –Primary Rate Physical Layer
  - g. ANSI T1.522-2000: Quality of Service (QOS) for Business Multimedia Conferencing. Specifies classes of Service for conferencing on IP Networks
  - h. AES15: ANSI S4.49: AES Recommended practice for Sound Reinforcement Systems –Communications Interface PA-422.
  - i. AES-R1-1997 AES project report for professional audio: Specifications for audio on high capacity media
  - j. AES14-1992 (r1998) AES standard for professional audio equipment -- Application of connectors, part 1, XLR-type polarity and gender
  - k. AES24-1-1999, (Revision of AES24-1-1995) AES standard for sound system control - Application protocol for controlling and monitoring audio devices via digital data networks
  - l. AES26-2001 (Revision of AES26-1995) AES recommended practice for professional audio -- Conservation of the polarity of audio signals
  - m. ANSI/TIA/EIA 606-1993: Standard for the Telecommunications Infrastructure of Commercial Buildings
  - n. ANSI/TIA/EIA 607-1994: Commercial Building Grounding and Bonding Requirements for Telecommunications
  - o. IEEE 149-1979 (R1990): Test Procedure for Antennas
  - p. IEEE 1100-1999: Powering and Grounding Sensitive Electronic Equipment
  - q. NEMA 250-2001: Enclosures for Electrical Equipment
  - r. SMPTE 292M: SMPTE 292M defines the base 1.485Gbps HD-SDI. Note: This standard can handle all HD formats except 1920\*1080 @ 50P and 60P.
  - s. SMPTE 372M: Uncompressed Dual-Link HD-SDI for 50P & 60P
  - t. SMPTE 424M: 2.97 Gbps HD-SDI for 50P & 60P
  - u. TIA/EIA-568-B: Digital audio over Cat5 audio cable
  - v. UL 1047-1999: Isolated Power Systems Equipment
  - w. UL 1581-1998: Reference Standard for Electrical Wires, Cables, and Flexible Cords
  - x. UL 1682-1998: Standard for Safety for Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type up to 800 Amperes and up to 600 volts ac or dc.

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- y. UL 467-1998: Grounding and Bonding Equipment
- z. UL 813-1999: Commercial Audio Equipment and accessories for use in commercial enterprises
- aa. ANSI/TIA/EIA-568-A: Commercial Building Telecommunications Cabling
- bb. ANSI/TIA/EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces
- cc. ANSI/TIA/EIA-607: Commercial Building Grounding and Bonding Requirements for Telecommunications
- dd. ANSI/TIA/EIA TSB-72: Centralized Optical Fiber Cabling Guidelines
- ee. ANSI/TIA/EIA-526-14A: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
- ff. ANSI/TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single mode Fiber Cable Plant
- gg. ANSI/IEEE C-2 National Electrical Safety Code how to install cabling in accordance with the most recent edition of BICSI® publications:
  - i. BICSI Telecommunications Distribution Methods Manual
  - ii. BICSI Cabling Installation Manual

### 1.7 WARRANTY AND WARRANTY SERVICE REQUIREMENTS

- A. All systems devices shall be guaranteed free of defects in materials and workmanship for a minimum period of one year and for a maximum period not to exceed the length of the manufacturer's warranty. All workmanship will be guaranteed free of defects for a period of one year. These warranty times begin on the date the Systems Designer accepts the systems as complete.
- B. The Systems Contractor will provide the Owner with an emergency service request phone number that will be answered twenty-four hours a day, 365 days a year. See response times below.
- C. In a non-emergency situation, defective devices shall be repaired or replaced within forty-eight hours following the report of such defects by the owner, and telephone calls must be responded to within one business day.
- D. Many of the systems installed as part of this scope of work are critical to the operation of the facility. As such it is mandatory that the following replacement and response times be strictly adhered to in a Qualifying Emergency Event. Qualifying emergency events are defined as events that may cause severe hardship or cause the systems to be inoperable or unusable for a scheduled class or event. In an emergency event:
  - 1. The Systems Contractor must respond to telephone calls within one hour. The personnel answering this call must be fully qualified to troubleshoot problems and propose solutions.
  - 2. If the situation requires a site visit, The Systems Contractor must have personnel on-site within eight hours of the phone call determining the need.
  - 3. If corrective measures on-site are required, they will be performed within twelve hours of the determination of a need for a site visit.

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- E. If, during the warranty period, any component is out of service for more than seven days due to unavailability of parts or service, systems contractor shall supply and install an identical new component. If an identical component is not available, systems contractor will substitute equivalent equipment, with the approval of the Owner.
- F. Repeated device failures, defined as the failure of a device or a single type of device three or more times over three contiguous months, will be considered as a failure of a manufactured system and all items of this type shall be replaced at no charge to the Owner.
- G. During the course of the warranty period, the systems contractor shall provide a minimum of three (3) service visits to the site for inspection and adjustment of equipment. Systems contractor shall submit proposed schedule for these visits and shall notify Owner and Systems Designer in writing at least one month in advance of each visit.
- H. During the warranty period, the Systems Contractor will supply the Owner with any published updates of manufacturer provided operating software and firmware for any and all software-controlled equipment that are issued to correct “bugs”. During the warranty period, the Owner will rely on the Systems Contractor to determine when to update the software and/or firmware, unless it is needed to correct a situation that renders the systems unstable, non-functional, or otherwise affects operations.
- I. At least one representative of the Systems Contractor, well versed in the installation and the operation of the systems, shall be on site in support of the Owner for the first significant public event in each venue (as determined by the Owner) where the system will be used. The Contractor representative(s) for this event shall also be competent in show operations.
- J. The systems contractor is to coordinate ongoing remote access to AV Systems Networks for support and troubleshooting. Owner to provide the access at their discretion.

### 1.8 PERMIT

- A. Obtain all permits necessary for the execution of any work pertaining to the installation, and conform in all trades with all applicable codes/regulations. Obtain all permits necessary for operation of any equipment by the Owner, including but not limited to laser projectors and radio systems.

### 1.9 INSURANCE

- A. All equipment and materials shall be fully insured, by the Systems Contractor, against loss or damage up until acceptance of the system by the Owner or until Owner relieves the Contractor in writing of this responsibility, whichever is earlier, regardless of the location of the equipment. All equipment is deemed to be under the control of the Systems Contractor until acceptance of the system by the Owner or until Owner relieves the Contractor in writing of this responsibility, whichever is earlier.

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### **1.10 EXISTING CONDITIONS**

- A. For projects including renovation work on existing facilities, visit the site prior to making a bid. No subsequent allowance will be made due to failure to thus observe and verify conditions which may affect the work. Report to the Architect and Systems Designer any discrepancies among this specification and existing conditions and similarly report obvious omissions.



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### 1.11 DIVISION OF RESPONSIBILITY TABLE

ITEMS PROVIDED AND INSTALLED	Electrical Contractor Provide	Electrical Contractor Install	Systems Contractor Provide	Systems Contractor Install
Main Power Panel Boards and Circuit Breakers	X	X		
Audio Video Isolated Ground Power (AVIGP) Transformers	X	X		
AVIGP Isolated Ground Conduit, and Conductors	X	X <sup>1</sup>		
AVIGP panel boards and circuit breakers	X	X		
AVIGP standard load centers and circuit breakers	X	X		
AVIGP Company Switches	X	X		
Audio Video Systems Equipment Racks, Termination Panels, and Audio Video Devices				
- Racks			X	X
- Termination Panels			X	X
- Termination Panel Back Boxes		X <sup>1</sup>	X	
- Termination Panel Floor Boxes		X <sup>1</sup>	X	
- All conduit, J-Boxes, Cable Sleeves, Ladder Tray, Mounting Hardware for Audio Video Systems Signal and Control Cabling	X	X <sup>1</sup>		
- Conduit Isolation Bushings at Racks	X	X		
- Audio Video Cabling			X	X
- Audio Video Cabling Termination			X	X
AVIGP Branch Circuits for Systems Equipment Racks going to:				
- In Wall Outlets	X	X		
- Ladder Tray Mounted Outlets	X	X		
- Ceiling Mounted Outlets	X	X		
- In Rack Power Distribution Devices		X <sup>2</sup>	X <sup>2</sup>	
Audio Video Systems Conduit Riser Diagram Submittal	X <sup>3</sup>			

Note 1: Installation criteria and coordination provided by Systems Contractor

Note 2: Rack Power Raceways are provided and installed by the Systems Contractor. The branch circuits are installed and terminated to the raceway by the Electrical Contractor. Care must be taken to maintain the isolation of the rack and its contents from building ground.

Note 3: The Conduit Riser Diagram is developed by the Electrical Contractor with criteria provided by the Systems Contractor. This is a critical submittal. Any conduit installed prior to approval is at risk and any replacement, remediation, or repairs required to meet specifications will be performed at systems Contractor's cost.

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### PART 2 - EQUIPMENT

#### 2.1 GENERAL EQUIPMENT

- A. All equipment specified by manufacturer and model number is done so for the purposes of establishing a standard of quality, performance, construction and function.
- B. All materials and equipment shall be of the latest design or model offered for sale by the manufacturer.
- C. All equipment will be new and be supplied with a full manufacturer's warranty.
- D. The equipment provided shall operate at the required AC line voltage and frequency for the available power supply.
- E. Contractor shall provide quantities as indicated in the specifications, specification appendices, and in the large format AV drawings. Where quantities appear to differ, the Contractor must request clarification from the Systems Designer.
- F. Audio & Video Wire and Cable
  - 1. All wire numbers listed in the drawings are Windy City unless otherwise noted.
  - 2. THHN wire is not an allowable substitute for twisted pair stranded loudspeaker wiring.
  - 3. Approved manufacturers: Belden, Canare, Gepco, West Penn, Whirlwind, Windy City.
  - 4. Where conflict exists with any codes or ordinances, such codes and ordinances shall take precedence.
  - 5. Where conflict exists with electrical specifications, the higher standard or more stringent requirement shall apply, at the discretion of the Systems Designer or AHJ.
- G. AV System Plates and Panels:
  - 1. Rack Mount Panels shall be constructed of 11 gauge steel or 1/8" Aluminum, minimum thickness. Finish shall be black or match adjacent equipment. The panels shall be 19" wide with standard EIA mounting hole spacing. Height as specified.
  - 2. Back Box Enclosures shall be code grade steel. Black, Galvanized, or Stainless Steel (for NEMA4 or 4X). Size as specified.
  - 3. Plug Box and Termination Panels shall be constructed of 11 gauge steel or 1/8" Aluminum, minimum thickness. Finish shall be black (unless instructed otherwise by Architect – see 1.5.C.3.e.iv. Size as specified. Approved Manufacturers: Steel City, Raco, Hoffman, Whirlwind, Pro Co, Wireworks
  - 4. Engraved lettering is white paint filled engraving on black anodized panel unless it is a custom color panel in which case, confirm lettering color with Systems Designer. Lettering is to be upper case, 14 point, Arial. Where spacing is critical, reduction to 12 point is allowed.

#### 2.2 MAJOR EQUIPMENT

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- A. Equipment provided shall be that specified herein or approved substitute (see Paragraph 1.5.C.3.b).
- B. Detailed performance specifications shall be those published by the manufacturer effective on the date of this document for all equipment listed.
- C. See Major Equipment List in Appendix B.

### 2.3 DETAIL DRAWINGS

- A. The drawings herein may detail custom built equipment and system details.
- B. Furnish all materials and labor to provide complete and finished work even though not specifically shown on the drawings.
- C. Detail drawings are located in large format AV drawings.

## PART 3 - EXECUTION

### 3.1 AUDIO VIDEO SYSTEM REQUIREMENTS

- A. Requirements herein refer to materials and work which are related to or part of the Systems. Where conflict exists with other specifications concerning such work or materials, this specification takes precedence unless otherwise approved in writing by the Architect.

### 3.2 AUDIO VIDEO SYSTEMS INSTALLATION

- A. All equipment must be installed in such a manner and in locations that allow for access for maintenance and repair. Equipment racks must be placed in the rack rooms to permit full access for operation and service.
- B. Furnish and install all necessary brackets, braces and supports. All mounting hardware shall be included. AV devices may require additional support and/or backing in stud walls or ceilings to support the weight of the device. Contractor must furnish and install all support and backing as necessary for proper and safe installation.
- C. All bolts and fasteners must be Grade 5 or better.
- D. All bolted attachments to have lock washers or other self-locking fasteners.
- E. Provide all required mounting brackets and framing, hardware and components, safety systems and rigging systems using the following minimum design factors (given as ratio of working load limit (WWL) : rated breaking load):
  - 1. 5:1 – Minimum design factor for all mounting components regardless of mounting condition.
  - 2. 5:1-8:1 – Minimum design factor for manufacturer provided mounts & assemblies where engineered stamped documentation and destructive testing data is provided by manufacturer.
  - 3. 10:1 – For all hardware and connecting assemblies between manufacturer rated assemblies when equipment is hung above the general public. This includes but is not limited to wire rope, bolts, shackles, turnbuckles, beam

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- clamps, supplemental steel provided by Systems contractor and other connecting hardware.
4. Design factor calculations to be provided with all equipment mounting details.
  5. Systems Contractor shall coordinate required additional blocking, supplemental steel or channel strut supports with Main Contractor & specific trade contractors.
  6. All mounting systems not provided as a complete package from a single manufacturer must be engineered, approved, and have drawings stamped by a professional rigging engineer or licensed structural engineer, as approved by the Main Contractor. The engineer shall verify that the design meets or exceeds design criteria for this particular use case. Each mounting system solution must be separately engineered, verified, and stamped.
- F. All supporting structures and enclosures supplied by the systems contractor not having a standard factory paint finish shall be painted. Paint specifications will be supplied by the Architect or indicated herein.
- G. Provide custom color or finish for any equipment, panels, or materials supplied which are in public view. This does not exclude equipment or materials where standard colors and finishes may be specified herein. Request information on color and finish from the Architect.
- H. Finish of blank panels and custom assembly panels shall match adjacent equipment panels. All color choices should be clearly indicated on panel drawing submittals, and on the panel schedule submittals
- I. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched or screened. Markings for these items are detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Systems Designer prior to marking.
- J. Protect equipment and related wiring where construction conditions may cause damage or environmental conditions exceed manufacturer's specifications.

### 3.3 CONDUIT

- A. Review and coordinate Systems conduit installation with the electrical contractor to ensure proper operation of the Systems. Provide input to the electrical contractor so that they may complete the AV conduit riser submittal.
- B. All wiring shall be in conduit unless authorized by the Architect, approved by the Systems Designer, and permitted by code. Exceptions are short runs at rack terminations where there is no means of connecting conduit to the equipment.
- C. Where installed exposed, conduits shall be parallel with or at right angles to walls or ceilings and shall be supported from walls or ceilings by means of approved galvanized iron clamps or hangers. Conduit connections to equipment racks shall be insulated in order to maintain ground isolation.
- D. Minimum size conduit shall be 3/4 inch. All conduit shall be sized for a maximum 40% fill, unless applicable codes require a lower maximum fill

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- E. No conduit run between pull boxes/termination boxes may exceed 100 feet in length, and no single turn may exceed 90 degrees.
- F. No conduit run shall have more than 180 degrees of combined turns between pull boxes.
- G. Conduit containing STP, UTP, and COAX wire types must be installed so that the final length of the cable runs does not exceed maximum cable lengths as stated in 3.7.N and 3.7.O.
- H. Systems wiring is divided into wiring groups according to their nominal voltage levels. Cabling may be combined in a single conduit, and/or junction box(es) as long as all cables are of the same wiring group. Refer to the Major AV Drawings General Information sheet for information on conduit separations by cable type. Refer to major AV drawings Terminations Schedule for cabling, grouping, and destination details, by termination):
- I. All conduits, within 6” of termination box, junction box, gutter or rack/ ladder tray, must be labeled with conduit group and destination of the opposite end of that conduit, as follows: “AV -<Group>- <opposite end>”. For example “AV – III – STGA-01”. Permanent marker on the conduit where it can be seen from the ground or nearest access point is acceptable.
- J. Each termination does not require individual home run conduits. Conduits of like groups may be combined at junction boxes so that a smaller number of larger conduit sizes may be used instead of a larger quantity of smaller individual conduits.
- K. Electrical contractor must have written authorization from the Systems Designer for any conduit installation which does not conform to these requirements. The conduit separations above are based on the use of EMT conduit for all AV and other signals. Separations where Rigid conduit is utilized for AV systems and/or other adjacent systems may be halved. Separations where PVC conduit is utilized for AV systems and/or other adjacent systems must be doubled. Flex conduit is not allowed without written authorization for each separate instance. The Contractor must request information on separation adjustments for each instance where a different type of conduit than what is listed above is used.

### 3.4 ELECTRICAL POWER

- A. Review and coordinate electrical power system installation including grounding with the electrical contractor to ensure proper operation of the Systems.
- B. Verify that all AC power circuits designated for Systems equipment are wired with correct polarity and isolated ground. Report in writing any discrepancies found to the Architect for corrective action.
- C. Provide distribution of electrical power within the equipment racks with a minimum of one spare AC receptacle for each four in use per branch circuit.
- D. All AV systems electrical power distribution and outlets are provided and installed per the Division of Responsibility Table (see 1.11)
- E. DIV. 26 contractor is to provide engraved cover plates for all power receptacles used in the Audio Video Systems, both isolated ground, and standard circuits that

## SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS

are shown as provided by Electrical Contractor. The engraving must call out the panel number and the circuit number(s) for the circuit(s) connected to that particular receptacle. Refer to

### 3.5 STEEL SUPPORTS

- A. Fabricate and install any supports so that the installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joists, or structural steel, nor welding to structural steel, will be permitted except as authorized, in writing, by the Architect.

### 3.6 BOXES

- A. With the exception of portable equipment, all boxes, conduits, cabinets, equipment and related wiring shall be held in place and the mounting shall be plumb and square.
- B. All boxes shall be securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.
- C. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes are not permitted except as authorized, in writing, by the Systems Designer.
- D. Clean all box interiors before installing plates, panels or covers.
- E. Using permanent marker on the box or on wire tags, indicate the lengths of installed cable for all COAX and Category wiring inside the box.
- F. Using permanent marker, inside the box, indicate the box name, for example "STGA".

### 3.7 WIRING METHODS AND PRACTICES

- A. Provide installation of all Systems wire and cable, ensuring proper:
  - 1. Pulling Tensions
  - 2. Quantities
  - 3. Types
  - 4. Lengths
  - 5. Routing
  - 6. Wire Group Separation
  - 7. Identification
- B. The interconnection of equipment in a rack shall use the same wire by type as specified for runs external to racks unless otherwise indicated on AV single line drawings. All wiring within racks shall be direct between devices without splices.
- C. Interconnection wire between amplifiers and loudspeaker transition panels will be type SP12 (refer to wire types on AV001)
- D. Connector polarity shall be maintained except for terminations at equipment manufactured to other standards. In the event that manufactured equipment can

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be ordered with, or internally set to, various standards, the equipment shall be configured as follows:

1. Polarity for XLR style connector shall be: pin 2-high, pin 3-low, and pin 1-shield.
  2. Polarity for TRS style connector shall be: tip-high, ring-low, and sleeve-shield.
- E. Spare wire runs of each group and type shall be pulled to each termination location. The number of spares shall be ten percent of those in actual use or one, whichever is greater.
- F. Splicing of cables is not permitted between terminations of specified equipment.
- G. Do not pull wire or cable through any box fitting or enclosure where change of raceway alignment or direction occurs without written approval from the Systems Designer; do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, and rollers to protect cables from excess tension, abrasion or damaging bending during installation.
- H. Provide wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturer's recommendations.
- I. All wires shall be permanently identified at each wire end by marking with self-laminating adhesive labels fully covered with clear heat shrink tubing, and a chart kept of each wire's function. This applies to wire within a rack assembly as well as wire running in conduit.
- J. Wire ends should be wrapped with heat shrink tubing. Each shield or drain wire should be covered with heat shrink to avoid unintentional connections.
- K. Use Wago or Entrelec DIN rail mounted terminal blocks for all terminal block wiring connections. Do not exceed one wire per terminal connection point. Do not cut strands from conductors to fit lugs or terminals. Spare terminal blocks, equivalent to 10% of those in actual use, shall be provided.
- L. Form, in an orderly manner, all conductors in enclosures and boxes, wire ways and wiring troughs, providing circuit and conductor identification. Tie using wraps of appropriate size and type. Limit spacing between ties to six (6) inches and provide circuit and conductor identification at least once in each enclosure.
- M. Provide service loops, minimum 6', at each termination so that plates, panels, patch bays, and equipment can be dismantled and placed on an adjacent horizontal work surface allowing for safe service and inspection without disconnection.
- N. Maximum installed length of Category cables is 200'
- O. Maximum installed length of Coaxial cable for HD-SDI, 3G-SDI, 6G-SDI, and 12G-SDI is 200'

### 3.8 GROUNDING

- A. Audio system wiring shall conform to the following procedures:
1. Audio equipment AC ground pins shall connect to AC isolated ground.
  2. Audio equipment chassis shall connect to AC isolated ground or rack frames.

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3. Audio rack frames shall connect to AC isolated ground bus in panelboard by means of #2 gauge (minimum) conductor.
  4. Audio shields between AC powered pieces of equipment, where signal shield is tied to chassis ground, shall be directly connected to ground at the initiating end only. Capacitively terminate the receiving end with a 0.1 $\mu$ F capacitor.
  5. Audio signal paths between AC powered pieces of equipment shall be connected using balanced lines and/or transformer isolation as required. No unbalanced signal paths may be connected to the patch bay.
  6. Isolate all Systems wiring from racks, back boxes and conduit.
  7. Isolate all Systems racks from conduit and other conductive surfaces. Use insulated bushings for conduit connections and a dielectric plinth between racks and conductive flooring materials.
  8. AC isolated ground system shall be isolated from all other facility grounds except at the single point of connection at the AV isolation Transformer.
  9. All metallic conduit, boxes and enclosures shall be grounded in accordance with the current National Electrical Code.
- B. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provision of grounding conductors separate from the AC ground.

### 3.9 EQUIPMENT RACKS

- A. The equipment racks shall be considered as custom assemblies and shall be assembled, wired and tested in the systems contractor's shop. Assembly of racks on-site will not be permitted, without written approval from the Systems Designer (except for system wiring which must terminate directly to the patch bays via soldering, punch-down or other non-connectorized termination process).
- B. Placement of equipment in equipment racks, as shown in the drawings, is for maximum operator convenience. Verify any changes in placement of the equipment with the Systems Designer before assembly.
- C. Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks.
- D. All wire, cable, terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system. Labeling on manufactured equipment shall be by engraved plastic laminate or by thermal printer on adhesive tape, with white lettering on black background or dark background that is similar to panel finish.
- E. Provide stiffeners to custom panels to prevent panel deformation during normal plugging or switching operations.
- F. All wires and cables used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted engineering practice.
- G. Harnessed cables shall be combed straight, wrapped every six (6) to ten (10) inches, and attached to the structure as necessary. Each cable that breaks out from a harness for termination shall be provided with an ample service loop so that panels, patch bays, and equipment can be dismantled and placed on an adjacent



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horizontal work surface allowing for safe service and inspection without disconnecting.

- H. Harnessed cables shall be formed in either a vertical or a horizontal relationship to equipment, controls, components or terminations.
- I. All system components and related wiring shall be located with due regard for the minimization of induced electro-magnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience for the operator.
- J. All rack mounted equipment, with front panel controls, shall be provided with security covers to avoid tampering with preset levels. If specific security covers are not included in the equipment list, the systems contractor will provide the manufacturer's security cover for each specified device or a suitable alternate.
- K. Every device shall be installed with regard for proper polarity. Absolute polarity shall be maintained through the entire Systems signal chain.
- L. Any permanently mounted electronic device must be balanced. Systems contractor will provide balancing transformers for unbalanced equipment connections where necessary.

### 3.10 SYSTEMS CONTRACTOR TESTS

- A. The Systems Contractor must test all the systems and systems components, as described below, prior to Systems Designer Testing and Commissioning. At the conclusion of the Systems Contractor Testing, the Systems Contractor will submit a Written Statement of Completion and test reports indicating test results, including failed tests and re-tests to clear the failures.
- B. Test each point to point wire segment individually, and test any linkage of multiple point to point cables that form an end to end link.
- C. Systems contractor must document all test requirements and results for submission (see 3.12 below).
- D. Confirm that each individual wire and cable run (whether in a rack or in conduit) is identified with a unique number. These numbers are affixed to both ends of each cable and are clearly visible. Provide a complete list of these numbers along with the termination location of each end of the wire run.
- E. Verify all circuits and extensions for correct connection, continuity and polarity. Absolute polarity must be maintained between all points in the system.
- F. Identify installed length of all copper and fiber cabling.
- G. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. A wide band oscilloscope shall be used to verify this condition.
- H. Confirm that the system is free of audible clicks, pops, and other noises when any operating control is activated, with or without input signal.
- I. For MIC, LINE, ACOM, SP48(signal pair), CTRL, AND MIDI cable types, confirm:
  - 1. Proper circuits appearing at each termination location
  - 2. Proper circuits appearing at each jack bay position

## SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS

3. Continuity of all conductors
  4. Proper polarity is maintained
  5. Absence of shorts between conductors within each circuit
  6. Absence of shorts between circuit conductors and conduit
  7. Perform a sweep test to 0.5MHz
- J. For ANTS, and ANTL cabling confirm:
1. Verify that TDR impedance is 50 +/-3 ohms
  2. Frequency sweep test from 5MHz to 1000MHz.
- K. For VIDSDI cabling confirm:
1. Verify that the installed cable meets, at a minimum, the requirements set forth in SMPTE ST 2081 for 6G-SDI single-link and 12G-SDI dual-link.
  2. Verify that TDR impedance is 75 +/-3 ohms
  3. Frequency sweep test from 5MHz to 6GHz.
- L. For STP and UTP cabling:
1. Use Category 6A cable pair tester to verify compliance with TIA/EIA standards referenced above (including all current addendums)
  2. Test each cable using the permanent link procedure for opens, shorts, reversals, cross twists and mis-wiring. Check NEXT, ELFEXT, Delay Skew, Return Loss, and Alien Crosstalk.
  3. Report all mis-wiring or failures found and report retests as needed.
  4. If any conductors report open or short, replace the entire wire and re-test.
- M. For OS2 and OM4 Fiber cabling:
1. Using appropriate test devices and proper factory terminated jumpers, measure all fiber optic line attenuations, end to end, as required by TIA/EIA-526-14A.
  2. Optical budget may not exceed the cable performance by length plus splice and connector losses (0.03 dB for each fusion splice, 0.3dB for each mechanical splice, and/or 0.4 dB for each connector).
  3. Overall attenuation must meet TIA/EIA-568B standards. Perform attenuation tests at 850nm and 1300nm as appropriate.
- N. Confirm that loudspeakers and mountings are free of buzzes and rattles when the loudspeaker is swept with sine wave tones over its rated bandwidth at one-half (1/2) its maximum rated power.
- O. For all permanently mounted loudspeaker terminations, provide impedance measurement of each pair of loudspeaker lines with all loudspeakers connected and all amplifiers disconnected. These measurements shall be documented as editable tabular data listing impedance for each 1/3 octave band from 20 Hz to 20 kHz and shall be accurate to the nearest tenth of an Ohm.
- P. For all intercom terminations, confirm proper operation by initiating and receiving audio communication and call light. For single lines connected to a matrix, test each line with each channel in the matrix. Verify that all channels are quiet and without spurious noise.
- Q. For all electronic devices mounted in racks and connected to patch bays, confirm:
1. Every input and output is balanced.
  2. Proper polarity is maintained throughout the entire audio path.

## SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS

3. Tip connection of each TRS jack is connected to the positive terminal of each corresponding input or output.
- R. For all devices requiring IP addressing:
1. IP addressing scheme must make use of subnets such that all devices, regardless on which network (Audio, Video, Control, or House) they reside, have a unique IP address to eliminate the possibility of duplicate IP addresses if networks are inadvertently cross-patched.
  2. All devices must have static IP addresses.
  3. Create a spreadsheet of all devices and their IP addresses, Subnet Masks, MAC Addresses, and other pertinent IP configuration information.
  4. Coordinate all IP addressing schemes with the Owner.
- S. If the Audio, Video, and Control network switches are dedicated to these systems and the systems do not rely on Owner furnished and configured network switches:
1. Configure network switches to operate properly and provide the proper network configurations to support the network devices and protocols used by those devices.
  2. Configure, as needed, VLANs, IGMP, QOS, and other protocols requiring configuration to provide a fully functioning and robust network system.
  3. With all networks configured and operating, and all network devices configured and operating, confirm that the networks are behaving as expected and as required.
- T. Electrical Contractor, coordinating with the Systems Contractor must confirm that there are no shorts between the Neutral and Isolated Ground conductors, and between the isolated ground conductor and building ground for each AV Technical Power circuit. Electrical Contractor, coordinating with the Systems Contractor must confirm there are no Bootleg Grounds or Neutral-Ground Reversals on each AV Technical Power circuit.
- U. The systems contractor is responsible for the programming and configuration of all DSP systems and control systems necessary as specified in this project specification and AV large format drawings.
1. Programming and configuration must be complete and ready prior to System Designer's arrival for verification of functionality and acceptance testing.
  2. Programming for the DSP systems must contain control pages to support normal operations, and to support Systems Designer Testing and Commissioning operations, as described in this specification and the large format AV drawings.
  3. Programming for the Control Systems must include all master controller code and touch panel code and graphics, working together to provide the function as described in this specification and the large format AV drawings.
- V. Test all Audio, Video, and Control system controls, including but not limited to mixing consoles, switchers, routers, touch panels, paging stations, volume controls, and source selectors for proper operation.
- W. Test proper operation of any portable controls at each designated control location (Stage Manager's rack, for example).

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### 3.11 SYSTEMS CONTRACTOR INITIAL SETTINGS

- A. All initial adjustments must be documented and submitted as part of the Systems Contractor Test Reports (see 1.5.C.3.j.ii and 3.12).
- B. Make all adjustments and modifications so that the system is operational and fully functional including but not limited to:
  - 1. Update all device software and firmware to the latest manufacturer's recommended release that allows for proper operation with ALL OTHER DEVICES in the systems.
  - 2. Make all adjustments and modifications for system gain structure per recommendations of major component manufacturers.
  - 3. Properly configure all EDID and HDCP settings to allow for proper function of all video systems.
  - 4. Install all programming for digital mixing consoles, DSP, Control and any other software based devices in the systems, and verify that audio and video signal passes as designed through these systems. Verify that control systems function as specified. Systems contractor to provide initial DSP and control system programming prior to Systems Designer testing, one full set of programming changes and adjustments, prior to handover to the Owner, and one additional set of changes and adjustments during the initial warranty period, as part of the base scope of work.
  - 5. Properly balance all 70 Volt loudspeaker zones to be consistent from zone to zone using amplifier settings and loudspeaker taps to adjust for differing loudspeakers or installation height. All 70 Volt loudspeakers within a given zone must not have a broadband SPL variation of greater than +/- 2dB from center of speaker to center of speaker.
  - 6. Properly adjust delay and equalization for all loudspeaker systems using SIM, SMAART or other similar dual FFT type measurement devices. All testing and adjustment shall be in accordance with all manufacturer recommendations and industry standard practice. Contact the Systems Designer for further system delay and equalization requirements.
  - 7. Capture traces showing magnitude and phase response for each loudspeaker or loudspeaker cluster before and after equalization and delay adjustments.
  - 8. Capture traces showing magnitude and phase response for the systems operating as a whole from 3 locations in each major seating area. One of these areas should be the House Mix Position, if applicable.
  - 9. Equalization and timing of the loudspeaker systems shall be further adjusted as required by the Systems Designer and Owner during Systems Designer Testing and Commissioning.

### 3.12 SYSTEMS CONTRACTOR TESTING REPORTS

- A. Submit written report detailing the results of Initial Adjustments and Systems Contractor Tests. Report to include, at minimum, the following:
  - 1. Copies of all relevant drawings, charts, test instrument data, and photographs.
    - a. PDF copies of all available manufacturers' operation and service literature for each major system component.

## SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS

- b. Copy of all programming files including, but not limited to, Audio DSP programming and Graphic User Interface (GUI) files, Control system Touch Panel GUI files and control system control programming files including un-compiled source codes.
  - c. All other documentation and results of testing and initial settings as referenced in 3.10, and 3.11 above.
  - d. Written certification that the installation conforms to the requirements stated herein, is complete in all respects, and is ready for inspection, Acceptance Testing, and tuning.
2. Prepare and submit an Avixa standard Commissioning Checklist for each system in this specification.
  3. Prepare and submit a training syllabus for Owner training (see section 3.14).
- B. This report shall be completed and submitted to the Systems Designer for review a minimum of five (5) days prior to Systems Designer Testing and Commissioning.

### 3.13 SYSTEMS DESIGNER TESTING AND COMMISSIONING

- A. Systems Designer Testing and Commissioning shall be performed by the Systems Designer during a period designated by the Architect. Systems contractor shall furnish a minimum of three (3) technicians or one technician per Systems Designer commissioning team, for the acceptance testing period, and one or more engineers fully capable of programming DSP and Control systems, and making any other engineering adjustments to equipment in the systems. Contact Systems Designer for number of commissioning teams that will be deployed. For Bid purposes assume there will be two (2) commissioning teams.
- B. The minimum time required for Systems Designer Testing and Commissioning is two (2) working days, including three (3) blocks of four (4) hour dedicated quiet time. Coordinate this time period so that free access, work lighting, and electrical power are available on the site.
- C. Ensure that Systems areas are in a clean and orderly condition ready for acceptance testing.
- D. Provide test equipment (meeting the following minimum specifications) on site, at all times during Systems Designer Testing and Commissioning. Prior to testing, provide the Systems Designer with a listing of the specific equipment to be made available (#).
1. Oscilloscope: 10MHz Bandwidth, Sensitivity – 1mV/cm
  2. Digital Multi-meter: 1% Accuracy
  3. Function Generator: 1MHz Bandwidth, Distortion < 1%
  4. Real Time Analyzer: 1/3 Octave with microphone
  5. SMAART Analysis package with V.8 software and a minimum of two matching test microphones (Earthworks M30 or better)
  6. Pink Noise Source: 20 Hz – 20 kHz Bandwidth
  7. Test mic tone calibrator
  8. Impedance Sweep Meter: 20 Hz – 20 kHz Range, 1 Ohm – 50 kOhm
  9. Polarity Checker: Mic, line, or loudspeaker level
  10. Video Test Signal Generator(s): must provide all signals, resolutions, and output formats as needed to fully test the systems.

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# Systems Designers may choose to supply some of their own test equipment. Confirm specific requirements prior to commissioning

- E. Be prepared to verify the performance of any portion of the system by demonstration, listening tests and instrumented measurements.
- F. Be prepared to facilitate the visual inspection of system components and wiring, including removal of termination panels for inspection of wiring termination and wire management practices.
- G. Be prepared to demonstrate all software and control systems.
- H. Be prepared to go through the commissioning checklist and verify all items as complete.
- I. Make additional mechanical and electrical adjustments within the scope of the work and which are deemed necessary by the Systems Designer as a result of the Acceptance Tests. This may include focusing of loudspeaker systems, changes in system gain structures, grounding, filtering or interfaces.
- J. Systems contractor will bear any costs incurred for additional Systems Designer's time and expenses due to failure to have the system functioning in accordance with specification requirements at the times scheduled for Systems Designer Testing and Commissioning.

### 3.14 USER TRAINING

- A. Systems contractor will provide in-depth training in operation and regular maintenance of all systems and on all equipment included in the scope of work contained in this specification and the AV large format drawings.
- B. Training to include (but is not limited to):
  - 1. Required Manufacturer provided training.
  - 2. Detailed operation of mixing consoles, video switchers and routers, computer control systems and other essential system elements as relevant to their installation in this project.
  - 3. Maintenance and repair of system equipment, including replacement procedures for user-replaceable parts.
  - 4. Review of Operation and Maintenance Manual (See 3.15)
- C. Systems contractor will provide a minimum of six (6) training sessions of four hours each with times and dates to be approved by the Owner.
- D. The first session shall take place in the presence of the Systems Designer and shall occur directly after the completion of Systems Designer Testing and Commissioning. If the Systems Designer, Owner, and/or Architect judge any work to be deficient and/or not substantially complete at the time scheduled for training, the training will be postponed until the Systems Designer, Owner, and Architect judge the entire AV system conforms to this specification and the AV large format drawings.

## **SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS**

- E. Systems contractor will bear any costs incurred for additional Systems Designer's time and expenses due to failure to have the system functioning in accordance with specification requirements at the times scheduled for User Training.

### **3.15 SYSTEMS DOCUMENTATION**

- A. Systems Designer will review the Systems Documentation submittal (see 1.5.C.3.k) Upon approval of the documentation submittal, the systems contractor will prepare five electronic copies stored on five separate USB storage devices and submit four to the Owner and the fifth to the Systems Designer.

### **3.16 FINAL ACCEPTANCE**

- A. Final acceptance will be contingent upon issuance by the Systems Designer of a letter of acceptance stating that the work has been completed and is in accordance with the contract documents.

## **APPENDICES TO FOLLOW**

### **APPENDIX A – AUDIO NARRATIVE TULSA PERFORMING ARTS CENTER ARPA 2024 AUDIO NARRATIVE**

23 January 2024 – 100% Construction Documents

#### **1. INTRODUCTION**

This document is broken down into the following parts:

1. Introduction
2. Facility-Wide
3. Chapman
4. Williams

#### **2. FACILITY-WIDE**

##### **2.1 OVERVIEW**

The Chapman Theater will receive a new sound system and mixing console system to replace aging equipment. The Williams Theatre will similarly receive a new mixing console system. To achieve this goal, a new fiber optic based networked audio system will be distributed throughout the two theaters to allow for high channel count low latency audio to be transported easily throughout.

We note that there is not an isolated ground power system for AV equipment in the building. As much as possible new electrical work should be installed in anticipation of isolated system in the future.

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This includes running ground wires to each branch circuit, oversized by 2 AWG, and installing hospital grade isolated ground outlets.

### **2.2 AV EQUIPMENT RACKS**

New or repurposed equipment racks will be installed in the Chapman Booth, Chapman Instrument Storage, and Williams Booth. These racks will house Amplifiers, Networking equipment, DSP Digital Signal Processing hardware, and Audio input/output devices.

### **2.3 AV FIBER NETWORK**

A fiber optic network connects all of the mixing consoles and audio input/output racks throughout the facility. In addition an interface is provided to connect the fiber system to Dante and Milan networking equipment in appropriate areas. An auto routing network hub is provided to make connecting and disconnecting fiber loop network elements seamless.

Please note that fiber devices permanently mounted in equipment racks are intended to be connected with LC connectors to reduce cost.

## **3. CHAPMAN THEATRE**

### **3.1 PERFORMANCE AUDIO SYSTEM**

The loudspeaker systems are designed to fulfill the requirements of multiple styles of performance ranging from pop music, to musical theatre, to ballet, to the spoken word. Audio fidelity is paramount to all of these functions and the audio system is designed to provide full range 20hz to 18kHz at every seat with a maximum sustained output level of 105dB +/- 6dB.

- The main system consists of four speaker arrays:
  - i. Main Left and Right arrays that cover the orchestra and mezzanine levels of the theater. These arrays are rigged on a winch so that they can be raised up in the catwalks and out of sight when not in use.
    1. NOTE: If flying space does not allow the currently designed Main Left and Right Arrays speaker boxes an alternate design with more compact boxes is available.
  - ii. Main Center array that covers the orchestra and mezzanine levels of the theater. This array is permanently hung at center in front of the proscenium.
  - iii. Finally, a Subwoofer array that provides low frequency extension for the entire auditorium is suspended at center directly behind the Main Center array. It is also permanently hung.



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- A set of three delay speaker arrays extend coverage to the balcony.
  - i. Delay Left and Right
  - ii. Delay Center
- Fill speakers are positioned at points in the theatre where architecture makes it impossible for the main and delay loudspeakers to cover a seating area.
  - i. Left and Right fills for when the pit is seated.
  - ii. Stage Lip speakers at the edge of the stage when the pit is seated.
  - iii. Pit Rail speakers at the pit rail when the orchestra pit is in use.
  - iv. 1<sup>st</sup> Balcony Side Fill consists of two speakers mounted to the wall of the auditorium to cover the extreme side seats on the 1<sup>st</sup> balcony where the wrap around theater.
  - v. 1<sup>st</sup> Balcony Delay Side Fill consists of two speakers mounted under the 2<sup>nd</sup> balcony
  - vi. Orchestra delay speakers extend the fidelity of the main sound system under the balcony with seven delay speakers.

Note that the amplifiers used in the performance audio system are 120V 30A, which may require new or reconfigured electrical circuits.

### 3.2 SURROUND SPEAKER SYSTEM

The surround speaker systems is provided to compliment the main systems and offer immersive audio opportunities for live performance. Theatrical productions in particular will take advantage of this facility and it opens possibilities for enveloping the audience in any branch of the performing arts.

- The surround speaker consists of speakers on the rear and side walls of the theater at each level of seating.
  - i. Orchestra level
    - 1. Side Walls five speakers each side
    - 2. Rear Wall six speakers
    - 3. Balcony Rail 4 speakers
  - ii. 1<sup>st</sup> Balcony Level
    - 1. Side Walls three speakers each side
    - 2. Rear Wall six speakers
    - 3. Balcony Front four speakers
  - iii. 2<sup>nd</sup> Balcony Level
    - 1. Side Walls two speakers
    - 2. Rear Walls six speakers
- The intent is to use as much of the existing surround speaker wiring as possible. However, a discovery session about the existing wiring runs and cable gauge is necessary before this scope can be adequately settled. It is also intended that this system remain in place and useful

## **SECTION 27 41 00 – PERFORMANCE AUDIO SYSTEMS**

after any renovations to the theater so care must be taken to insure the speakers and mounting are removeable or can be protected during construction work.

Please note that this system is not intended to fulfill any cinema surround sound standards.

### **3.3 DIGITAL MIXING CONSOLE SYSTEM**

In order to accommodate a variety of production requirements a large front of console is provided to manage high channel counts with full processing on all channels and an extensive matrix function for addressing the various speaker systems throughout the facility. When this console is not needed, it can be rolled out of the hall and into storage.

A small console is installed in the booth that can handle any simple events, interfacing with guest mixing consoles, and other day to day tasks. If needed, it can also be moved into the FOH mix position.

Connections are also available on stage and either a house console, for instance the main console for the Williams, or a guest console can be patched into the network for monitor duties.

One audio input/output device is permanently placed in the booth to provide analog connections in the booth. Two high channel count i/o devices are mounted in portable rolling racks which can be deployed at A2, on stage or in the pit as needed.

Multicable and stage boxes are provided to efficiently move audio from microphones to the stage boxes.

## **4. WILLIAMS THEATRE**

### **4.1 DIGITAL AUDIO MIXING CONSOLE SYSTEM**

A digital mixing console system is provided for the Williams Theatre. This system is interchangeable with the Chapman system so that crew personnel familiar with either space can easily transfer those skills.

A main console is installed at the FOH mix position in the house. The console is portable and can be removed if required. Since the majority of the productions in this space are musicals, this console is equipped with specialized theatrical software to leverage the advantages of digital mixing in a musical environment. This software is also available for the Chapman main console and it could be upgraded at any time for a one time fee.

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An audio input and output device is provided in the Williams booth to handle all the outputs for productions in the space. A second i/o device provides inputs and outputs on stage. Additionally, a Dante network is leveraged for connection the existing wireless microphone receivers and other peripherals.

Fiber and Cat6A links are available to connect the Williams to the Chapman if ever required but it is anticipated that two spaces will normally be completely independent.

### APPENDIX B – MAJOR EQUIPMENT LIST

The following speaker equipment list is based on L-Acoustics Systems. The L-Acoustics Products shown are for REFERENCE ONLY. Please ONLY bid on L-Acoustics Quote Number 0006370SQ-2.

As an alternative, a d&b based system is also available for bidding which has been designed to the same specifications under d&b Sales Quote No.: SQ00044014.

Any questions about the equality of the two designs must be addressed immediately to the consultant.

NOTE: Confirm all colors with architect before ordering.

#### CHAPMAN SPEAKER SYSTEM

Qty	Manufacturer	Item	Description
<i>Main L/R</i>			
2	L-Acoustics	K3i-Bump	K3i Array Bumper
24	L-Acoustics	K3i	Line Array Speaker Bi-Amp Dual 12" Install
<i>Center Cluster</i>			
6	L-Acoustics	A15i Focus	Arraying Point Source Speaker 15"
1	L-Acoustics	A15i Wide	Arraying Point Source Speaker 15"
1	L-Acoustics	A15i-BUMP	A15i Bumper
<i>Subwoofer</i>			
1	L-Acoustics	KS28-BUMP	KS28 Array Bumper
4	L-Acoustics	KS28	Subwoofer Dual 18" Direct Radiating
<i>Delay Main L/R</i>			
2	L-Acoustics	A15i-BUMP	A15i Bumper
6	L-Acoustics	A15i Focus	Arraying Point Source Speaker 15"
<i>Delay Center Cluster</i>			
1	L-Acoustics	A15i-BUMP	A15i Bumper
3	L-Acoustics	A15i Focus	Arraying Point Source Speaker 15"
<i>Side Fill</i>			
2	L-Acoustics	X12	12" Wedge Coaxial Speaker
2	L-Acoustics	X-UTILT	U Bracket Wall Mount with Tilt
2	L-Acoustics	X-US1215	X12 Short U Bracket

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### *UnderMezz*

7	L-Acoustics	X8	Arraying Point Source Speaker
7	L-Acoustics	X-UL8i	X8 Long U-Bracket install version

### *Delays*

2	L-Acoustics	X15 HIQ	15" Wedge Coaxial Speaker
2	L-Acoustics	X-UTILT	U Bracket Wall Mount with Tilt
2	L-Acoustics	X-UL15	X15 Long U Bracket

### *Delay Fill - Mezzanine*

2	L-Acoustics	X8	Arraying Point Source Speaker
2	L-Acoustics	X-UL8i	X8 Long U-Bracket install version

### *Pit Rail*

9	L-Acoustics	X4i	4" coaxial point source speaker
9	L-Acoustics	X4i-onCW	X4i Wall or Ceiling mount

### *Stage Lip*

6	L-Acoustics	X8	Arraying Point Source Speaker
6	L-Acoustics	X-UL8i	X8 Long U-Bracket install version

### *Balcony Rail Surround*

4	L-Acoustics	A10i Wide	Arraying Point Source Speaker 30"
4	L-Acoustics	A-U10i	A10i U Bracket

### *Rear Surrounds*

18	L-Acoustics	X8	Arraying Point Source Speaker
18	L-Acoustics	X-UL8i	X8 Long U-Bracket install version

### *Side Surrounds*

20	L-Acoustics	X8	Arraying Point Source Speaker
20	L-Acoustics	X-UL8i	X8 Long U-Bracket install version

### *Amplifiers*

9	L-Acoustics	LA7.16i	16 Channel Amplifier
1	L-Acoustics	LA12X	Amplifier Controller 4 Channel High Power

Items below in the Speaker Cable and Racks sections are NOT included in L-Acoustics or d&b Quote and must be costed separately.

Speaker Multicore Cable for Main L/R Arrays - **coordinate with cable reel provided by rigging contractor**

2	LINK	Mult Cable	LK 48/6 Cable with 48 12AWG conductors - 50'
2	LINK	Fan Out	LK 48/6 to 12 NL4 Connectors 12AWG

### *Racks*

2	Middle Atlantic	ERK-4425-AV	44RU Rack Preconfigured for Pro AV
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## MIXING CONSOLES

Qty	Manufacturer	Item	Description
<i>Chapman Console</i>			
1	Digico	Quantum338	Mixing surface with MAD1 and MM OpticalCon
1	Digico	Quantum338 Flight Case	3 piece flight case with pull out drawer
<i>Williams Console</i>			
1	Digico	SD12-96 MAD1 and 1 MM HMA	Mixing surface with MAD1 and MM OpticalCon
1	Digico	SD12 Theatre Software	T software
1	Digico	SD12 Flight Case	3 piece flight case with pull out drawer
1	Digico	DMI DANTE2 64 Channel @96	64 channel Dante Card at 96 or 48kHz

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### *Chapman Booth*

1	Digico	SD Rack	Empty Rack with MADi & MM OpticalCon
2	Digico	SD 32bit Analog Input Card	8 inputs
2	Digico	SD 32bit Output Card	8 Outputs
1	Digico	SD11i	Mixing surface with MADi and MM OpticalCon
2	Digico	Orange Box DMI Converter	Empty Box with 2 DMI Slots
2	Digico	DMI Neutrik OpticalCon MM	Multi Mode Optocore on OpticalCon
1	Digico	DMI DANTE2 64 Channel @96	64 channel Dante Card at 96 or 48kHz
1	Digico	DMI Milan Card	AVB Milan Card

### *Chapman Stage Racks*

2	Digico	SD Rack	Empty Rack with MADi & MM OpticalCon
11	Digico	SD 32bit Analog Input Card	8 inputs
5	Digico	SD 32bit Output Card	8 Outputs

### *Williams Booth*

1	Digico	SD Rack	Empty Rack with MADi & MM OpticalCon
2	Digico	SD 32bit Analog Input Card	8 inputs
1	Digico	SD 32bit Output Card	8 Outputs
2	Digico	SD AES i/o Card	8x8

### *Williams Stage Rack*

1	Digico	SD Rack	Empty Rack with MADi & MM OpticalCon
6	Digico	SD 32bit Analog Input Card	8 inputs
3	Digico	SD 32bit Output Card	8 Outputs

### Multicable

<b>CONFIRM COLOR CODING BEFORE ORDERING</b>			
2	Link	Multi Cable	20ch Cable with LK 85 Connector M to F - 15'
4	Link	Multi Cable	20ch Cable with LK 85 Connector M to F - 25'
4	Link	Multi Cable	20ch Cable with LK 85 Connector M to F - 50'
5	Link	Stage Box	Stage Box 16 Female XLR 4 Male XLR, LK 85 Male
5	Link	Fan Tails	Fan out 16 Male XLR, 4 Female XLR, LK 85 Female

### Cable

<b>CONFIRM COLOR CODING BEFORE ORDERING</b>			
8	Whirlwind	ENC6ASE06	6' Cat6A Cable
4	Whirlwind	ENC6ASE10	10' Cat6A Cable
4	Whirlwind	ENC6ASE25	25' Cat6A Cable
4	Whirlwind	ENC6ASE50	50' Cat6A Cable
2	Custom	TBD	HMA to OpticalCon Adapters
10	Neutrik	NKO2M-L-0-3	OpticalCon Duo Lite MM Tactical Cable 3 meter ~10'
			OpticalCon Duo Lite MM Tactical Cable 10 meter ~32'
10	Neutrik	NKO2M-L-0-10	OpticalCon Duo Lite MM Tactical Cable 25 meter ~82'
4	Neutrik	NKO2M-L-0-25	

### Patchbay

4	Black Box	JPM385A	24 port LC Duplex Patch Panel - Feed Through, 1RU
4	Black Box	JPMT700A	24 port CAT6A Patch Panel - feed through, 1RU
1	TBD	TBD	LC Duplex Patch Cable as needed plus 10%
1	TBD	TBD	Cat6A Patch Cable as needed plus 10%

### Networking

6	Netgear	GSM4248P	Network Switch 40 port with POE+ and 4 SFP+
4	Netgear	GSM4230PX	Network Switch 24 port with SFP and POE+
2	Ubiquiti	Dream Machine Pro	Network Router
4	Ubiquiti	UniFi U6 Long-Range	WiFi Access Point
2	Optocore	Autorouter R66AR10MM	Optical Autorouter MM 10 location, 20 SFP

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12	Netgear	AXM761	SFP+ Multi Mode 10Gig Fiber Transceiver
2	Apple	iPad	Tablet Computer
Racks	Middle		
2	Atlantic	ERK-4425-AV	44RU Rack Preconfigured for Pro AV
3	ProX	T-16RSS	16RU Rolling Flight Case Rack 19" deep

**END OF SECTION 27 41 00**