AUDIOVISUAL STANDARDS & DESIGN GUIDELINES

LOS ANGELES COMMUNITY COLLEGE DISTRICT

February 2, 2022

VERSION 1.2

TABLE OF CONTENTS

INTRODUCTION

Goal & Intent of Document

The intent of this document is to aid in the application of consistent instructional technologies within the Los Angeles Community College District (LACCD) classroom environment to meet the goals established within the 2018-2023 LACCD District Strategic Plan:

Goal 1: Access to Educational Opportunities

Goal 2: Premier Learning Environments

Goal 3: Student Success and Equity

Goal 4: Organizational Effectiveness

Goal 5: Fiscal Integrity

The purpose of the Audio Visual (AV) Classroom Standards are to provide minimum performance criteria for instructional technologies and audio-visual systems that will meet the needs of institutional learning, support various teaching methods and styles, enhance District/College communications, improve operational systems, meet accessibility (ADA) compliance requirements, and meet fire/life/safety compliance requirements.

This standard provides a minimum baseline level of audio/visual capabilities along with guidelines for use in architectural programming, design, construction, renovation, and upgrades of classrooms throughout the entire District.

Flexibility and Evolving Classroom Technologies

LACCD Stakeholders identified that classroom technologies will play a major factor in how education in the future differs from education today. It was identified that the standards shall be:

- Flexible - to support a variety of instructional pedagogy
- Expandable - to support future classroom technologies such as wireless presentation, augmented & virtual reality, and holography
- Scalable - to support additional media inputs and outputs for future needs

As such, to supplement the existing Audiovisual system capabilities, the standards include infrastructure that enables the District to easily adopt future classroom technologies as identified above.

Acknowledgments

District Academic Senate

Technology Policy and Planning Committee

District Technology Committee

Facilities Planning Subcommittee

BuildLACCD

RELEVANT STANDARDS

LACCD Standards

The AV Classroom Standards shall be compliant* with the following related standard(s):

- LACCD Facility Design Standards – Cabling & Telecommunications
  http://www.build-laccd.org/contractors-bidders/standards-guidelines

Note: In the event of a conflict, the District standards shall apply.

Communications Standards

- ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises
- ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard
- ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard
- ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard
- ANSI/TIA-568-C.4, Broadband Coaxial Cabling and Components Standard
- ANSI/TIA-569-C, Telecommunications Pathways and Spaces
- ANSI/TIA-598-C, Optical Fiber Cable Color Coding
- ANSI/TIA-606-B, Administration Standard for Telecommunications Infrastructure
- ANSI/TIA-607-B, Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises
- ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard
- ANSI/TIA-526-7, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
- ANSI/TIA -526-14, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
- ASHRAE 9.9, Thermal Guidelines for Data Processing Environments

Industry Standards

All equipment and installations under this Specification shall conform to the latest version of the following:

- ANSI/IEEE C2 National Electrical Safety Code
- TIA/EIA Standards 568, 569, 606 and 607
- IEEE/ANSI 142 2007 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- ANSI/BICSI 001-2017, Information and Communication Technology Systems Design Best Practices for Educational Institutions

Building Standards

Building requirements and standards for code compliance in building projects that should be referenced as applicable.

- CBC 11B-706, Assistive Listening Systems
- National Electric Code (NEC) ANSI/NFPA 70

Federal Standards

- Americans with Disabilities Act (ADA)

Audiovisual Standards

- ANSI/INFOCOMM 4:2012, Audiovisual Systems Energy Management http://www.infocomm.org
- ANSI/INFOCOMM 3M-2011, Projected Image System Contrast Ratio http://www.infocomm.org
- ANSI/INFOCOMM 10:2013, AV Systems Performance Verification http://www.infocomm.org
- INFOCOMM 5M-201X, Display Image Size for 2D Content http://www.infocomm.org
- INFOCOMM A102.01:2015 Audio Coverage Uniformity http://www.infocomm.org
- INFOCOMM V201.02:2015 Direct View Display Image System Contrast Ratio http://www.infocomm.org

References

The following documents provide information regarding audiovisual industry “best practices,” including commonly accepted standards for design, installation, and performance of integrated audiovisual systems. The technical quality of the Contractor’s work and the resulting performance of the Audiovisual Systems installed in the Project will generally be measured against the standards and practices delineated in these References.

- Audiovisual Best Practices: The Design and Integration Process for the AV and Construction Industry, Timothy Cape and Jim Smith; Fairfax, VA; International Communications Industries Association, 2005
- ASTM Task Group E33.04C, Acoustical Environment in the Open-Plan Office, Atlas-Soundolier, Addendum, May 1994
- Dashboard for Controls Design Reference, InfoComm International®
- https://www.avixa.org
- Dashboard for Controls Contractors Guide, InfoComm International®
- https://www.avixa.org
- InfoComm International. ANSI/InfoComm 10:2013 Audiovisual Systems Performance Verification, Section 9.1. Fairfax: InfoComm International, 2013.
- International Organization for Standardization. ISO 266:1997, Acoustics -- Preferred Frequencies. Geneva: ISO.
- Avixa A102.01:2017 Audio Coverage Uniformity https://www.avixa.org
- ANSI/INFOCOMM 3M-2011, Projected Image System Contrast Ratio. https://www.avixa.org

Haas, Helmut (1972). “The Influence of Single Echo on Audibility of Speech”. Audio Engineering Society JAES Volume 20 Issue 2. 146-159. March 1972.

International Electrotechnical Commission. 2013. IEC 61672-1:2013 Electroacoustics – Sound level meters – Part 1: Specifications. Geneva: International Electrotechnical Commission.

International Electrotechnical Commission. 2013. IEC 61672-2:2013 Electroacoustics – Sound level meters – Part 2: Pattern Evaluation Tests. Geneva: International Electrotechnical Commission.

The following publications contain information that supports the design and application of this Standard, but are not required provisions of the Standard. Use the latest edition unless otherwise specified.

Acoustical Society of America (ASA).

- ANSI/ASA S1.1-2013, Acoustical Terminology. Melville, NY: Acoustical Society of America (ASA).
- ANSI/ASA S12.2-2008, Criteria for Evaluating Room Noise. Melville, NY: Acoustical Society of America (ASA).
- ANSI/ASA S1.13-2005, ANSI Measurement of Sound Pressure Levels in Air. Melville, NY: Acoustical Society of America (ASA).
- ANSI/ASA S1.11-2004, Electroacoustics - Octave-band and Fractional-octave-band Filters
  - Part 1: Specifications. Melville, NY: Acoustical Society of America (ASA).

Audio Engineering Society, Inc. AES56-2008 (R2014) AES Standard on Acoustics-Sound Source Modeling – Loudspeaker Polar Radiation Measurements. New York, New York: Audio Engineering Society, Inc.

Audio Engineering Society, Inc. AES-R2-2004, Project Report for Articles on Professional Audio and for Equipment Specifications — Notations for Expressing Levels. New York, New York: Audio Engineering Society, Inc.

ROOM STYLE CONFIGURATIONS

Tier 1 Classroom

Standard single screen classroom

The single screen classroom is the standard layout and style used across all LACCD campuses. Just one projector and one screen to display presentation materials. The room accommodates ceiling speakers for content/program audio playback and voice reinforcement as required. The ADA-approved instructor desk includes an equipment rack hosting the main source and processing equipment for the room as well the surface equipment including the computer monitor(s) for both source content preview and system control & operation, the document camera and the cable well for power, data and AV connections. The room shall include infrastructure to support the deployment of Hyflex remote learning equipment including conduits and wall boxes for future cameras and ceiling microphones. The system includes:

Single ceiling projector

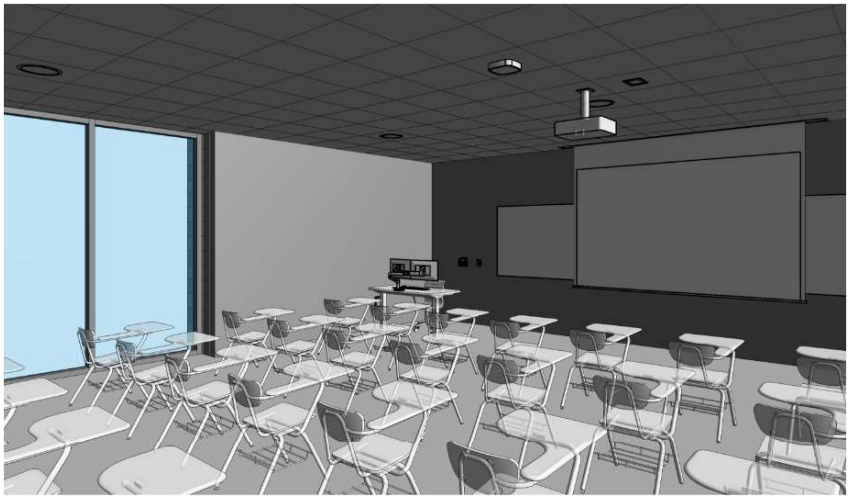
Single wall or ceiling (manual or motorized) projection screen

Ceiling speakers

Instructor station with dual monitors (one content, one interactive for control*) including:

- Presentation switcher
- Control processor
- Amplifier
- Blu-ray/DVD player
- Dedicated room computer
- Surface document camera
- Surface input connections (in recessed flip-up well)
- ALS monaural connection (RCA)

* Note that an option for a dedicated control panel can be used upon confirmation with LACCD.



Tier 2 Classroom

Dual screen classroom

The dual screen classroom is the standard layout and style used across all LACCD campuses for larger student capacity. This space supports two projectors and two screens to display presentation materials to the larger (wider) room audience. The room accommodates ceiling speakers for content/program audio playback and voice reinforcement as required. The ADA-approved instructor desk includes an equipment rack hosting the main source and processing equipment for the room as well the surface equipment including the computer monitors for both source content preview and system control & operation, the document camera and the cable well for power, data and AV connections. The room shall include infrastructure to support the deployment of Hyflex remote learning equipment including conduits and wall boxes for future cameras and ceiling microphones. The system includes:

Two ceiling projectors or wall-mounted large flat panel displays

Two wall or ceiling (manual or motorized) projection screens*

* One display can be interactive wall ultra-short throw projector

Ceiling speakers

Instructor station with dual monitors (one content, one interactive for control**) including:

- Matrixing presentation switcher
- Control processor
- Amplifier
- Blu-ray/DVD player
- Dedicated room computer
- Surface document camera
- Surface input connections (in recessed flip-up well)
- ALS monaural connection (RCA) for spaces of 49 seats or under of occupancy
- ALS transmitter for spaces of 50 seats or greater

** Note that an option for a dedicated control panel can be used upon confirmation with LACCD.

Tier 3 Classroom

Dual screen classroom with distance learning support

The dual screen classroom with distance learning support is the preferred layout to accommodate Hyflex learning models with distance learning support. This space supports two projectors and two screens to display presentation materials to the larger (wider) room audience. Both a wall camera and ceiling microphone array(s) are included for the instructor lecture capture and audience audio response. The room accommodates ceiling speakers for content/program audio playback and voice reinforcement as required. The ADA-approved instructor desk includes an equipment rack hosting the main source and processing equipment for the room as well the surface equipment including the computer monitors for both source content preview and system control & operation, the document camera and the cable well for power, data and AV connections. The system includes:

Two ceiling projectors or wall-mounted large flat panel displays

Two wall or ceiling (manual or motorized) projection screens*

* One display can be interactive wall ultra-short throw projector

Ceiling speakers

Ceiling microphone(s)

Wall camera

Instructor station with dual monitors (one content, one interactive for control**) including:

- Matrixing presentation switcher
- Control processor
- Recording/streaming appliance
- Media hub w/ USB to room computer
- Digital Audio Signal Processor (with Dante™)
- Amplifier
- Blu-ray/DVD player
- Dedicated room computer
- Surface document camera
- Surface input connections (in recessed flip-up well)
- ALS monaural connection (RCA) for spaces of 49 seats or under of occupancy
- ALS transmitter for spaces of 50 seats or greater

** Note that an option for a dedicated control panel can be used.

Tier 1 Conference Room

Small Meeting Space or Group Study Room

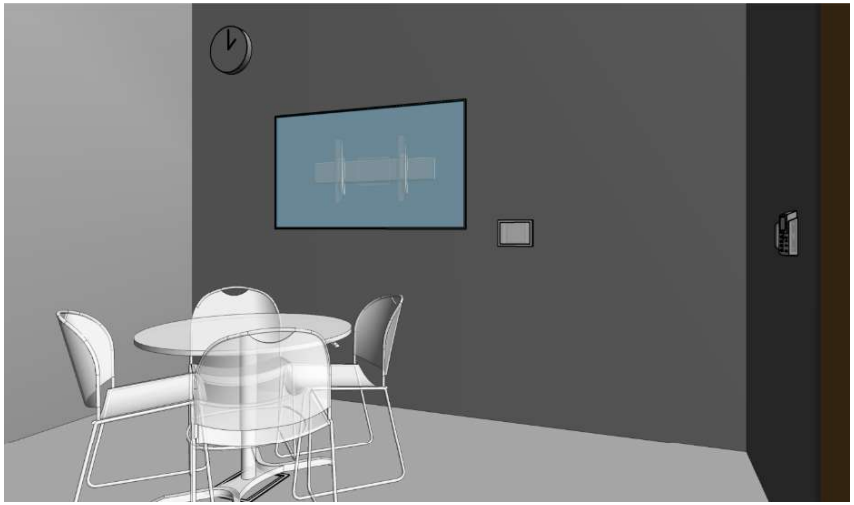
The small conference room includes a primary display for viewing (sized for room seating conditions) and uses the display speakers for audio support. The table includes a cable well for power, data and AV connectivity. The connections from the table to the display are either through wall connection (when the table is against the wall) or through a floor box or poke-through. The system includes:

Single wall-mounted flat panel display

Wall touch control panel

Wall or floor input connections extended to table well including:

- Input connections (in recessed flip-up well)
- Wall control panel with built-in control processor
- ALS monaural connection (RCA)



Tier 2 Conference Room

Medium-sized room with web-conferencing support

The medium conference room includes a primary display for viewing (sized for room seating conditions) and uses overhead ceiling speakers for content/program audio playback and conference audio. The table includes a cable well for power, data and AV connectivity. The connections from the table to the display are through a floor box or poke-through. Both a wall camera at the display and a ceiling microphone array are included for web conferencing connected to the room's dedicated PC. The room accommodates an equipment rack (free-standing or within room millwork) hosting the main source and processing equipment for the room. The system includes:

Single wall-mounted flat panel display

Wall touch control panel

Single floor box (power, data & AV)

Floor input connections extended to table well including:

- Input connections (in recessed flip-up well)
- ALS monaural connection (RCA)

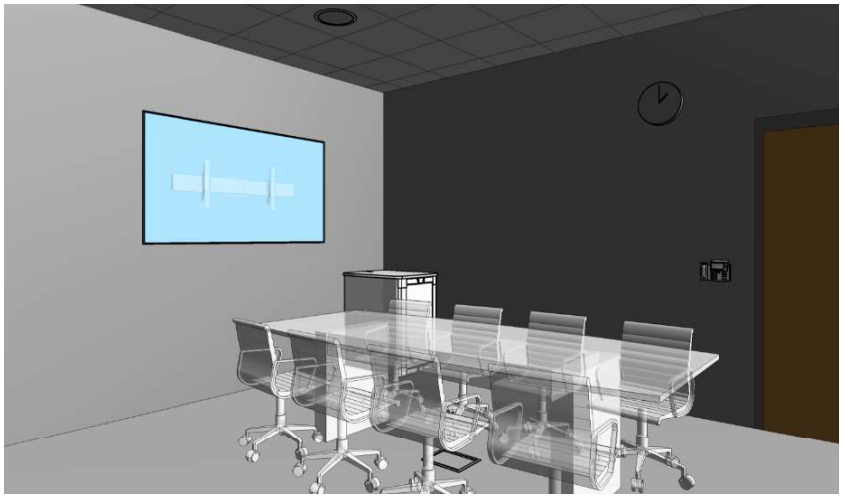
Ceiling speakers

Ceiling microphone

Wall camera above or below monitor in recessed camera housing

Equipment rack (free-standing or within room millwork) including:

- Presentation switcher
- Control processor
- Media hub w/ USB to room computer
- Digital Audio Signal Processor (with Dante™)
- Amplifier
- Dedicated room computer
- Surface input connections (in recessed flip-up well)
- ALS monaural connection (RCA) for spaces of 49 seats or under of occupancy



Tier 3 Conference Room

Large-sized room with web-conferencing support

The large conference room includes a primary large display or projector/screen for viewing (sized for room seating conditions) and uses overhead ceiling speakers for content/program audio playback and conference audio. The table includes cable wells for power, data and AV connectivity. The connections from the table to the display are through floor boxes or poke-throughs (quantity as required). Both a wall camera at the display and a ceiling microphone array(s) are included for web conferencing connected to the room's dedicated PC. The room accommodates an equipment rack (free-standing or within room millwork) hosting the main source and processing equipment for the room. The system includes:

Single wall-mounted large flat panel display or ceiling projector and screen

Wall touch control panel

Two or more floor boxes (power, data & AV)

Floor input connections extended to table well including:

- Input connections (in recessed flip-up well)
- ALS monaural connection (RCA) in primary/front

Ceiling speakers

Ceiling microphone(s)

Wall camera above monitor in recessed camera housing

Optional secondary rear camera

Equipment rack (free-standing or within room millwork) including:

- Presentation switcher
- Control processor
- Media hub w/ USB to room computer
- Digital Audio Signal Processor (with Dante™)
- Amplifier
- Dedicated room computer
- Surface input connections (in recessed flip-up well)
- ALS monaural connection (RCA) for spaces of 49 seats or under of occupancy

ROOM LAYOUT DIAGRAMS

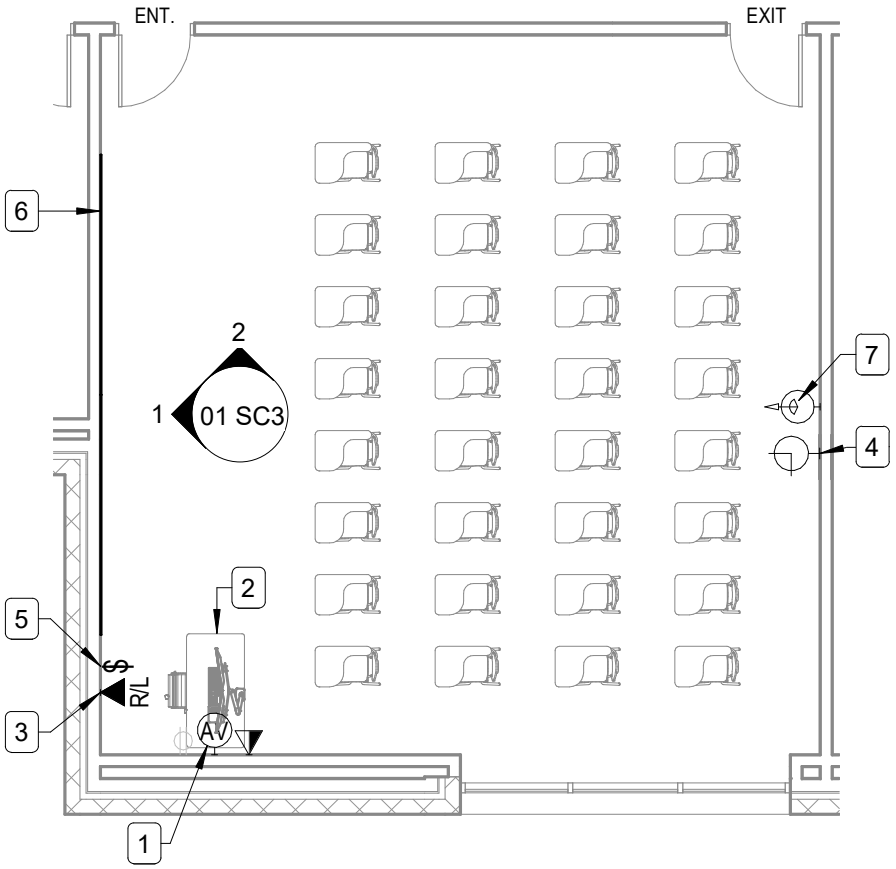
The following pages provide standard layouts for the various classrooms and other spaces covered by this standard.

These include:

- Single Screen Classroom
- Dual Projector Classroom
- Dual Display Classroom with Distance Learning Support
- Small Conference Room / Group Meeting Space
- Medium Conference Room with Conferencing
- Large Conference Room with Conferencing

Each of the layouts include a typical overall view, floor plan, reflected ceiling plan, wall elevations, conduit diagram and AV signal diagram.

The layouts can be applied to the specific building program and adjusted to match the requirements by space.



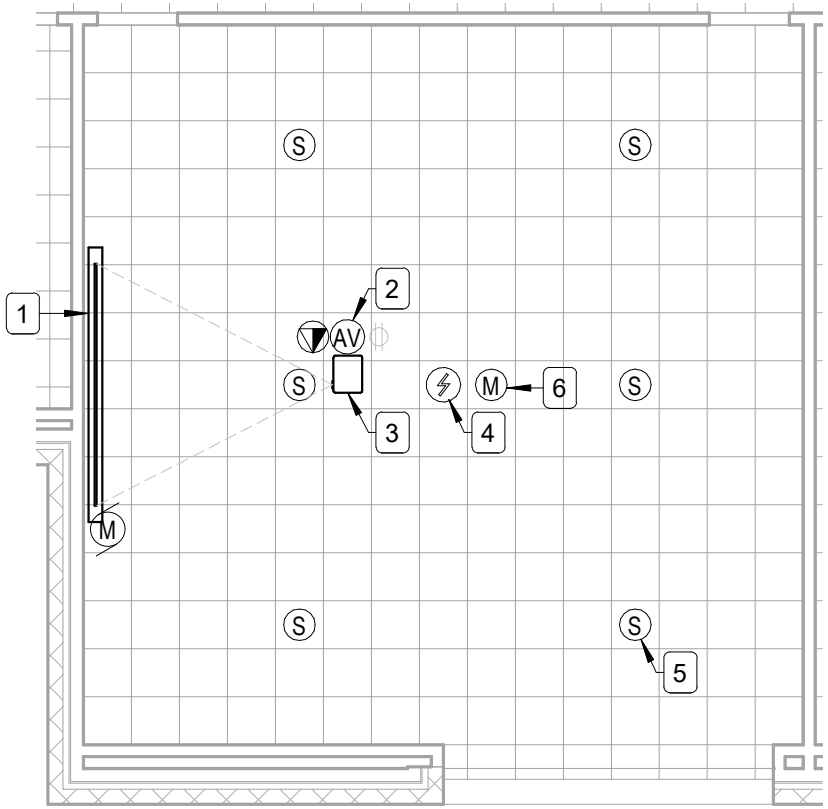
LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. PROJECTION SCREEN SWITCH (FOR MOTORIZED SCREENS).
6. WHITEBOARD.
7. FUTURE CAMERA (HYFLEX).

NOTE: COORDINATE ROOM AND SYSTEM EQUIPMENT DURING PROGRAMMING FOR HYFLEX INSTRUCTION

ROOM TYPE: TIER 1 CLASSROOM: SINGLE SCREEN CLASSROOM

DRAWING: AV FLOOR PLAN OVERVIEW



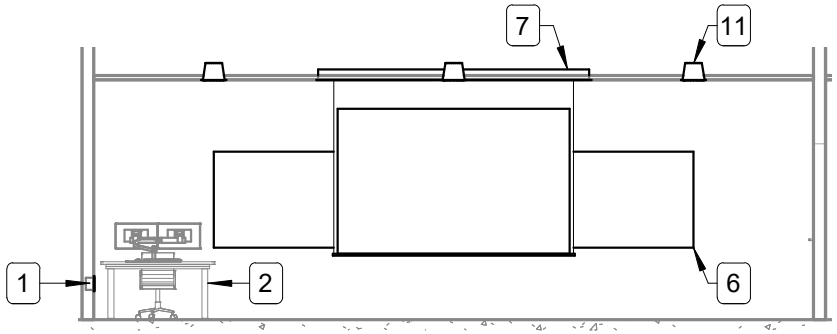
LEGEND:

1. CEILING MOUNTED PROJECTION SCREEN.
2. CEILING MOUNTED AV CONTROL.
3. PROJECTOR.
4. WIRELESS ACCESS POINT.
5. CEILING SPEAKER - TYPICAL OF 6.
6. FUTURE CEILING MICROPHONE ARRAY (HYFLEX).

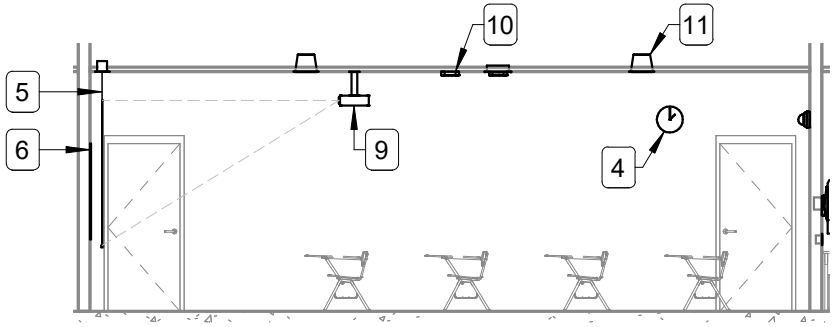
NOTE: COORDINATE ROOM AND SYSTEM EQUIPMENT DURING PROGRAMMING FOR HYFLEX INSTRUCTION

ROOM TYPE: TIER 1 CLASSROOM: SINGLE SCREEN CLASSROOM

DRAWING: AV REFLECTED CEILING PLAN OVERVIEW



1 ELEVATION A



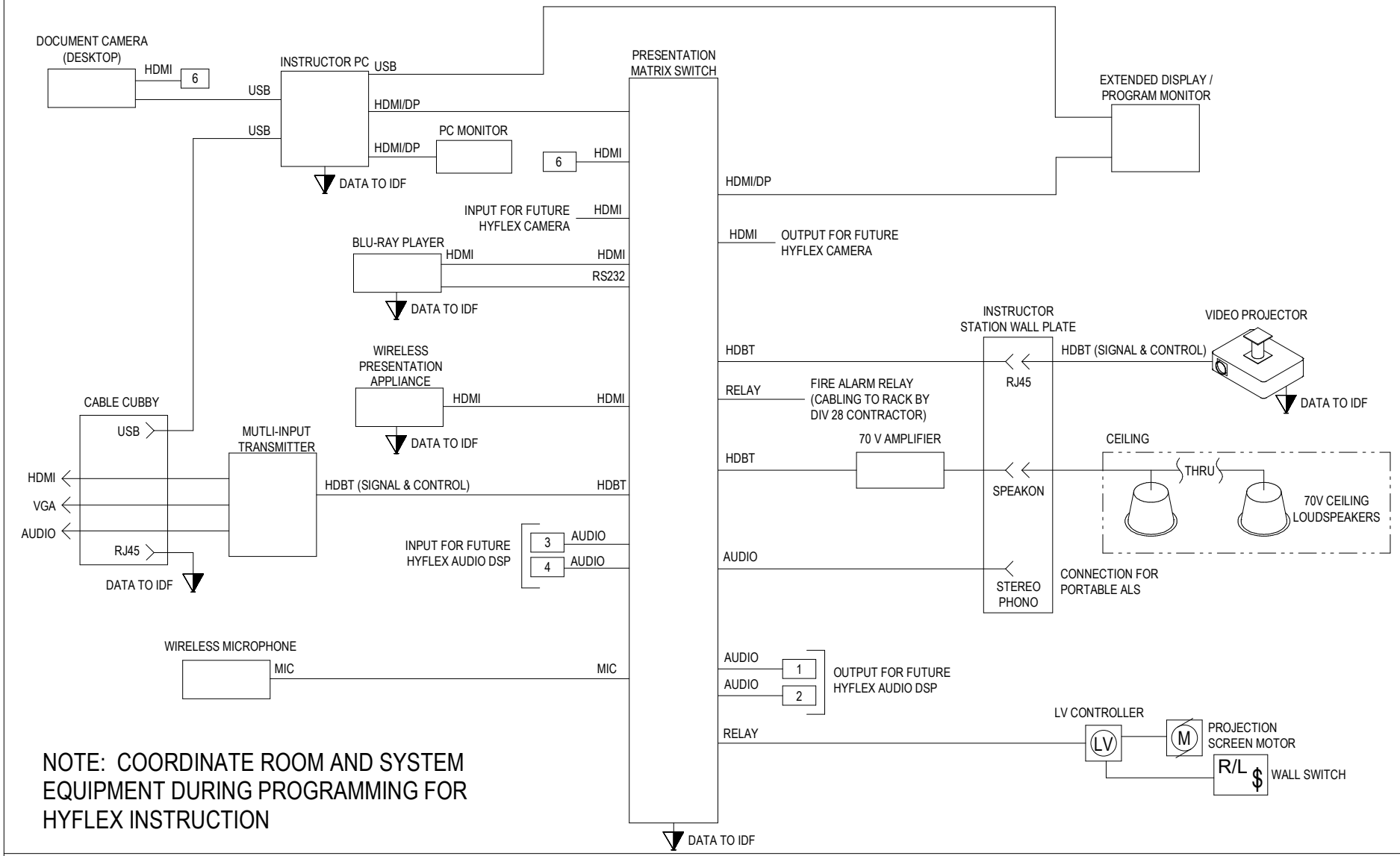
2 ELEVATION B

LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. PROJECTION SCREEN SWITCH (FOR MOTORIZED SCREENS).
6. WHITEBOARD.
7. CEILING MOUNTED PROJECTION SCREEN.
8. CEILING MOUNTED AV CONTROL.
9. PROJECTOR.
10. WIRELESS ACCESS POINT.
11. CEILING SPEAKER - TYPICAL OF 6.

ROOM TYPE: TIER 1 CLASSROOM: SINGLE SCREEN CLASSROOM

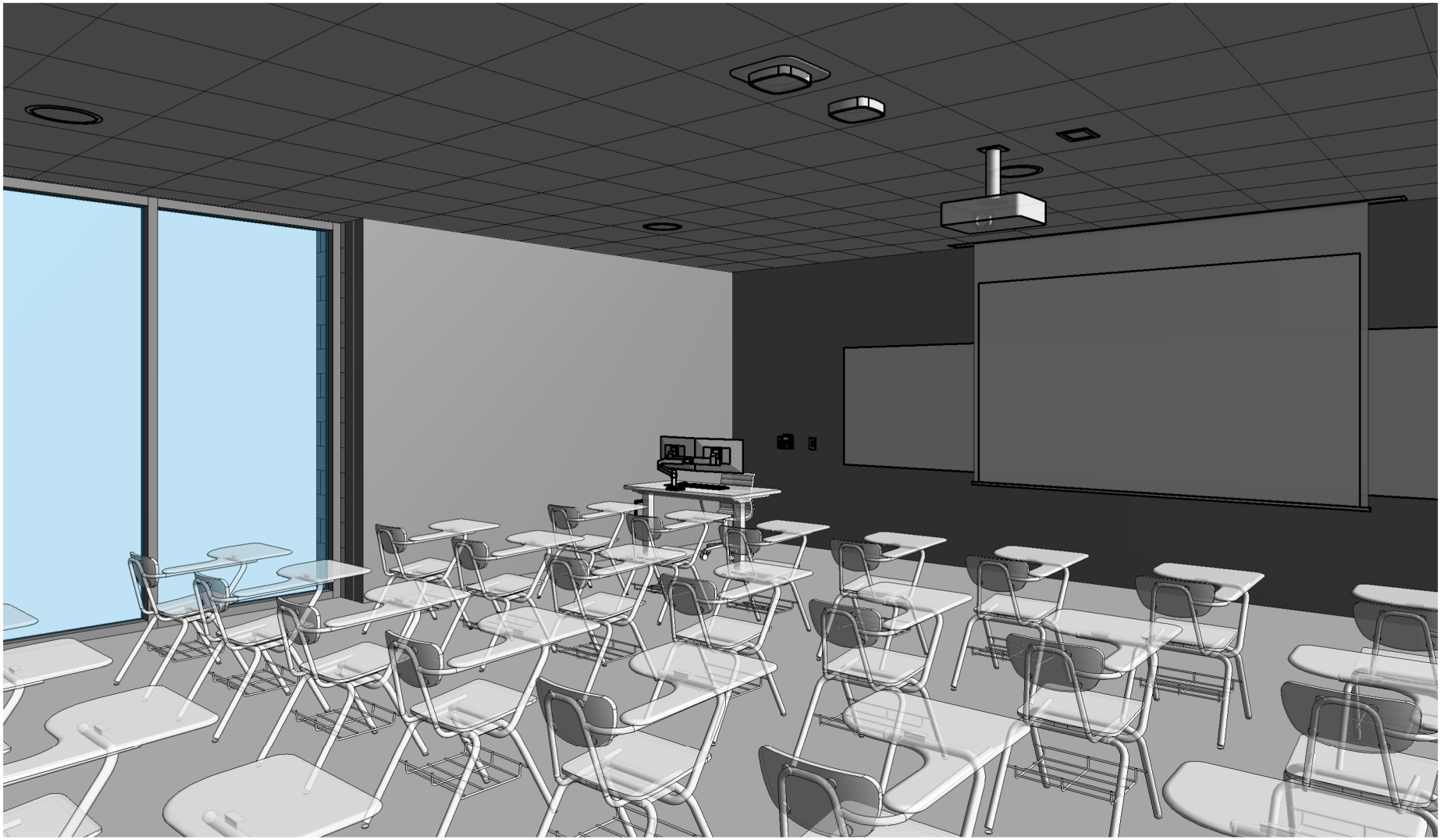
DRAWING: AV WALL ELEVATIONS OVERVIEW



NOTE: COORDINATE ROOM AND SYSTEM EQUIPMENT DURING PROGRAMMING FOR HYFLEX INSTRUCTION

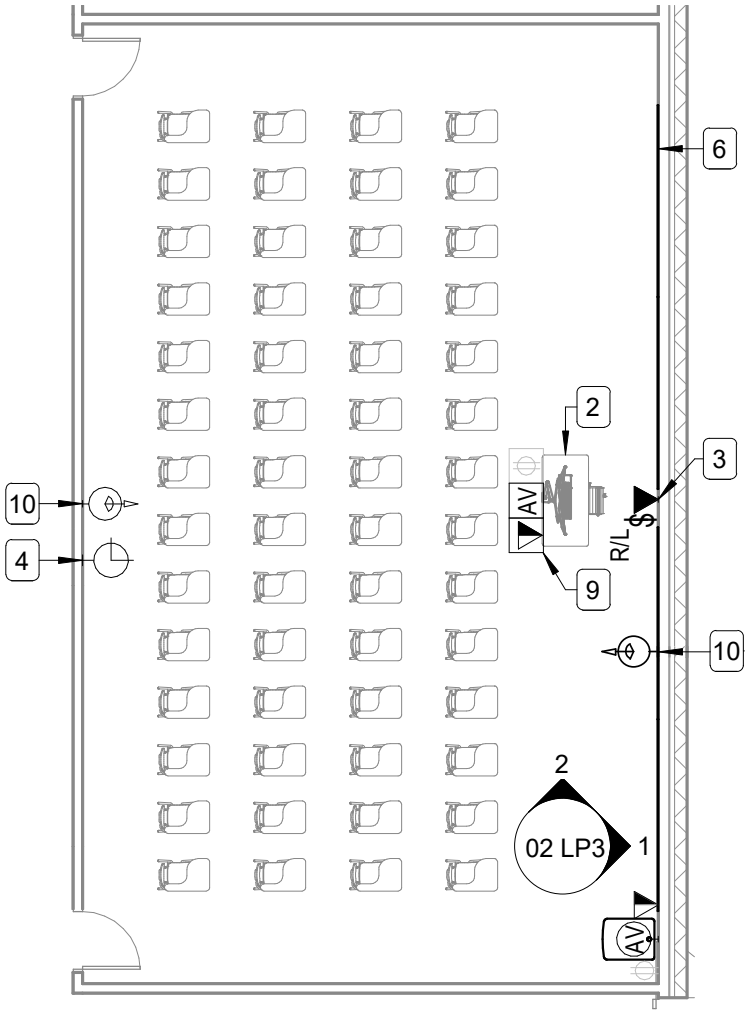
ROOM TYPE: TIER 1 CLASSROOM: SINGLE SCREEN CLASSROOM

DRAWING: AV SIGNAL DIAGRAM



ROOM TYPE: TIER 1 CLASSROOM: SINGLE SCREEN CLASSROOM

DRAWING: ISOMETRIC



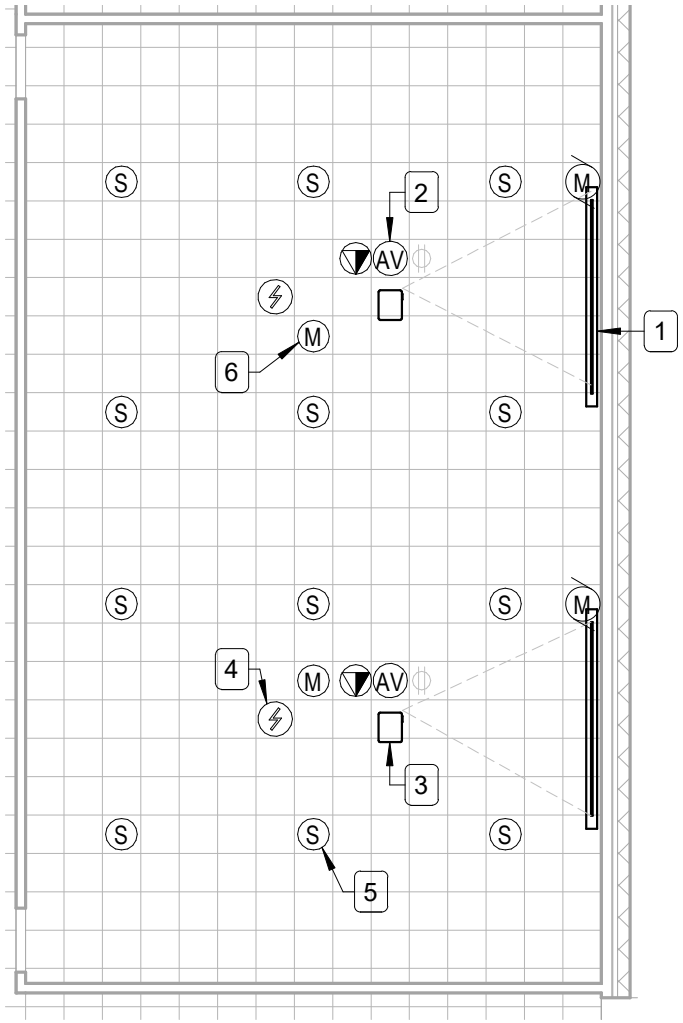
LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. PROJECTION SCREEN SWITCH (FOR MOTORIZED SCREENS).
6. WHITEBOARD.
7. IN-WALL AV EQUIPMENT BOX.
8. AV EQUIPMENT RACK.
9. AV FLOOR-BOX.
10. FUTURE CAMERA (HYFLEX).

NOTE: ALL CLASSROOMS TO INCLUDE INFRASTRUCTURE TO SUPPORT FUTURE DISTANCE LEARNING.

ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: AV FLOOR PLAN OVERVIEW

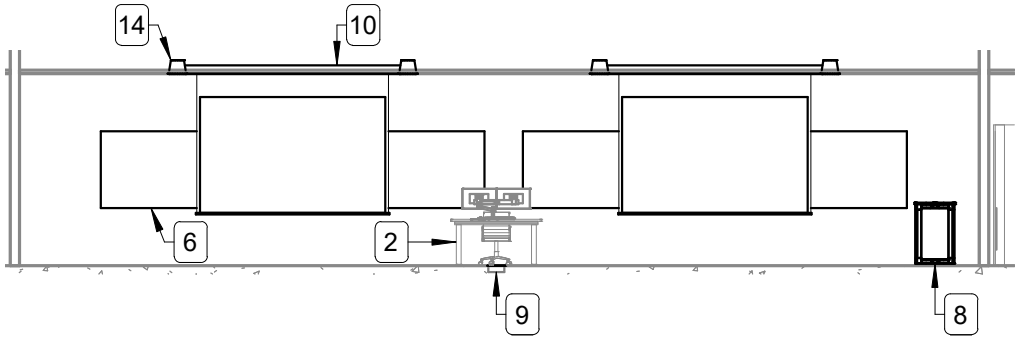


LEGEND:

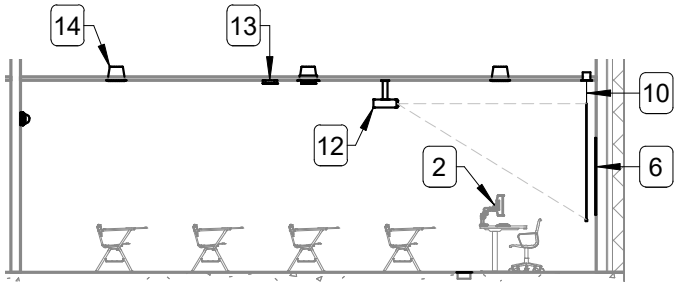
1. CEILING MOUNTED PROJECTION SCREEN.
2. CEILING MOUNTED AV CONTROL.
3. PROJECTOR.
4. WIRELESS ACCESS POINT.
5. CEILING SPEAKER - TYPICAL OF 12.
6. CEILING MICROPHONE ARRAY - (FUTURE) TYPICAL OF 2.

ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: AV REFLECTED CEILING PLAN OVERVIEW



1 ELEVATION A



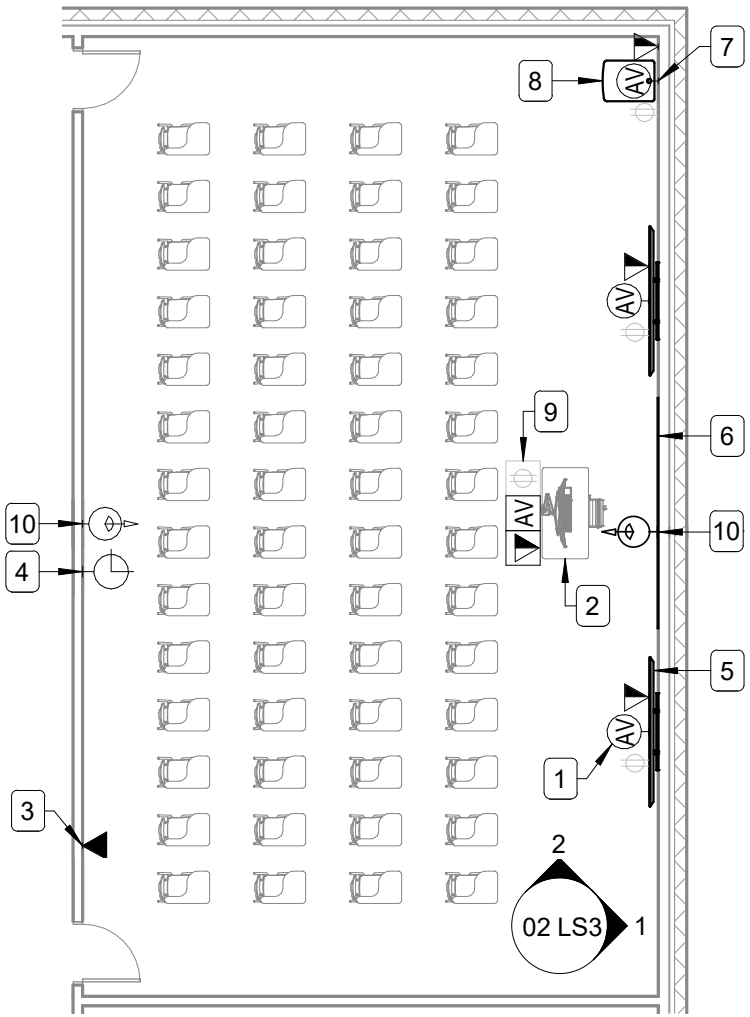
2 ELEVATION B

LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. PROJECTION SCREEN SWITCH (FOR MOTORIZED SCREENS).
6. WHITEBOARD.
7. IN-WALL AV EQUIPMENT BOX.
8. AV EQUIPMENT RACK.
9. AV FLOOR-BOX.
10. CEILING MOUNTED PROJECTION SCREEN.
11. CEILING MOUNTED AV CONTROL.
12. PROJECTOR.
13. WIRELESS ACCESS POINT.
14. CEILING SPEAKER - TYPICAL OF 12.

ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: AV WALL ELEVATIONS OVERVIEW



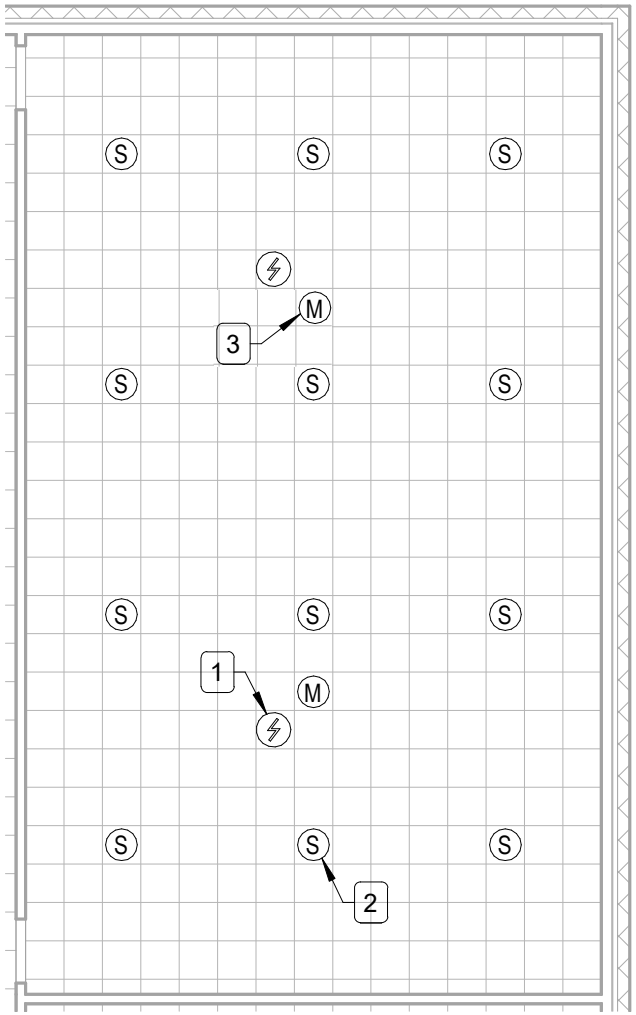
LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. WALL MOUNTED DISPLAY.
6. WHITEBOARD.
7. IN-WALL AV EQUIPMENT BOX.
8. AV EQUIPMENT RACK.
9. AV FLOOR-BOX.
10. (FUTURE) WALL CAMERA.

NOTE: ALL CLASSROOMS TO INCLUDE INFRASTRUCTURE TO SUPPORT FUTURE DISTANCE LEARNING.

ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: AV FLOOR PLAN OVERVIEW

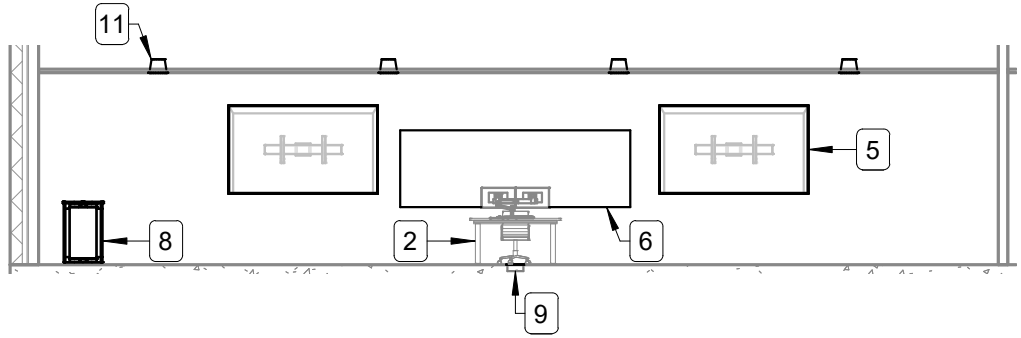


LEGEND:

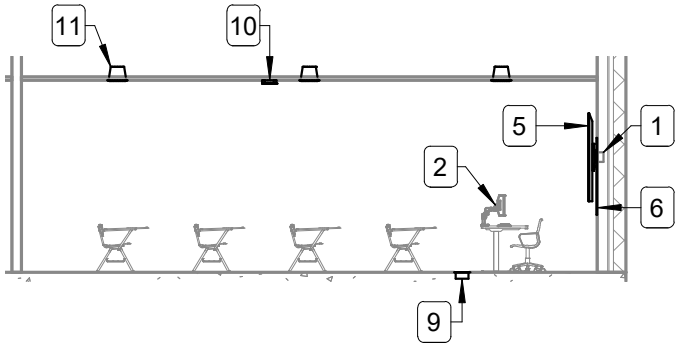
1. WIRELESS ACCESS POINT.
2. CEILING SPEAKER - TYPICAL OF 12.
3. CEILING MICROPHONE ARRAY - (FUTURE) TYPICAL OF 2.

ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: AV REFLECTED CEILING PLAN OVERVIEW



1 ELEVATION A



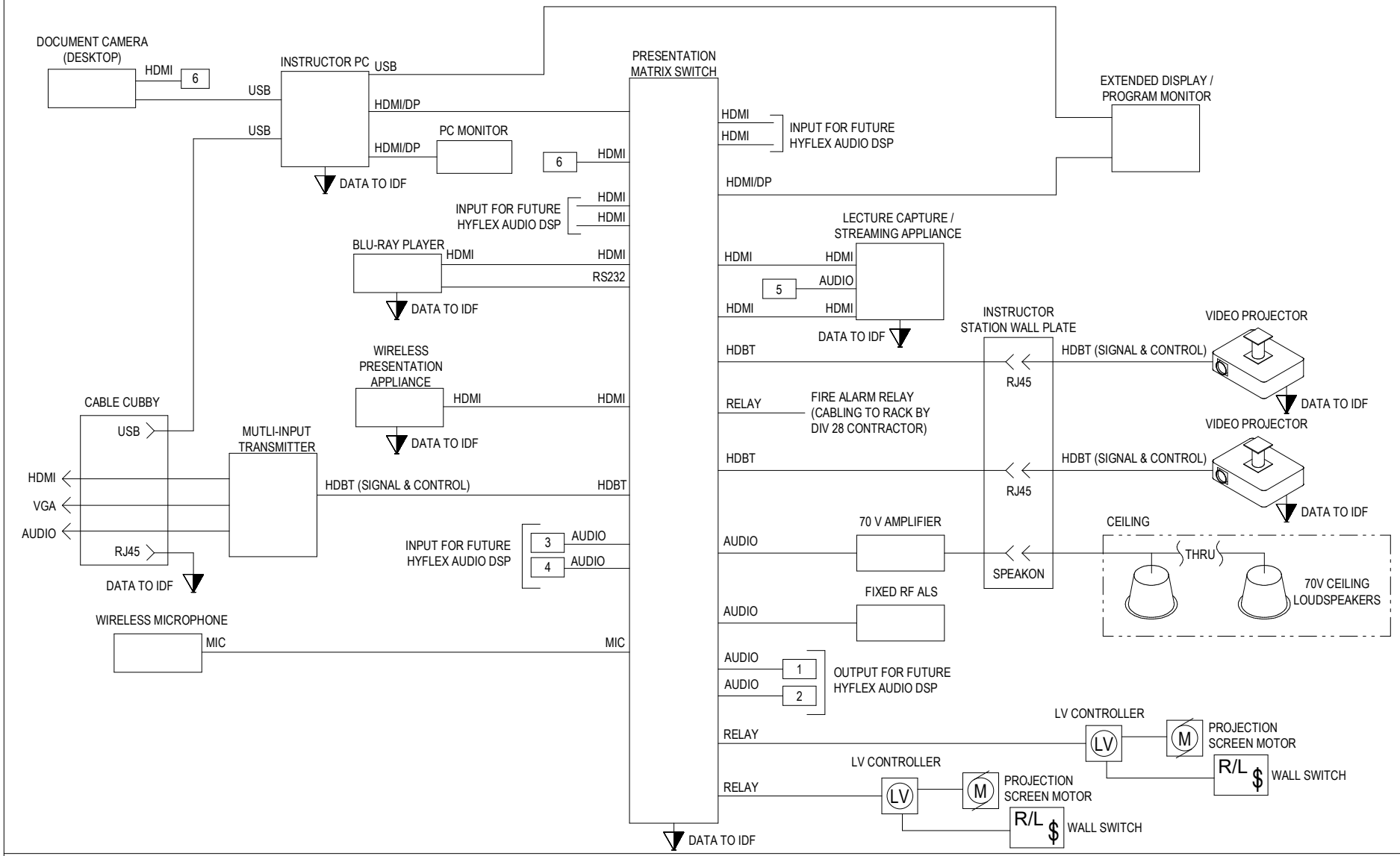
2 ELEVATION B

LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. WALL MOUNTED DISPLAY.
6. WHITEBOARD.
7. IN-WALL AV EQUIPMENT BOX.
8. AV EQUIPMENT RACK.
9. AV FLOOR-BOX.
10. WIRELESS ACCESS POINT.
11. CEILING SPEAKER - TYPICAL OF 12.

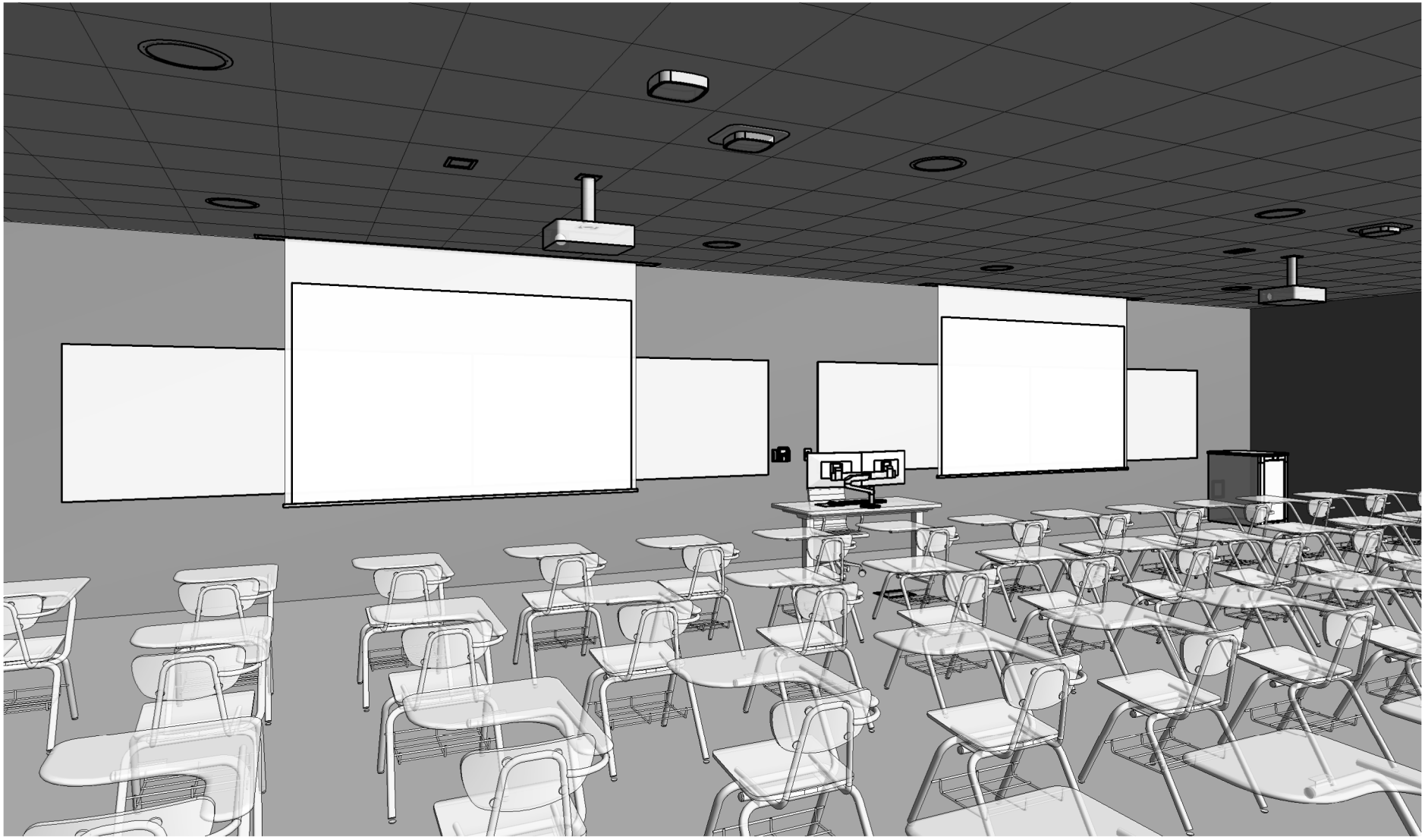
ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: AV WALL ELEVATIONS OVERVIEW



ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: AV SIGNAL DIAGRAM

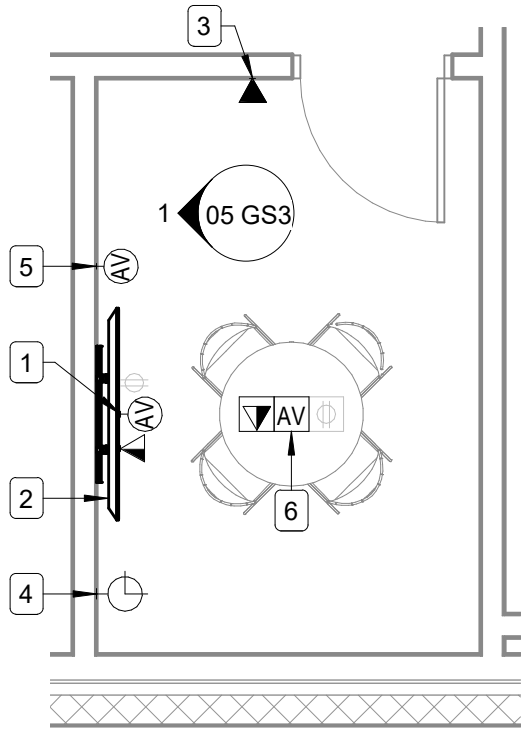


ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: ISOMETRIC

ROOM TYPE: TIER 2 CLASSROOM: DUAL SCREEN CLASSROOM / DIVISIBLE CLASSROOM

DRAWING: ISOMETRIC



LEGEND:

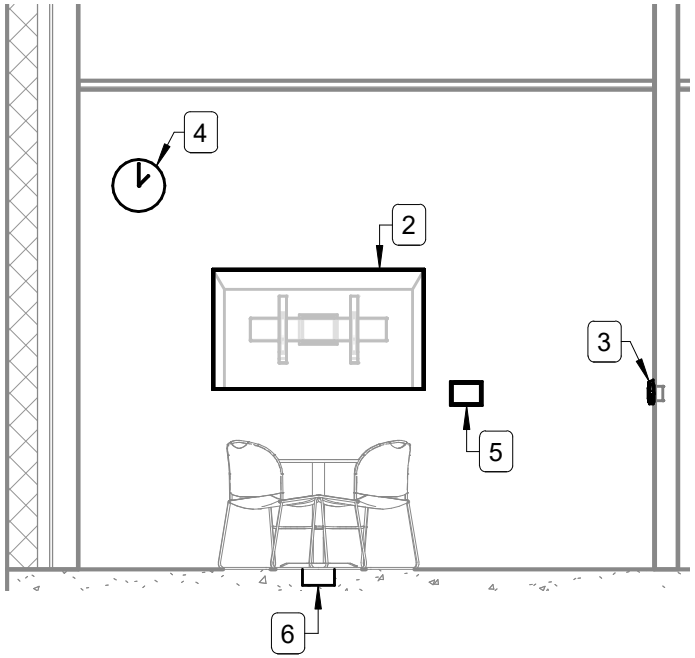
1. MULTI-SERVICE WALL BOX.
2. WALL MOUNTED DISPLAY.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. WALL MOUNTED CONTROL PANEL.
6. AV FLOOR-BOX.

ROOM TYPE: TIER 1 MEETING ROOM: SMALL MEETING ROOM / GROUP STUDY

DRAWING: AV FLOOR PLAN OVERVIEW

LEGEND:

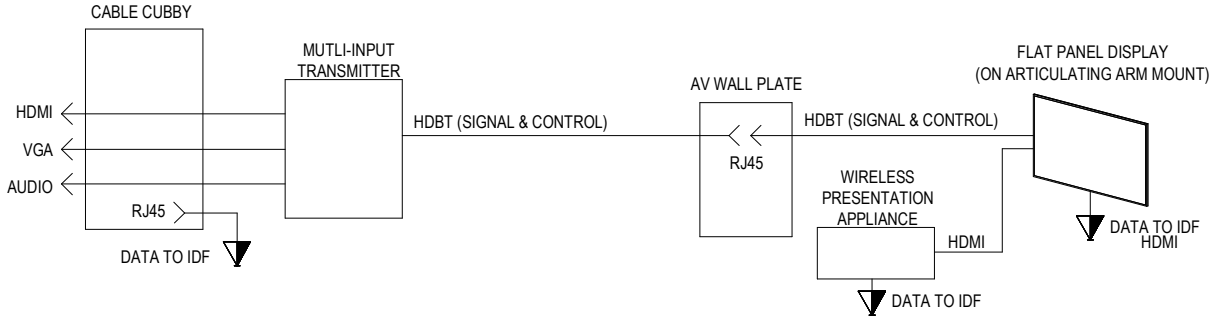
1. MULTI-SERVICE WALL BOX.
2. WALL MOUNTED DISPLAY.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. WALL MOUNTED CONTROL PANEL.
6. AV FLOOR-BOX.



1 ELEVATION

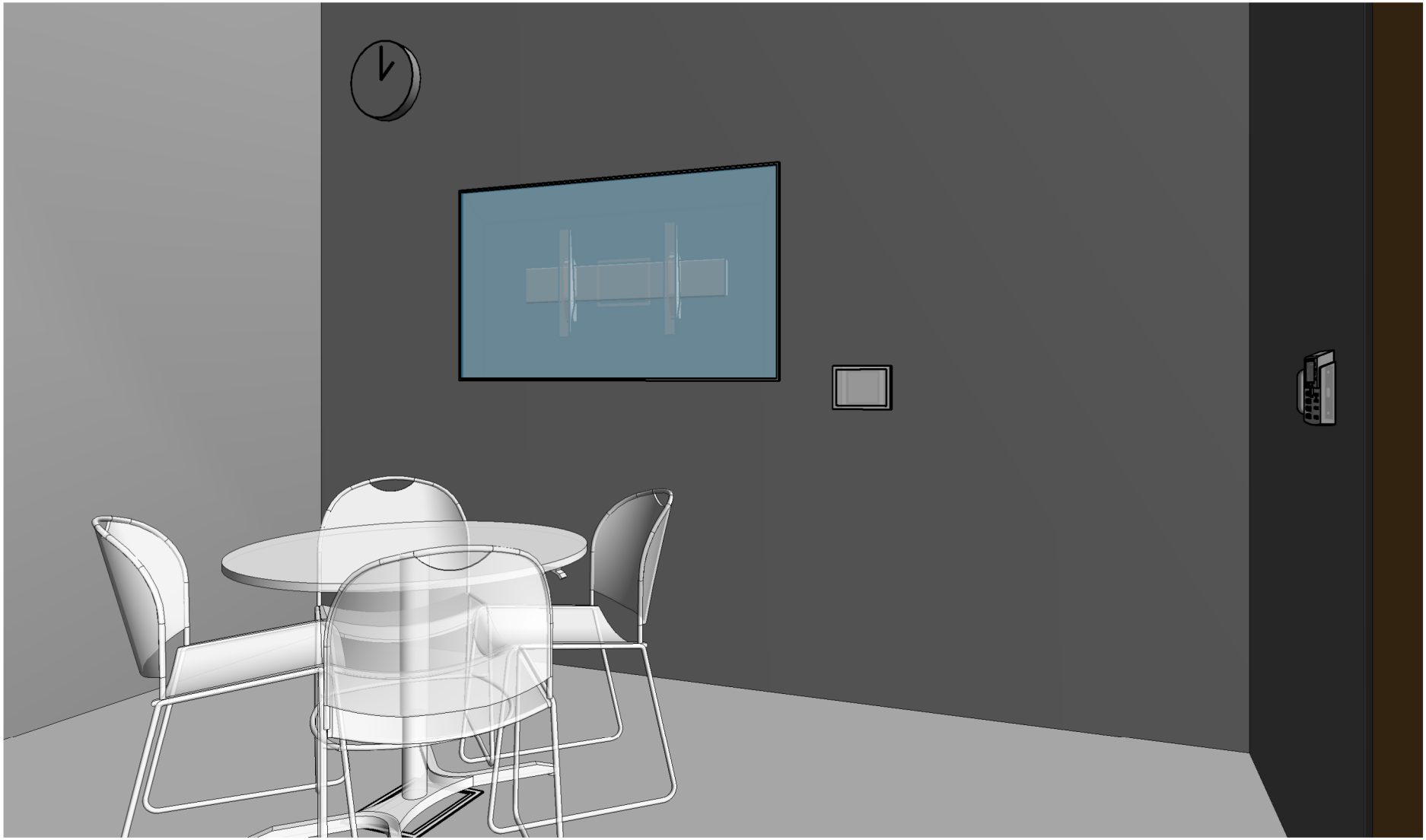
ROOM TYPE: TIER 1 MEETING ROOM: SMALL MEETING ROOM / GROUP STUDY

DRAWING: AV WALL ELEVATIONS OVERVIEW



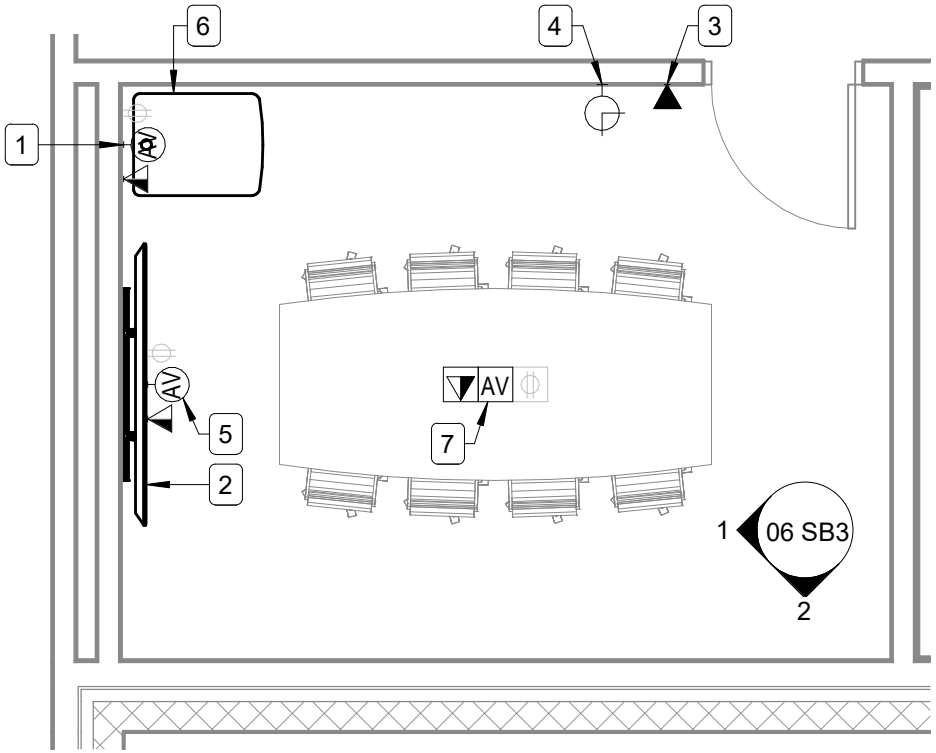
ROOM TYPE: TIER 1 MEETING ROOM: SMALL MEETING ROOM / GROUP STUDY

DRAWING: AV SIGNAL DIAGRAM



ROOM TYPE: TIER 1 MEETING ROOM: SMALL MEETING ROOM / GROUP STUDY

DRAWING: ISOMETRIC



LEGEND:

1. MULTI-SERVICE WALL BOX.
2. WALL MOUNTED DISPLAY.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. IN-WALL AV EQUIPMENT BOX.
6. AV EQUIPMENT RACK.
7. AV FLOOR-BOX.

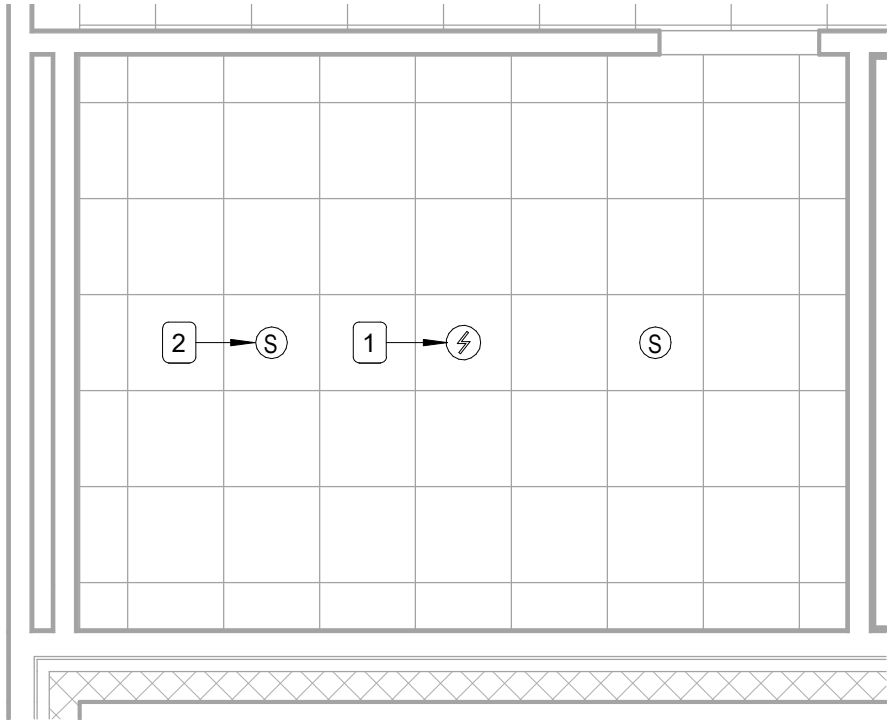
ROOM TYPE: TIER 2 MEETING ROOM: MEDIUM MEETING ROOM / CONFERENCE ROOM

DRAWING: AV FLOOR PLAN OVERVIEW

LEGEND:

1 WIRELESS ACCESS POINT.

2 CEILING SPEAKER - TYPICAL OF 2.

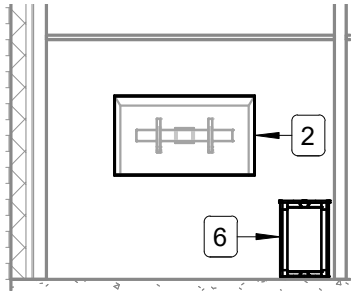


ROOM TYPE: TIER 2 MEETING ROOM: MEDIUM MEETING ROOM / CONFERENCE ROOM

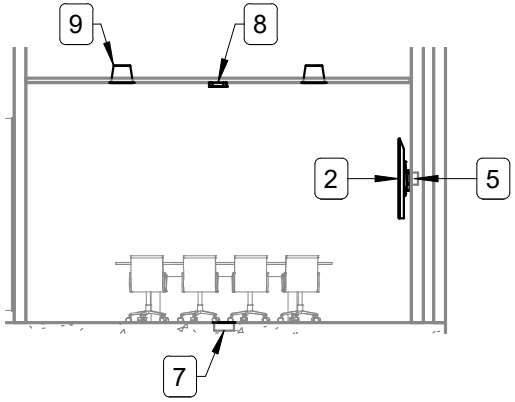
DRAWING: AV REFLECTED CEILING PLAN OVERVIEW

LEGEND:

1. MULTI-SERVICE WALL BOX.
2. WALL MOUNTED DISPLAY.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. IN-WALL AV EQUIPMENT BOX.
6. AV EQUIPMENT RACK.
7. AV FLOOR-BOX.
8. WIRELESS ACCESS POINT.
9. CEILING SPEAKER - TYPICAL OF 2.



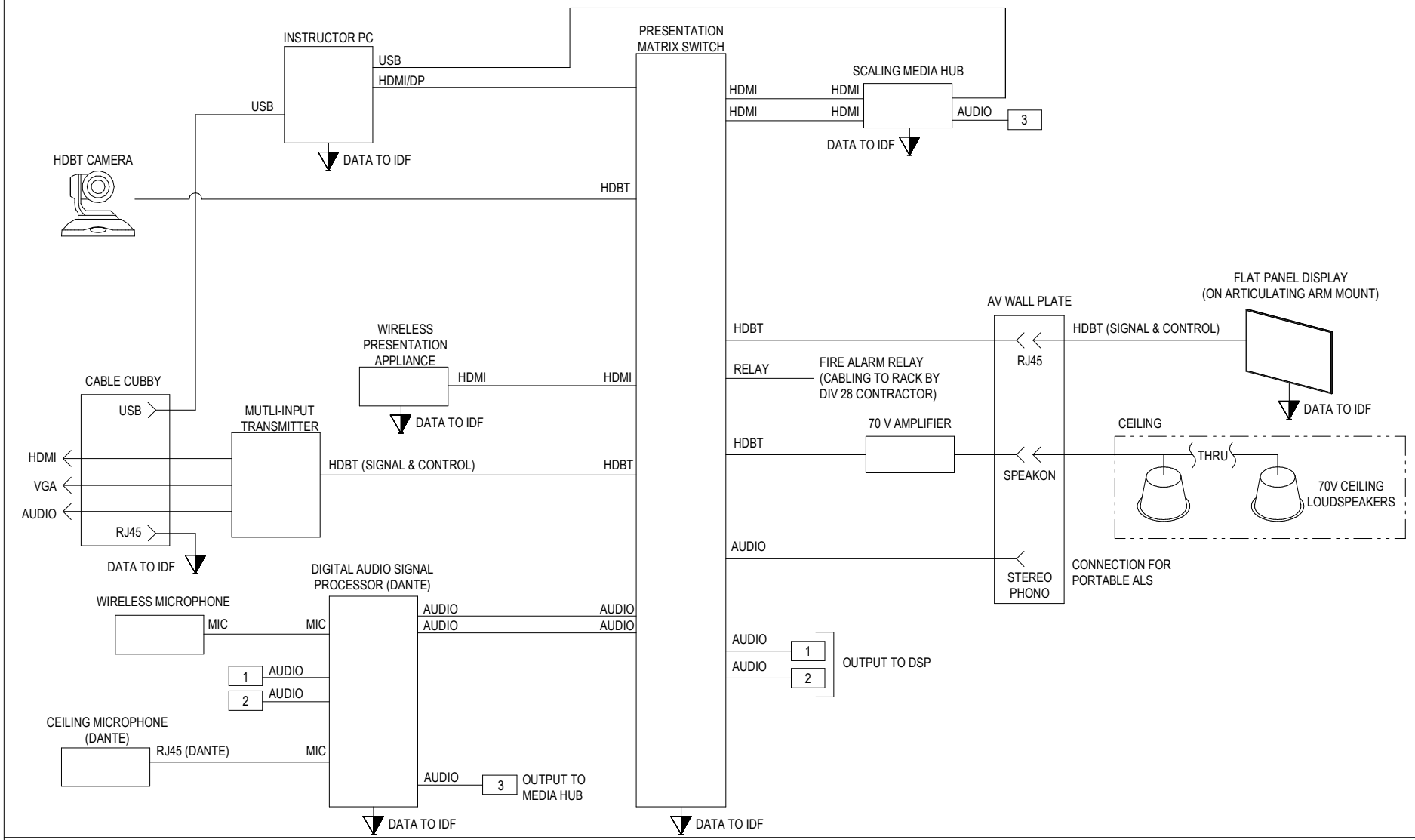
1 ELEVATION A



2 ELEVATION B

ROOM TYPE: TIER 2 MEETING ROOM: MEDIUM MEETING ROOM / CONFERENCE ROOM

DRAWING: AV WALL ELEVATIONS OVERVIEW

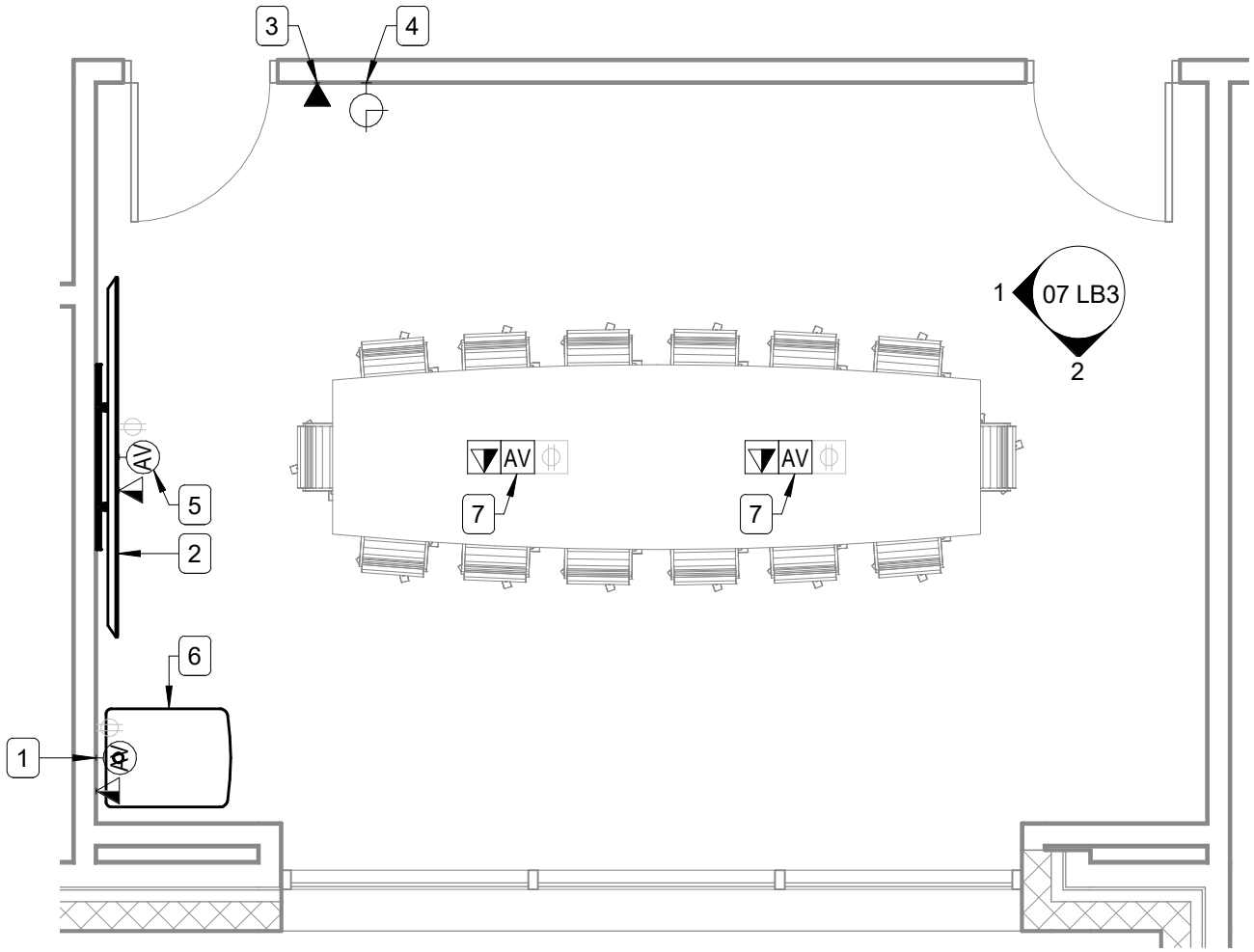


ROOM TYPE: TIER 2 MEETING ROOM: MEDIUM MEETING ROOM / CONFERENCE ROOM

DRAWING: AV SIGNAL DIAGRAM

ROOM TYPE: TIER 2 MEETING ROOM: MEDIUM MEETING ROOM / CONFERENCE ROOM

DRAWING: ISOMETRIC

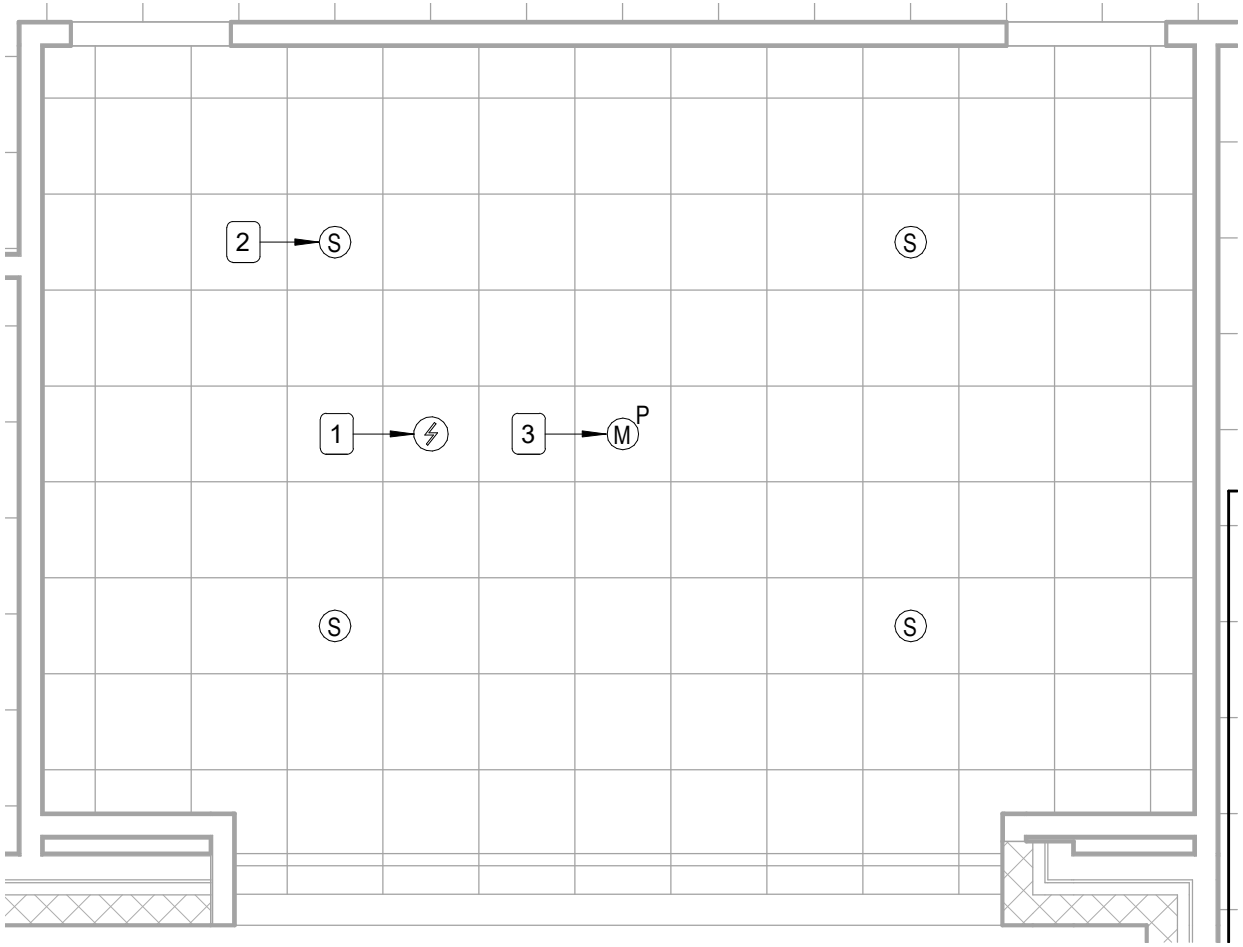


LEGEND:

1. MULTI-SERVICE WALL BOX.
2. WALL MOUNTED DISPLAY.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. IN-WALL AV EQUIPMENT BOX.
6. AV EQUIPMENT RACK.
7. AV FLOOR-BOX.

ROOM TYPE: TIER 3 MEETING ROOM: LARGE CONFERENCE ROOM / BOARDROOM

DRAWING: AV FLOOR PLAN OVERVIEW

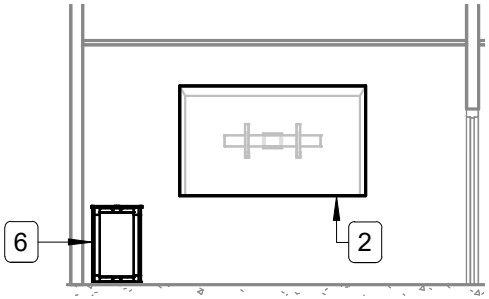


LEGEND:

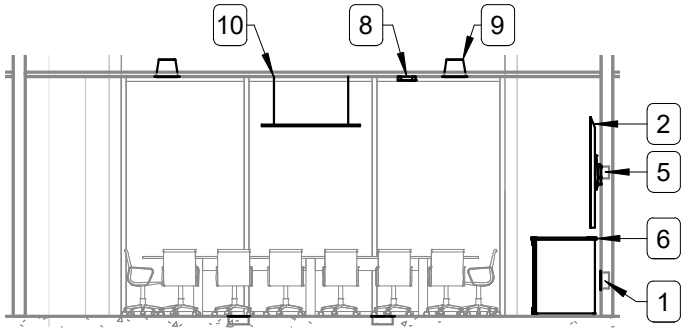
1. WIRELESS ACCESS POINT.
2. CEILING SPEAKER - TYPICAL OF 4.
3. CEILING MICROPHONE.

ROOM TYPE: TIER 3 MEETING ROOM: LARGE CONFERENCE ROOM / BOARDROOM

DRAWING: AV REFLECTED CEILING PLAN OVERVIEW



1 ELEVATION A



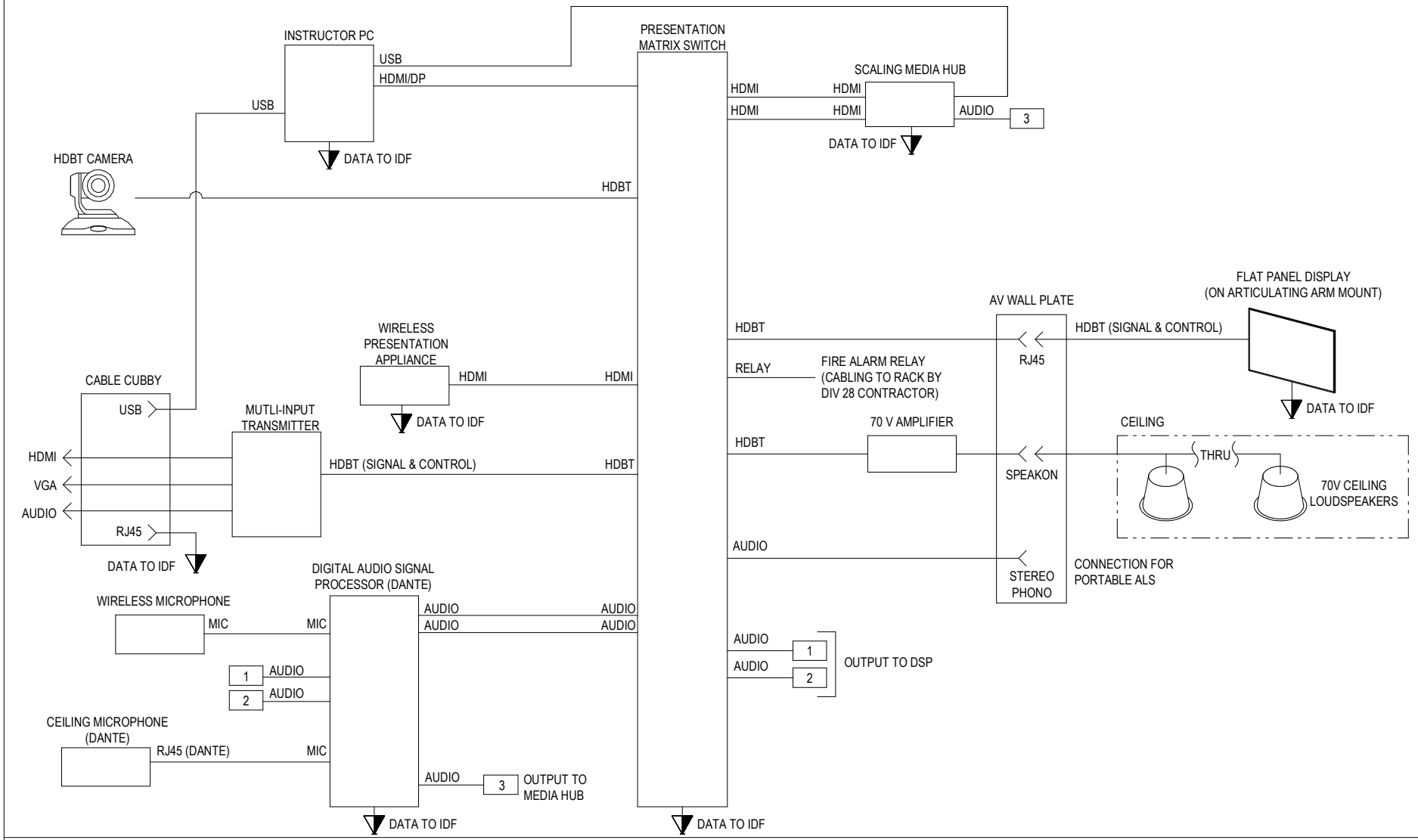
2 ELEVATION B

LEGEND:

1. MULTI-SERVICE WALL BOX.
2. WALL MOUNTED DISPLAY.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. IN-WALL AV EQUIPMENT BOX.
6. AV EQUIPMENT RACK.
7. AV FLOOR-BOX.
8. WIRELESS ACCESS POINT.
9. CEILING SPEAKER - TYPICAL OF 4.
10. CEILING MICROPHONE.

ROOM TYPE: TIER 3 MEETING ROOM: LARGE CONFERENCE ROOM / BOARDROOM

DRAWING: AV WALL ELEVATIONS OVERVIEW



ROOM TYPE: TIER 3 MEETING ROOM: LARGE CONFERENCE ROOM / BOARDROOM

DRAWING: AV SIGNAL DIAGRAM

ROOM TYPE: TIER 3 MEETING ROOM: LARGE CONFERENCE ROOM / BOARDROOM

DRAWING: ISOMETRIC

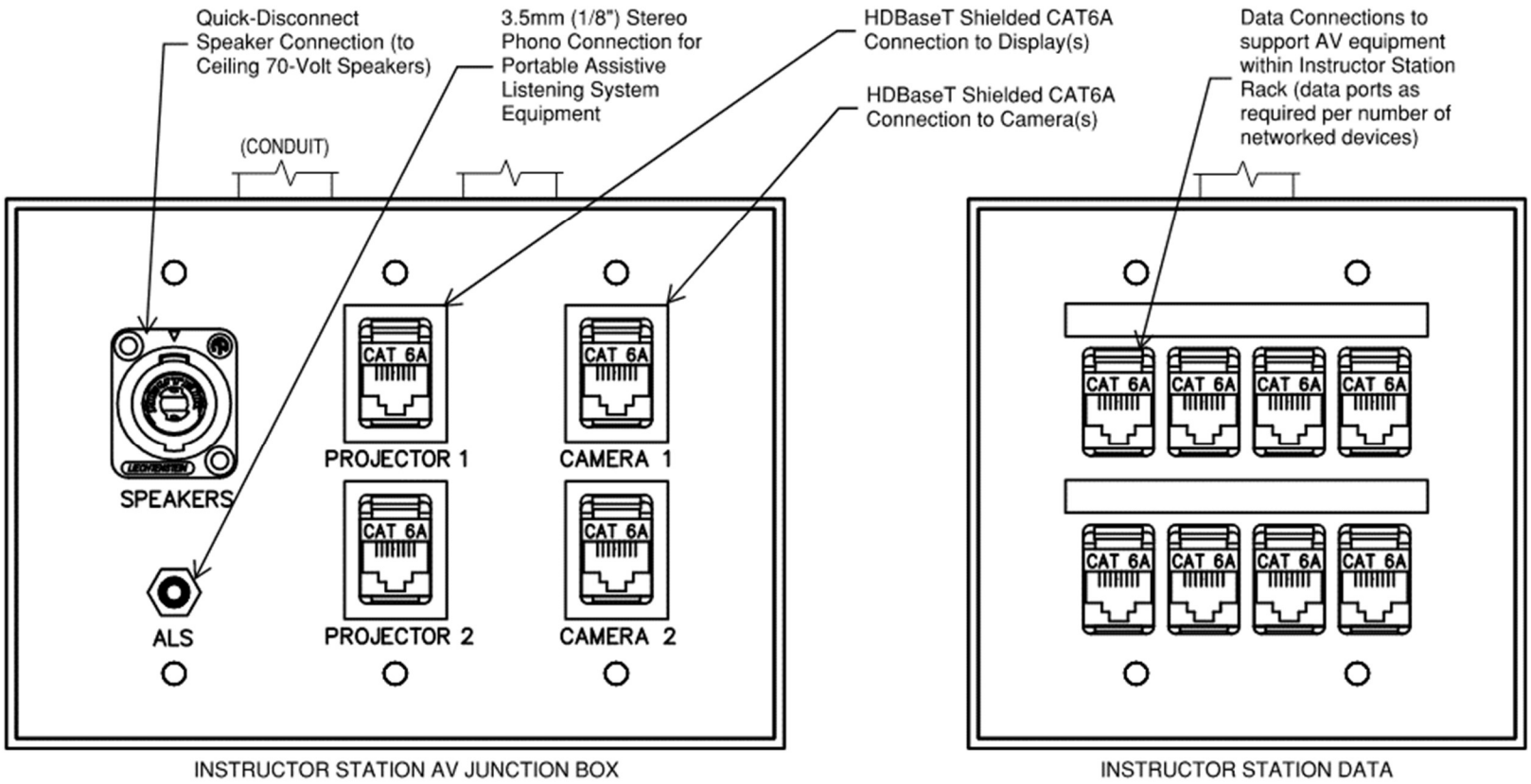
ARCHITECTURAL DESIGN REQUIREMENTS

Power/Data Requirements (Table 1)

Power and Data requirements for all AV system components including Projector, Flat Panel Displays, Racks, Floor Box or Poke-Through (poke-thru) devices, Furniture Cutouts & Wells, Instructor Desk, etc. are listed in the table below. For all designated Audiovisual locations, power and data should be co-located for support as required. Refer also to the LACCD Communications and Security standards where applicable.

Device / Location	Requirements	Notes
Ceiling Projector	(1) 110VAC duplex 15A outlet (2) data RJ45 ports (1) HDBT RJ45 port*	Co-locate near projector pole for shortest cable distance. *Note: Ceiling HDBT cable to be shielded CAT6A running back to corresponding RJ45 port at the instructor station floor box or wall plate.
Wall (Ultra Short Throw) Projector	(1) 110VAC duplex 15A outlet (2) data RJ45 ports (1) HDBT RJ45 port*	Locate behind projector wall mount per manufacturer's plate layout. *Note: HDBT cable to be shielded CAT6A running back to corresponding RJ45 port at the instructor station floor box or wall plate.
Projection Screen	(1) 110VAC 15A hard-wired	On (house) left of screen.
Flat Panel Display	(1) 110VAC duplex 15A outlet (2) data RJ45 ports (1) HDBT RJ45 port*	Locate services within in-wall combination recessed multi-compartment enclosure (with cover). Box to be located in center of display (coordinate with mount and structural backing). *Note: HDBT cable to be shielded CAT6A running back to corresponding RJ45 port at the instructor station floor box or wall plate.
Instructor Station, Wall	(1) 110VAC quad 20A outlet (8) data RJ45 ports (1) HDBT RJ45 port*	Co-locate on wall with AV box – all to be within a horizontal 18" span and hid be side of desk against wall. Mount at +18" AFF. *Note: Station HDBT cable to be shielded CAT6A running back to corresponding RJ45 port at the ceiling projector. Quantity of connectors corresponds to number of displays and remote inputs.
Instructor Lectern, Floor	(1) 110VAC quad 20A outlet (8) data RJ45 ports (1) HDBT RJ45 port*	Locate services within combination recessed multi-compartment large capacity floor box or poke-through (with flip cover). *Note: Station HDBT cable to be shielded CAT6A running back to corresponding RJ45 port at the ceiling projector. Quantity of connectors corresponds to number of displays and remote inputs.
Wireless Access Point	(3) data RJ45 ports	Locate in center of room. *Note: This exceeds common industry standards.
Audiovisual Rack, Large (Cabinet, Free Standing)	(1) 110VAC quad 20A outlet, dedicated circuit (8) data RJ45 ports	Co-locate on wall with AV box – all to be within a horizontal 18" span and hid be side of desk against wall. Mount at +96" AFF UON for full-height rack.
Audiovisual Rack, Small (Credenza, Free Standing)	(1) 110VAC quad 20A outlet (6) data RJ45 ports	Co-locate on wall with AV box – all to be within a horizontal 18" span and hid be side of desk against wall. Mount at +18" AFF UON.
Table Connection (Well)	(1) 110VAC duplex 15A outlet (2) data RJ45 port	Extend power and data to floor connection plate(s) through table leg. (confirm data if needed by program)

Wall Camera	(1) HDBT RJ45 port* (1) data RJ45 port	HDBT cable to be shielded CAT6A running back to corresponding RJ45 port at the instructor station floor box or wall plate or conference room equipment rack. For PoE (power).
Ceiling Microphone Array	(1) data RJ45 port*	For PoE and Dante™ signal for AV digital audio processor.
Wall Clock IP Speaker	(1) data RJ45 port	Locate in front of classroom at +96" AFF.
Ceiling IP speaker	(1) data RJ45 port	Locate in ceiling near room center.
Wall Telephone	(1) data RJ45 port	Locate at +44" AFF within 36" of entry door.



Typical Classroom Instructor Station Audiovisual Connection Plate Detail

Structural Requirements

Structural mounting details shall be provided for all applicable AV equipment on every project.

Refer to Appendix C for sample details. All structural details in this document are for reference only and shall be reviewed by and coordinated with both the project architect and the team's structural engineer for all attachment and structural elements to ensure compliance to building code and with the Division of the State Architect (DSA).

Floor boxes & Poke-Throughs

Floor support devices used for classrooms, conference spaces, etc. shall be coordinated with furniture locations for best location and leg/pedestal positions for cable management. Architect shall provide physical locations for all floor service unit positions based on furniture positions and slab structural requirements.

Floor box (6" deep) (Figure 1) shall be used for combining audiovisual, power and data within one combined unit under Instructor Stations and Conference Room table legs on slab-on-grade locations.

On non-slab-on-grade floors (and if a floor box type cannot be used), a high-capacity poke-through shall be used such as an 8" or 10" Recessed Fire-Rated Poke-Through (Figure 2) depending on the capacity required.

In some cases, a smaller recessed poke-through or floor box may be used if cabling (data/AV) is to only pass-through into the furniture (such as a desk or table) or is only being used for power and/or data connectivity to furniture within the room.

Coordinate power, data and Audiovisual faceplates within each enclosure.

Covers for floor boxes to be flush with the finished floor.

Figure1: Typical Floor Box

Figure 2: Typical Floor Poke-Through

Architectural/Acoustic Requirements

Rooms, particularly those seating 40 or more, shall have a sound system that amplifies the program sound (A/V and computer) for listeners. Larger spaces shall also provide amplification of the instructor's voice. The program sound amplification/speakers shall be distributed throughout the room, while the instructor voice should come from the front of the room.

Ensure there is enough soundproofing between classrooms and their adjacent spaces to provide a comfortable learning and teaching experience with minimum sound distractions.

Be aware of the acoustics within the room, especially in larger spaces. Slight changes or enhancements to furniture and finishes can reduce echoes and reverberations. In rooms where sound isolation is critical, walls shall be full-height to the deck to minimize audio bleed-over from or into the room. Reference ANSI/ASA S12.60 for more information.

For web-conferencing, broadcast and recording spaces within classroom, acoustic coverings on opposing walls provide the best support for audio absorption during recording or live streaming of classroom sessions (to help reduce echo). Also, cooler colors and larger patterns (preferably none at all) work better with cameras to prevent a moiré effect on video capture. No thin patterns or lines should be provided.

Signage

Room numbers shall identify all classrooms at the door entrance and be consistent with building signage. Assistive Listening Signage shall also be placed for easy viewing.

Infrastructure for Interactive Signage and Room Scheduling shall be included comprising of a 2-gang junction box on the outside of each classroom, conference room and meeting space door. Each junction box shall be located at +44" AFF to the vertical center of the box and shall have a single 1" EMT conduit extending to the closest cable tray or to 6" above the accessible ceiling to accommodate a single CAT6 data cable.

Layout

Flat floor rooms offer the most flexibility in day-to-day use and are more cost-effective to renovate or reconfigure. Tiered floors should typically be constructed in larger capacity rooms.

It is generally cost-prohibitive to change a currently tiered/sloped classroom into a flat floor classroom and vice versa.

Addressing accessibility requirements is more challenging in tiered rooms and typically requires additional space (e.g., for compliant ramps).

Seating and Furniture (Student)

Furniture trends have resulted in desks that are larger than those used years ago, while provisions for accessibility require wheelchair accommodations and passage through a room. As a result, the seating capacity in a renovated classroom may decrease. In recent classroom renovations at the District seating capacity has been reduced by about 20% or more.

Moveable chairs should be light-weight and/or on wheels or casters to allow for rearrangement and grouping.

When feasible, allow for variety of seating and writing surface styles within a room to accommodate different student preferences. Some spaces may justify power to the tables to accommodate long-term student connections for charging their devices (note that power and data may be required also in certain conditions such as Computer Labs, etc.).

In larger Lecture Hall spaces, sloped or tiered-seating may be utilized to assist with student viewing. Depending on the layout of the space and the angle of the floor, stepped seating risers can range from 4" and greater in the platform height with standard stairs allowing access into each row.

Please note first that LACCD prefers that, when possible, the instructor station connection box should be fed from the wall with services rather than through floor boxes or poke-throughs.

Standard AV conduits typically includes dedicated 1-1/4" conduit for main AV connections and cabling. Larger conduit sizes may be utilized where multiple AV cables are run to a single location (e.g. sleeves or to cable gutters). Smaller 3/4" conduits are not permitted for AV cabling use.

Typically, backboxes are one and two gang in size, with custom size manufacturer back boxes utilized for special items, like touch panels or in-wall camera housings or the instructor station (2-gang & 3-gang). Note that all wall junction boxes are to be recessed in-wall type and deep style (3.5") for accommodating equipment and cable bends. Behind the typical flat panel displays, larger capacity multi-service consolidation boxes shall be used to help contain power, data and audiovisual conduits and connections.

Conduit shall be sized appropriately not to exceed 40% fill and future expansion should also be considered since additional cable may need to be added in the future. Conduit shall be used in spaces that are not accessible, for example, from in-wall mounted junction boxes to accessible ceilings.

Note that all conduits shall be labeled to their intended destination and shall include pull-strings for easy identification and cabling installation support.

Conduits To Devices

The designer shall review the system intent and size the conduits and quantities accordingly for the number of cables to be run within each (not exceeding the recommended fill ratio per NEC guidelines). Conduits are to be stubbed-up 6" above the accessible ceiling tiles.

When used in a hard-lid ceiling condition, conduits can be run up above the ceiling to the closest available accessible area in the ceiling (within the same room) or shall be contained within a complete conduit system to consolidation points or access panels.

When the room is an open-ceiling type (e.g. no ceiling), conduits shall be run and stubbed out of the wall at a 10'-11' height (unless otherwise noted and coordinated by project design) to a cable gutter to be cleanly ran through the room. In-wall consolidation boxes can be used to help conceal the conduits and cabling for better room aesthetics. All exposed conduits, consolidation boxes/covers and cable gutters or raceways shall be painted to match the room conditions per the architectural finish schedule (walls and ceilings).

For reference, the table below indicates the following minimum audiovisual conduit sizes (note that telecom and power will have separate conduit requirements) that can be used for planning room infrastructure (refer also to Appendix E for conduit diagram):

Device	Qty. (min.)	Size
AV Rack*	2	1-1/4"
Floor Box (or Poke-Through)	2	1-1/4"
Lecture Capture Camera	1	1"
Flat Panel Monitor	1	1-1/4"
Wall Speaker (each)	1	1"
Ceiling Speaker (to each in series)	1	1"
Ultra Short Throw Projector (wall mounted)		1-1/4"
Ceiling Projector		1-1/4"
Ceiling Microphone	1	1"
Wall-Mounted Wireless Microphone or ALS Antenna		1"
Control Panel (wall)	1	1"
Room Scheduling Panel	1	1"

***Note: Each instructor's lectern to have (3) total dedicated 1-1/4" conduits. One for AV connections, and a second for future Hyflex System cabling. These two AV conduits are to be terminated on a triple-gang deep (3.5") box. A third conduit to be terminated on a dual-gang deep (3.5") box for Data cabling and connections.**

Lighting

The lighting system must provide a comfortable level for reading and writing at the student stations plus the ability to light the writing surface and screen at the instruction area independently of the rest of the classroom. It should allow everyone in the room to see each other's faces easily to foster class discussion. Refer Foot Candle (fc) Guidelines in Table 2 on the following page.

Interior lighting should allow for variety of lighting scenes from full illumination to subdued lighting for projection.

Banks of lighting near the digital display (front row) shall be switched separately from the remainder of the lights. This will prevent screen image wash-out on projected surfaces.

Lighting must provide a level of room darkening to view projections on the front screen that also provides sufficient lighting for note taking.

All classrooms shall have no less than two separately controlled lighting areas – seating area and instructional area. The ability to dim both areas shall be provided as standard.

When possible, pendant-style lighting shall not be used in concert with projection screens and projectors to avoid conflict between the lights and the projected image.

When the classroom is dimmed for projection, some lighting will be required at the presentation area. Special lighting on the equipment rack or technology controls may be needed.

As a rule, all classroom spaces will have lighting organized into a number of zones. These zones can be combined and dimmed to create any number of different lighting scenarios. Classroom lighting should include day lighting, multi-modal lighting, controllability, and optimize energy performance. A room can be zoned based on the amount of day lighting available, with each fixture responding to the amount of light at any time and location.

Dimmer or toggle switches are preferred; no programmable lighting system should be installed without prior approval from LACCD.

Where programmable lighting is planned, provide a mock-up for instructor review well before planned installation allowing time for modifications to product selection.

Place back-lit switches at every room entrance, to provide at least minimal room illumination so users never need enter a dark room. In windowless rooms, provide a small light at the door.

Locate lighting controls with a clearly labeled switch-plate on the instructor multimedia lectern, and on the wall nearest to the instructional area. Where programmable lighting is used, controls should be integrated into the multimedia control panel.

Reference Engineering (IES) "The Lighting Handbook".

Recommended Zoning for Classroom Lighting

Zone 1 – Main classroom lighting (student seating area) this zone services students and allows them to read and take notes in class. Use multi-directional recessed (lay-in) fixtures that cast a modest amount of light downward (35%) and a larger amount of light toward the ceiling (65%), provides a comfortable overall lighting with relatively high efficiency. Avoid pendant mount fixtures. Note: Dimensional AV coordination required for any pendant mount solutions in classrooms.

Zone 2 – Instruction area (front of classroom and lectern area). Design whiteboard and demonstration table lighting to provide visibility when the room lights are at full intensity. The foot candles in this area should be consistent with the overall lighting of the room.

Zone 3 – Non-projection white board (board that is not obscured by a lowered projection screen). Lighting of white boards during concurrent AV presentations allows instructor to write on the board while in projection, without light bleeding over onto the projected image.

Zone 4 – Projection white board (board that is obscured by a lowered projection screen) Use the same requirements as Zone 3 during non-projection mode.

Zone 5 – Instructor workstation. The instructor should be able to read notes and use “on-board” AV equipment with low-light conditions of projection mode. In this condition, the overall room lighting may be lowered to better focus on the screen image and presentation.

Emergency Lights

Locate emergency light radiation away from the projection screen.

Color Temperature

The color temperature for all light fixtures should be the same. The color temperature goal is 3200 degree Kelvin. Color temperature range of 3000-3500 degree Kelvin is acceptable as long as all of the fixtures are the same.

Foot Candles (fc) Guidelines*			
	Day Lighting Mode	General Mode / Non-Day Lighting	AV Mode
Student Desk	30 fc min. – 150-200 max.	30 fc min.	10 fc min.
Whiteboard	20 fc vertical min.	30 fc vertical min.	
Projection Screen	N/A	N/A	8 fc vertical allow 8:1 video image with 5000 lumen projector
Walls	10 fc vertical	10 fc vertical	N/A
Conference Room Table	20 fc min.	30 fc min.	20 fc min.
*Based on the “IESNA Lighting Handbook and Application”, Ninth Edition			

Table 2: Recommended Foot Candles

Motion Sensors

Motion sensors are preferred in all rooms. When installing motion sensors, be sure to set timer to maximum to avoid light shut off during low-motion activities such as test taking. Sensors are to be wired to the security system for notification purposes by the proper department monitoring such systems.

If rooms are equipped with occupancy sensor lighting, BOTH motion and heat must trigger it. In addition, a manual override system should be in place. Occupancy sensors shall have time delay adjustments of 30 minutes before turning lights OFF.

Wall Clock and Paging Speakers

Network (IP) based wall clock speakers that are connected to the SingleWire InformaCast™ network and software are to be deployed in each classroom. A wall data jack and CAT6A cabling shall connect each digital clock speaker to the campus network. It may be preferred by facilities and program for the use of a PoE analog clock (non-speaker) option. These clock speakers are to be used for campus (or classroom) specific announcements through the paging system.

Room and Finish Color and Texture

Simple and relatively less-expensive cosmetic upgrades, such as painting previously white walls or carpeting previously tiled floors, can significantly increase satisfaction with rooms and provide a more comfortable learning experience.

Refer to classroom architectural and aesthetic guidelines per Facilities standards for additional support.

Flooring

Carpeted flooring provides better acoustics in conference spaces but is not used in the typical LACCD classrooms due to maintenance issues. Typical classroom spaces may be treated concrete or Vinyl flooring.

In auditoria spaces, oftentimes only the circulation areas/aisles are carpeted and the student stations are tiled, for easier cleaning and replacement but this is to be confirmed with LACCD during the project program phase.

Wood or other non-tile flooring options have different maintenance and upkeep requirements. There may be cost implications to choosing non-traditional flooring options.

Cabinet & Millwork Equipment Ventilation

Within each cabinet or millwork/credenza bay, one fan (minimum) shall be installed to evacuate the heated air from the rear of the equipment rack(s). Provisions (refer to details for millwork in the Appendix) shall be included to accommodate incoming fresh air (in the lower front section) and an exhaust (top or side) to facilitate a fan-assisted convection flow. The fan kit shall include front and rear grills to protect from objects entering the moving fan blades. The fan(s) shall be quiet-type (<25Db.) and shall be sized to help move the air through to the evacuation vent in each bay – typically 50CFM x number of fans required. Provide thermal sensing to activate fan system(s) as required. Top and side exhaust ports should include a grill (possibly separate from the fan grill depending on location and installation method). The front air inlet can be sized and located in toe-kick area but if located on the exposed front lower door area, a grill should be included. There are many aesthetic grill options that can be considered to compliment the millwork as required.

DISABLED ACCESS COMPLIANCE AND ACCOMMODATIONS

General Information

Qualified individual with a disability shall be able to participate in the benefits of the services, programs, or activities of the colleges. LACCD facilities shall be designed and constructed in compliance with the Federal Americans with Disabilities Act (ADA), and the California Building Code (CBC) requirements. When there are differences in the regulations, the most stringent shall be followed. Compliance shall be provided in the most integrated setting appropriate. Equipment and accommodations shall be provided as necessary to facilitate effective communication without compromising independence or privacy of the individual with a disability.

Assistive Listening Systems (ALS)

An assistive listening system shall be provided in assembly areas, including classrooms, lecture halls, and conference and meeting rooms per CBC section 11B-219.

Permanently installed assistive-listening systems are required in areas where the following conditions are present (1) the space accommodates at least 50 persons or has audio-amplification systems, and (2) the space has fixed seating.

Portable assistive-listening systems may be provided in all other areas required to have ALS. Portable system may serve more than one room. An adequate number of electrical outlets or other supplementary wiring necessary to support a portable assistive-listening system shall be provided.

Receivers required for use with an assistive listening system shall be hearing aid compatible; binaural/stereo. Earbuds are not acceptable. A 3.5mm stereo audio cable in the desktop connection boxes shall be provided to connect to the portable ALS system(s). 72MHz is the standard for ALS on all LACCD campuses.

Each assembly area required to provide assistive listening systems shall provide signs informing patrons of the availability of the assistive listening system. The sign shall include wording that states “Assistive-Listening System Available” and the international Symbol of Hearing Loss. Sign shall be posted in a prominent place at or near the assembly area entrance where arriving persons would easily notice.

Assistive listening signs shall comply with signage requirements of ADA and CBC, and campus signage standards.

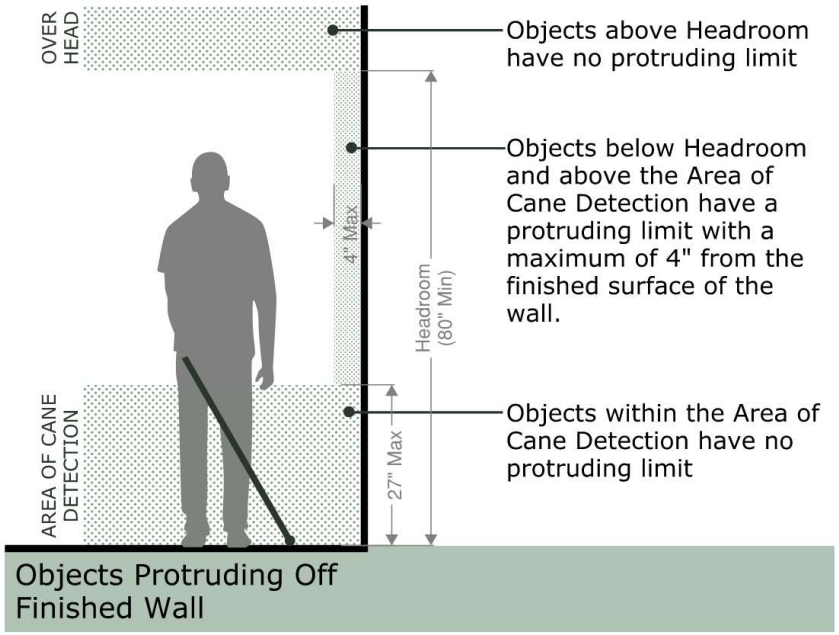
International Symbol of Access for Hearing Loss

Visual Support / Closed Captioning

All pre-recorded content sources shall support Closed Captioning (CC). All live video content being captured or played back shall have live transcription or encoded captioning that can be activated on the content. All flat screens must be CC capable.

Protrusions from Walls and Ceilings

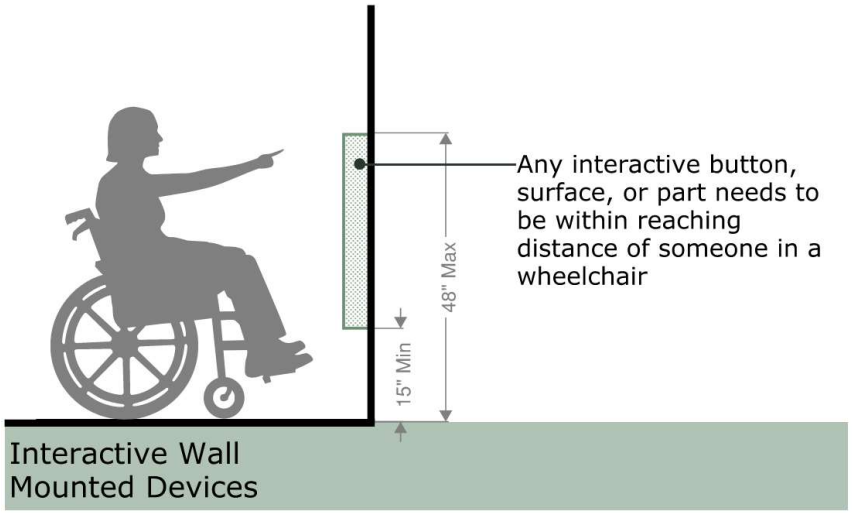
Vertical clearance of 80 inches high minimum shall be maintained throughout all circulation areas. Ceiling mounted equipment shall not reduce this clearance. Wall mounted equipment shall not project from walls by more than 4" when their leading edges are between 27 inches and 80 inches above floor. Examples include but not limited to wall mounted flat screens, control; panels, wall mounted racks, cameras, etc.



Acceptable Clearance for Wall and Ceiling Obstructions

Controls and Operating Mechanisms

All wall or cabinet mounted control switches, and operating mechanisms shall be on accessible routes, and within accessible reach ranges per regulations. When reach is unobstructed, the high end of accessible reach range is 48” above floor to the top of the control, or operating mechanism, and the low end is 15” to bottom of the control, or operating mechanism. Refer to ADA Standards, and CBC, for requirements, and limitations when reach is over obstructions, such as cabinets. Install wall boxes at appropriate heights to achieve required compliance.



Un-obstructed Approach

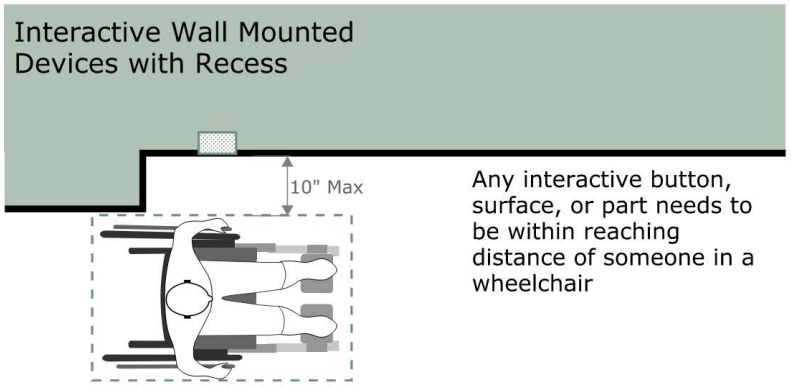
Accessibility for Instructor

Instructor stations shall be adjustable in height, or provide two fixed-height teaching positions for various statures, and seating preferences. Top of desk at accessible position shall not be higher than 34” above finish floor. Minimum 19” deep, 27” high, 36” wide clear knee and toe space shall be provided below the teaching station desk top. Controls, operating mechanisms, and desk mounted outlets shall be within accessible reach ranges. Monitor(s) size and position, and lighting shall be considered for each position. Aisle width leading to fixed stations shall not be less than 48” behind the desk. Electrical, and network connections shall be concealed. Loose wires draped on the floor are not acceptable.

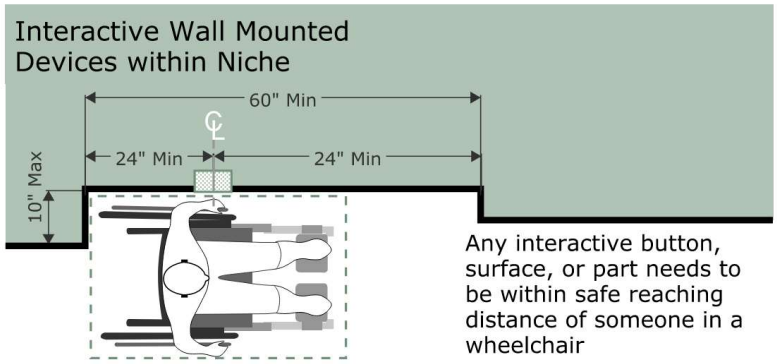
Interactive Touch Screen Communication Screens

Electronic communication systems that require a user to visually perceive information and touch a display screen to operate create access barriers for persons who are blind or have low vision. To ensure equality and appropriate access for public and students, LACCD and its Colleges shall not purchase, rent or lease, or allow outside entities to install systems in which the end user must rely solely on the touch screen system for operation of the equipment. Systems which are touch screens must have a parallel operational system that can be used by persons who are blind and have low vision in an independent manner. Relying on attendants or assistance to operate the equipment for the person with the disability would not be perceived as providing equitable access. When keyboards are used, keys shall be tactilely discernable without activating the controls or keys.

Touch screens shall be located on accessible routes, with a minimum 30” X 48” level floor or ground area directly in front of the screen. The 48” long side shall be centered in front of the controls. If screen is inside an alcove deeper than 10”, the alcove width shall not be less than 60”. Controls shall be within accessible reach ranges. The deeper the reach, the lower the control heights will be.



Interactive Touch Range



Reference Plane Relative to Operational Controls

The United States Access Board has guidance regarding this matter and many other that relate to accessible technology and which may be encountered within the touch screen systems. Items include:

- Auditory Output with Volume Control (for the Blind)
- Color Coding (for people with Color Blindness)
- Color and Contrast Settings (People with low vision)
- Screen Flicker (People with seizure disorders)

Additional guidance can be found at http://www.access-board.gov/sec508/guide/index.htm

It is highly recommended that input from the disability community be obtained prior to deployment. It is suggested that these devices be field tested by people with a variety of disabilities to ensure ease of use.

SYSTEM DESIGN REQUIREMENTS

Classroom Control Systems

The control system in the typical classrooms shall be based on a web interface driven from the room's dedicated PC and monitor. Control of the screen shall be either a touch interface or by mouse control.

The control processor shall be a rack-mounted type that will govern all source transport controls, display input and control and all internal base processing, timing and control including microphone and audio levels, the receiving and transmitting of all external triggers and interfaces (lighting, shades, screens, emergency notification, etc.) and network connectivity for remote management.

The control processor shall be networked-based and shall connect to the designated LACCD network for interfacing with remote management systems.

Conference Space Control Systems

The control system in the typical conference spaces shall be via a wall mounted or desktop flip-up touch control panel.

Remote Networked Management Application

All control systems shall be set up to be connected to the primary remote management system via network connectivity. The system shall allow for remote monitoring and control of AV systems from a central location. All program hooks for both source devices (including all transport controls) and display sync devices (projectors, monitors, archival appliances, etc.) shall be accommodated for the possible monitoring and control of all connected equipment and the capturing of all usage data for possible reporting and review of room status and device activity.

Sources & Inputs

Room dedicated computer – the classroom dedicated computer shall be installed at the instructor station and shall be a small form-factor PC connected to a monitors at the instructor desk (the second monitor is tied directly to the presentation switcher output). The computer shall be controlled from a wired keyboard and mouse or touch-screen monitor. Wireless HID (human interface device) devices may be coordinated with the LACCD and each individual campus IT Department for their use. A USB extension cable shall be provided from the computer to provide the ability to connect USB drives at the instructor PC. Interactive monitors shall also be outfitted with USB connections to the main room PC. A standard Kensington™-style cable lock shall be provided to secure the PC (unless clamped to a rack shelf).

Blu-ray / DVD Player – This source equipment may be included and shall be installed in the instructor station. Instructor will load media manually and select the source from the push button control panel. The Blu-ray player shall be a 4K upscaling model and shall support CEC and IP control.

Auxiliary audio/video input – Auxiliary audio/video inputs will be located at the instructor station desktop and will include an HDMI connection for digital video. Power and data local to the connection points should be included. For interfacing with legacy equipment requiring VGA (HD-15) and composite video (RCA for VCRs), an adapter unit to an HDMI input can be integrated within the rack to accommodate older source devices and coordinated with room and department programming.

A 1080p or better resolution document camera will be a common auxiliary equipment type required in classrooms. The document camera shall be connected by HDMI to the classroom presentation switcher and via USB to the PC for image capture and control. The

(Sources & Inputs, continued)

camera can also be used as a video capture appliance for web collaboration in classrooms when required. Where required, instructor stations shall include a lockable drawer also accommodating the permanent and secure installation of the document camera. If no lockable drawer is available, the standard Kensington™-style cable lock shall be provided to secure the unit to the surface.

Specialty sources can be connected to the typical classroom system to expand curriculum for new technology elements including digital microscopes & oscilloscopes, virtual reality devices, etc.

Projectors

Ceiling-mounted video projectors will be used to display video and computer images on a motorized projection screen,

Minimum light output requirements for projectors in classrooms are 6,000 ANSI lumens. Large rooms and rooms with high ambient light may require a video projector with higher light output such as 7,500+ lumens.

Data network connection for network control and remote governance & status requesting and control.

WUXGA resolution (1920 x 1200 pixels) to support 1080p video formats and higher computer resolutions. Projector to have 3-chip color processing.

Projector security with equipment tray and key lock. All locks for projector mount should to be keyed alike and coordinated with Campus Media Services and Facilities Departments.

Projector mount: Ceiling panel mount. The Ceiling Panel shall feature two knockout panels for electrical and audio video boxes and shall contain a 1 1/2” NPS lock nut welded in place. It shall include a 1 1/2” x 3” NPS threaded pipe.

Source connection types to include a high-definition input such as HDMI, or HD-base T. HD-base T is the preferred signal input from the presentation switcher to the projector and shall accommodate display control. For systems using the HDMI input, control shall be done via IP through the projector’s LAN connection.

Projection Screens

Size – screens shall be sized to accommodate good viewing at student seat locations. Minimum screen image height is 60” with a student seat location 25’ from screen. (standard rule is 1’ of screen image height for every 6’ of distance from screen.) Bottom of screen image shall be no less than 4’ above the finished floor and preferred to be 6’ if possible, to clear the head of a typical standing presenter and all seated participants.

Aspect Ratio – typical aspect ratio shall be 16:10 (widescreen format) for computer content and video content viewing.

Screen location – screen shall be located at front wall at a centered position. Screen location shall accommodate a minimum 6’ width of writing board surface adjacent to screen. This design is intended to allow an instructor to use the writing board while a projected image is being shown. Screen shall not be blocked by the Instructor Desk. The screen shall be positioned 6”-8” from the wall surface to clear obstructions such as whiteboard clips, clocks and fire beacons when lowered.

Screen material – screen material shall be a matte white with a black 2” border. Screen material shall have a gain of approximately 1.0. Screen material shall have a solid black backing to prevent rear light sources (windows, etc.) to pass through. If extreme conditions persist due to room architecture for side lighting, etc., an Ambient Light Rejecting screen material can be used to help control the screen washout effect due to overhead and side lighting or windows.

Installation – screens shall be ceiling or wall mounted per the room conditions. Typical classroom and meeting/conference space screens shall be motorized for quiet yet quick screen retraction.

(Projection Screens, continued)

Where required on larger (auditoria) image sizes, motorized ceiling recessed projection screens with a manual switch located near the instructor station and a low voltage parallel interface for AV system connection shall be used.

Motor & control – screens shall have hard-connected ceiling or wall power located on the left (house-left) side and shall be run to the wall low-voltage control switch with a connection wire for operation. A parallel low-voltage control wire for up/down relay operation shall be run to the AV rack or instructor station position for remote system operation. This relay wire shall be run and coiled with a slack 10' of cable for installation within the rack leaving enough cable for a service loop or tether within the harness. The wall control switch shall be located near on the front wall (not behind the lowered screen) at located at +44" AFF on the same side as the teaching position. The wall control switch is a 1-gang Decora™ device and

can be shared in the same junction box with other screen wall switches (e.g. dual screen conditions require a 2-gang junction box). These switches shall be co-located (where possible) with other services such as lighting and HVAC controls for aesthetics. The screen motor shall be a quiet type.

Motorized wall mounted type and shall be non-tab-tensioned. Wall mount spacer brackets to be used as required. For larger lecture or auditoria spaces, tab-tensioned screens shall be used for any screen sizes over 200" diagonal.

Motorized in-ceiling type and shall be non-tab-tensioned. Wall mount spacer brackets to be used as required. For larger lecture or auditoria spaces, tab-tensioned screens shall be used for any screen sizes over 200" diagonal.

Note: For Retrofits – When there is a choice between an image being too small and line-of-sight, retrofits shall prioritize an absolute maximum of 8X distance vs. screen height. If necessary, the image may to go lower than optimum so students in the rear can read the text clearly without strain. Per LACCD, the bottom of the screen does not have a large impact on the presentation that outweighs the need for visibility of all students.

Projected Image Contrast Ratio

Projector contrast ratio should be a minimum of 20,000:1, minimum contrast ratios are listed below. Reference ANSI/INFOCOMM 3M-2011

- Passive viewing 7:1 Images and text distinguishable from background; informal viewing of video and data
- Basic decision making 15:1 Bullet point text, documents, spread sheets, charts and graphs
- Analytical decision making 50:1 Assimilation, retention and analysis of Images and text that contain finest detail
- Full motion video 80:1 1 High level of engagement with film, video or television programs

Flat Panel Displays

Flat panel displays shall be wall-mounted; an in-wall AV storage/combination services box shall be used to house connections and small electronic devices. Power, data and AV connections shall be located in the AV box as separated services within their own dedicated junction boxes and conduits. Displays shall be sized to accommodate viewing distances and the display format shall be 1920x1080 minimum resolution. Control shall be via IP / network where available but shall also support RS-232 (serial) bi-directional communication as a secondary control method.

Flat panel displays shall be commercial type for all applications.

Audio Support

Rooms shall have a sound system that amplifies the program sound (AV and computer) and larger spaces will require amplification of the instructor's voice (voice amplification or reinforcement) via a fixed or

(Audio Support, continued)

wireless microphone system (in rooms that require the use of a wireless lapel microphone system). The program sound amplification

and instructor voice speakers should be distributed throughout the room for even audience coverage and monaural playback.

In certain spaces, the program may dictate for stereo audio playback for program content sources. When this is required, dual stereo speakers shall be located at the front (+96" AFF) on either side of the projection screen(s).

Other specialty spaces may also require Surround Sound, 5.1, 7.1 Dolby Atmos, etc. for film production or editing classrooms and/or the addition of subwoofers for low frequency audio response in athletic or music classrooms. These are not covered in these standards but the guidelines within this document for installation and ADA clearances shall still be applicable.

Wireless microphones and ALS equipment should be tested to ensure there are no dead zones and that the contractor has coordinated channels around an RF spectrum analyzer for the best available spectrum and channel selection.

Distance Education Support & Web Collaboration

The instructor may, curriculum dependent, wish to leverage real-time collaboration or conferencing to bring in a remote presenter or share the classroom experience. Many inexpensive or free software options are available to accommodate this (Zoom, WebEx, Goto Meeting, etc.) and can be used on the room PC (District limitations on software installation and permissions apply).

Using a camera with either an HDMI, HD-base T or USB connection/output and a ceiling microphone attached to the PC through a "media hub", the "far-end" or remote participants can be displayed on the screen via the PC source and heard via the in-room speakers. Care should be taken to control the input audio to prevent echo or feedback when using a voice-amplification system.

Audiovisual Device & Cable Labeling

All audiovisual devices shall be labeled for easy identification with as-build system diagrams with titles such as "AV PC", "SWITCHER", "AMPLIFIER", etc. All audiovisual cabling shall be permanently labeled on both ends of the cable, the termination points need to be identified on the labels, the labels need to be legible, the labels must be printed, not hand-written. Information on the labels should be recorded into records.

- First data element – unique identifier and optional prefix/suffix information
- Second data element – near end device connection
- Third data element – far end device connection

Audiovisual Audio Coverage

Speaker placement for small spaces up to 40+ capacity shall be single-channel systems and shall utilize 70v systems. Larger spaces shall require additional channels, including a separate zone close to the presentation location, this zone to have a separate level control to reduce feedback, in addition to the additional zones the larger spaces shall have wall mounted stereo playback speakers

- Accessible ceiling speakers to be 2x2 or 2x4 flat field type
- Hard-lid/Gypsum or special ceiling speakers to be 6" (minimum) dual-concentric speaker type with plenum back-can
- Wall mounted stereo playback to be 12" two-way type

AV Furniture

Lecterns (standard and ADA approved):

- The LACCD standard for the typical instructor station is desk-style model with a height-adjustable keyboard tray and monitor on an articulating arm. The instructor station shall include the

latest college logo on the front face (student/audience side) and both the logo and color scheme shall be approved by the District prior to ordering. The desk shall include provisions to install a separate 14RU equipment rack within. The separate equipment rack permits the building of the system equipment within the rack while waiting for the longer lead time for the actual ordered furniture and then the installation within once all items are received. Typical lead times for the furniture is 4-6 weeks. Color and finishes are to be coordinated with the architect and room finishes prior to ordering.

Podiums:

- Any instructional or presentation rooms requiring a separate podium that is unique to the typical instructor station shall be coordinated with the District during the design phase of the project. The podium shall include the latest college logo on the front face (student/audience side) and both the logo and color scheme shall be approved by the District prior to ordering. The podium shall include an angled surface with a cable well along with cable passage holes through the inside to support connections to the floor. Other design features shall be based on specific application and space programming requirements. Typical lead times for the furniture is 4-6 weeks. Color and finishes are to be coordinated with the architect and room finishes prior to ordering.

Conference Tables:

- The typical conference table shall have surface accommodations for power and provisions for, at minimum, one flip-up well for audiovisual connectivity and integrated control panel. This connection / control well should be positioned at the rear of the table (seat facing the screen) assuming the main operator position is at that location. Depending on the conference space type, this may be shifted by program requirements closer to the center of the table (in the case of smaller spaces or group collaboration furniture residing closer to the wall surface. Note that all cable wells and surface connections must be within accessible reach ranges.

Credenzas:

- Room millwork credenzas in conference spaces may be outfitted to accommodate equipment rack(s) consisting of audiovisual support equipment including source, processing, distribution, amplification, special use and computing devices. Provisions for ventilation with the millwork should be accommodated including both incoming fresh air into the lower section of each cabinet bay and a top exhaust to support a convection process. Some equipment racks may require additional cooling support and, in these cases, a fan kit(s) should be used with a thermal sensor to assist the convection cooling process in each bay.

Integration of AV racks into furniture:

- In each classroom and larger conference space (as required by program), a standard equipment rack will be integrated into the furniture to accommodate the system components supporting each space. These racks are separate from the furniture permitting equipment assembly at a remote location (separate from the furniture) and testing prior to the furniture being available for complete installation. Typically, these are 14 rack unit (RU) tall units that are 19” wide to accommodate standard equipment, panels and shelves that conform to the standard pattern of front screw mounting. Some of these racks (in the case of residing within the Instructor Lectern station) are standard racks that can be secured in place while others such as racks to be installed within conference room millwork are a pull-out and pivot style to accommodate easier support and servicing of internal equipment.

Space and depth within the millwork should be accounted for (refer to sample detail for credenza mounting in Appendix C) to accommodate both the rear services (power, data, AV) and the front door conflicting with rack-face device protrusion.

AV Controls & Software

All typical audiovisual classrooms are controlled by the District Standard Control platform with robust manufacturer supporting system architecture and processing equipment. A dedicated computer (small form-factor) and desktop monitor (either interactive or standard) shall host the operating software and Graphical User Interface or GUI (refer to Appendix A for standard GUI layout). The secondary instructor station monitor will be used to replicate the main screen output for instructor viewing. The PC and software shall be connected to the LACCD network for overall room management of each individual room system from a remote Helpdesk location.

In conference room and meeting spaces, the control software is done through an Extron touch-enabled graphical screen either in a desktop residing panel or an integrated input-well touch screen.

In the typical classrooms and larger conference spaces, the base control processing equipment resides within the equipment rack.

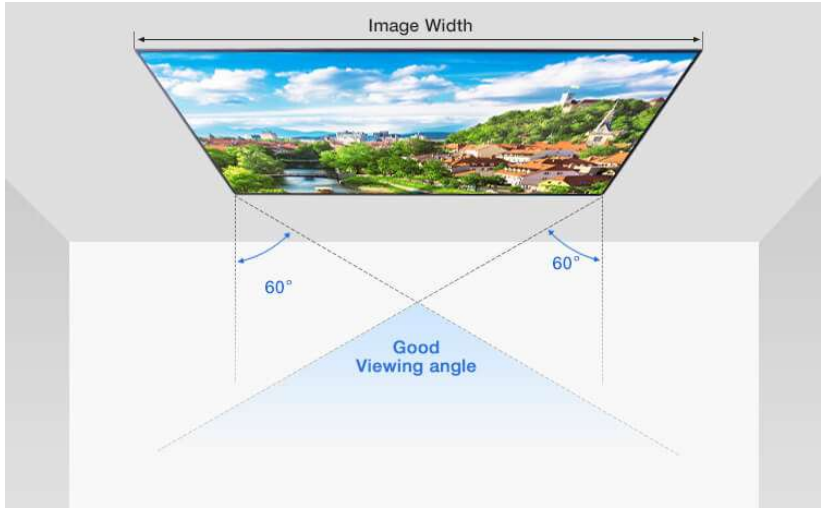
DISPLAY SIZE REQUIREMENTS

Display Size for Audiovisual Spaces

Display sizes shall be determined based on closest and furthest viewing distance, considering the content to be for analytical decision making. All displays must maintain a clear and unobstructed view for any persons within the space. Screen shall be a minimum of 42" AFF to the bottom of the screen image.

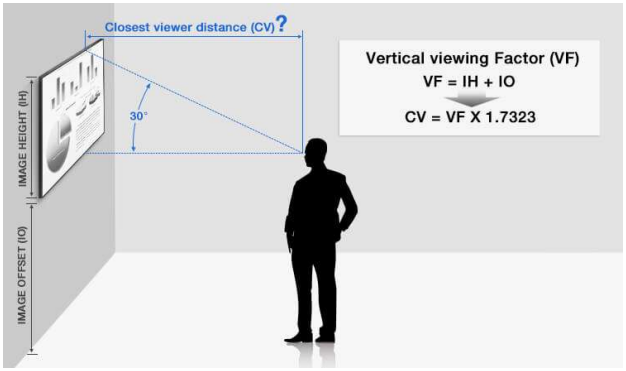
Reference ANSI/INFOCOMM V202.01.2016

- Typical classrooms – 130" diagonal at 25' viewing distance
- Larger classrooms – 164" diagonal at 30' viewing distance
- Vertical viewing factor – Image height plus image offset
- Closest viewer – Vertical viewing factor multiplied by 1.732
- Farthest viewer – Vertical resolution divided by image height multiplied by the acuity factor of 3438



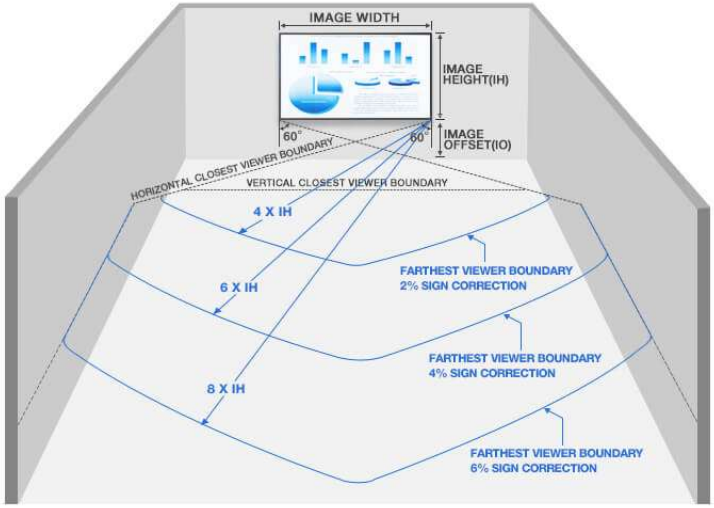
Viewability of Display Content[1]

[1] *Figure Referenced PID.Samsungdisplays.com.*



Closest Viewer Calculations[2]

[2] *Figure Referenced PID.Samsungdisplays.com.*



Farthest Viewer Calculations[3]

[3] *Figure Referenced PID.Samsungdisplays.com.*

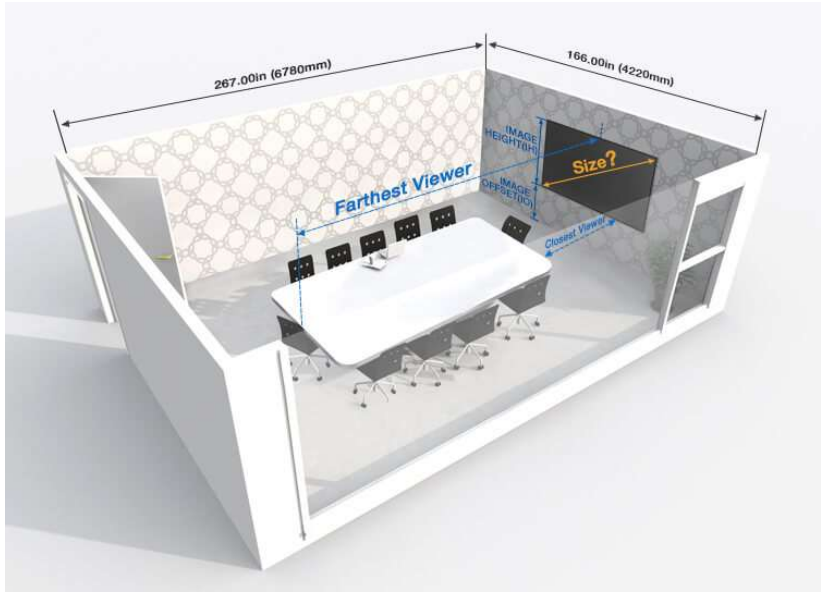
(Display Sizes for Audiovisual Spaces, continued)

A good viewing angle must be no more than 60 degrees from the perpendicular edge of the opposite side of the screen (refer to figure on previous page).

Sample Conference Room Display Sizes

Based on table size and proximity to flat panel display for typical Meeting / conference room and group team rooms.

- 2-4 people: 35” to 42” diagonal flat panel display
- 4-6 people: 42” to 55” diagonal flat panel display
- 7-10 people: 55” to 65” diagonal flat panel display
- 10-16 people: 65” to 85” diagonal flat panel display
- 14-20 people: 75” to 90” diagonal flat panel display



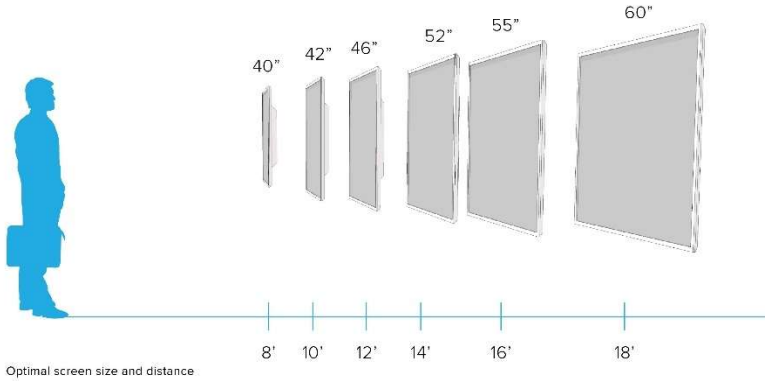
Farthest Viewing Diagram[1]

[1] *Figure Referenced PID.Samsungdisplays.com.*

Diagonal	Ideal (1080p)	Furthest (720p)
50”	6’-6” to 9’-9”	9’-9” to 16’-7”
60”	7’-10” to 11’-8”	11’-8” to 19’-10”
70”	9’-1” to 13’-8”	13’-8” to 23’-2”
80”	10’-5” to 15’-7”	15’-7” to 26’-6”
90”	11’-8” to 17’-7”	17’-7” to 29’-10”
100”	13’-0” to 19’-6”	19’-6” to 33’-1”
110”	14’-4” to 21’-5”	21’-5” to 36’-5”
120”	15’-7” to 23’-5”	23’-5” to 39’-9”

Display Size vs. Viewing Distance Table

Signage Display Sizes & Viewing Distances



Signage Display Size Reference[2]

[2] *Figure Referenced https://www.enplug.com*

SOFTWARE

General Requirements

All program source code (compiled and uncompiled) becomes the exclusive property of the District. The District shall have full rights and ownership of the program code for their use, modification and distribution.

All source code changes must be fully documented. Updated programming (compiled and un-compiled hard and soft copy versions of code) must be updated and located at all equipment rack locations and for all equipment manuals.

Source code changes and/or additional programming will be warranted by the vendor for a period of 1 year with the Contractor responsible for any required diagnosis and repair.

All manufacturer's software operating system updates, bug fixes, patches, etc., shall be installed as part of the periodic system maintenance of the system during the warranty period.

An acceptance test will be performed at commissioning during which the software and any additional code changes or upgrades must perform accurately and be error free.

Audiovisual System Control Software

Audiovisual System Control Software shall facilitate operation and/or status monitoring of all designated Audiovisual Equipment.

Graphical user interface (GUI) designs for all Audiovisual System control touch panels developed in accordance with the guidelines of the Avixa / InfoComm International® "Dashboard for Controls Design Reference" and "Contractors Guide" for layout and flow principals.

Graphical User Interface designs shall conform to LACCD's graphic standards and guidelines for use of logos or other graphical treatments.

Coordinate and integrate requirements for lighting control presets with control panel scene recall where appropriate.

Coordinate with the LACCD for all required IP address range and info for AV networked devices and supply any specific requirements for network parameters (QoS for switches, multicast for streaming, bandwidth and port settings for videoconferencing, etc.).

Configure and record all final IP address information and supply final listing of devices and their information to the LACCD IT Department.

Configuration of all networked AV devices with appropriate settings and instruction on how to access remotely for support of management.

Tie all control system and networked AV peripherals into main LACCD or specific management software package (either included in this scope or existing system) for remote control, management and support.

Provide hooks and other calls to allow integration of these rooms into a future centralized remote management system.

Coordinate and integrate requirements for motorized window covering and screen controls.

Set up of all video windowing software in multi-image processors whether in stand-alone units or within video projectors.

Set up of Codecs in coordination with LACCD's videoconference and/or network support staff including any specific networking or line provisioning.

TECHNOLOGY & NETWORKING

The audiovisual systems shall be connected to the LACCD Data Network. The audiovisual systems shall be coordinated with LACCD OIT for the following requirements as required for the system devices.

Requirements for Connection to the Owner's Network

All IP endpoints will be provisioned using 802.1X certificate-based authentication (EAP-TLS) with a unique private certificate deployed to every device using an automated tool.

The system shall natively support full dual-stack IPv4/6.

All Ethernet connections shall support 802.3ab auto-negotiating full duplex 10/100/1000Mb.

Any Power over Ethernet (PoE) requirements shall comply with 802.3af or 802.3at.

Wi-Fi connections shall be compliant with at least one of the 802.11g/n/ac/ax standards. 802.11b shall not be supported.

The use of the 2.4GHz, 5GHz and 6GHz bands commonly used for Wi-Fi shall be reserved for the exclusive use of LACCD institutional Wi-Fi. Any other use of these frequencies including Bluetooth and Zigbee is prohibited unless approved by LACCD IT.

All privileged/administrative user credentials shall be for named individuals. The use of shared/system accounts is prohibited except when justified by the system manufacturer and specifically authorized by the LACCD IT.

Passwords for all accounts must be changed to adhere to the District's password policy. Contractor shall provide documentation, tools and direct support to assist the District in changing any passwords known to the Contractor to those only known by the District. Passwords must support the Owner's password policy (currently 15-character minimum for elevated accounts).

Authentication to all system components shall be using the Owner's directory of record (Microsoft Active Directory) and must support the District's multi-factor authentication (Azure AD MFA) and FIDO2.

All authentication attempts (passwords) must be encrypted at rest and in-transit using industry standard encryption mechanisms.

Actions by service and privileged accounts must be logged and auditable.

Authentication and authorization events must be captured and logged. Logs are to be sent in real time to the District's log aggregation devices.

All privileged access, user audit and important system and application logs must be sent to the District's security information and event management (SIEM) in real time.

All system components shall be configured using the least privilege model, ensuring that only necessary communication is possible. Unnecessary services shall be disabled, and host-based firewalls shall be used to enforce traffic restrictions. Ingress/egress rules for system servers and handsets shall be applied to allow only traffic that is required to ensure system functionality. Large port ranges are not to be allowed for ingress. Ingress/egress to the Internet shall be denied except to allow approved functionality.

Authorization is the determination of whether a user has permission to access particular information or applications. Proper authorization for use of an application usually requires the use of the appropriate attribute, group, and/or role as defined in the District's Active Directory (AD). The Contractor-provided service or application must be able to interface with AD.

The District requires secure and role-based authorization for the functions and elements appropriate to the individual's role.

The District will provide any required physical or virtual servers or endpoint computers. Contractor shall provide requirements (including minimum and recommended configurations) for each system.

All system software, operating systems and firmware shall be the latest version and updated at the time of Substantial Completion.

All components must be manufacturer-supported as active products for at least 5 years after installation. The use of software in or expected to be “Extended Support” during the 5 years subsequent to installation is prohibited. Security updates must be provided for products under active support.

All system products must detail End-of-Sale, End-of-Support and End-of-Maintenance dates.

The Contractor shall configure the entire system to periodically generate backups of all system software, configuration, programming, messages and content to an District -directed location.

All web interfaces are expected to support the current version of the following browsers, including the mobile versions for iOS and Android:

- Microsoft Edge (or current Microsoft browser)
- Apple Safari
- Mozilla Firefox
- Google Chrome

System shall be configured in accordance with Center for Internet Security (CIS) benchmarks. Documentation shall be provided representing how the system is configured to align with the CIS Benchmarks.

The District limits the use of inherently insecure technologies, such as server- or client-side Java and Adobe Flash and requires that neither of these two technologies be used in or by any applications or interfaces.

Application whitelisting and endpoint malware prevention shall be deployed on all endpoints. Information detailing and supporting whitelisting support must be provided by the Contractor. All provided hardware and software must be compatible without disabling or reducing the District’s posture.

Network Connectivity

Upon installation, Contractor shall provide a table of switch port (in the respective BDF or IDF, etc.) to patch panel connections.

The network shall be provisioned such that each sub-system is on an isolated logical network (micro segmentation). Dedicated and isolated segments will be set up for each connected system type, and all traffic will be isolated to that logical network. Contractor will be responsible for coordinating with other project Contractors to document and configure the network in support of required firewall rules and access control lists (ACLs). Where required for functionality or described in this specification, connections to other systems will be permitted but must be locked down to the minimum traffic required and approved by the District. Individual system Contractors are responsible for documenting and justifying any proposed approved traffic to any other system with specific sources, destinations, traffic types and port numbers (e.g., source: server 1, destination: server 1, traffic type: https, TCP port: 443). The District shall be the sole arbiter of what traffic is allowed between systems.

Elevated or administrative access shall be prohibited except via secure methods through a District bastion host.

Authentication, authorization and accounting (AAA) shall be via the District’s AAA directory of record (currently Active Directory).

COMMISSIONING & SUPPORT

Audiovisual Systems Performance Verification - Commissioning

Refer to ANSI/INFOCOMM 10:2013 for more information.

Audio System Requirements

Note that Specialty spaces may require specialized audio and equalization control. Designer to consult with building user groups accordingly to gather specific requirements if any that are unique to individual space types and need considerations during commissioning.

Ceiling speakers should be mounted flush with the ceiling.

Acoustic remaining noise (buzzing, hum, etc.) from the sound system is not to exceed 25 dBA. Noise is measured at the normal rest position.

For program sound systems in classrooms, there are the following primary requirements:

- The system should be able to produce a constant, enduring sound pressure level at Leq = 100 dB (±3 dB).
- The acoustic frequency response should be within ± 3 dB in 1/3 octave bands between 70 Hz and 12kHz. Below 140 Hz and above 6 kHz, a roll-off of up to -3 dB per octave is also accepted.
- The above requirements should be met for at least 90 % of the audience.
- Under these conditions there should not be any audible distortion. The electrical distortion should not exceed 1 % Total Harmonic Distortion.

For combined sound systems with flush mounted loudspeakers in the ceiling, the above-mentioned requirements for vocal amplification apply. Additionally, requirements for program sound systems are to be met, but the requirement for the sound pressure level is reduced from 100 to 95 dB.

Wireless microphones and ALS equipment should be tested to ensure there are no dead zones and that the contractor has coordinated channels around an RF spectrum analyzer.

Video System Requirements

The video system should have the necessary number of inputs to be able to meet the described functions and contingencies. Additionally, there should be spare inputs for all relevant types – a minimum of 15 %, and never less than one of each relevant type. Spare inputs should be available at commissioning.

All switches, matrixes/multiplexers, etc. should be fully configurable from the control system, according to the functional requirements for the video system. The control system should select/control automatically based on the connected floor box, etc., and manual control by the user, correct source to the correct presentation medium (projector, monitor etc.)

The video system should allow full, individual control over what is shown on the monitor/interactive computer monitor in the lectern, on supporting monitors for distance learning, on video projectors and for outputs for distributing video signals to external parties, from the control system. Please note that it often is not practical that the above-mentioned functionality is fully available for regular users.

A matrixing presentation switcher or dedicated matrix switch shall be required for any room type with more than one projector/display to accommodate disparate source routing to any individual display.

Some video inputs will have accompanying audio inputs (stereo). Audio output from the video switch/matrix is routed to the associated program audio system and should follow the video shown on the

(Video System Requirements continued)

video projector/flat panel monitor. The switch/matrix should have a mute function for audio and video outputs.

In simpler rooms without voice amplification sound systems, the video switch is presumed to handle audio associated with video inputs without using a dedicated audio processor or program audio switch. If the video projector/flat panel monitor has a sufficient

number of inputs to cover all connections of permanently installed and mobile equipment, and satisfies the requirements for controlling/routing audio and video sources, a video switch may not be required.

Control Requirements

The control equipment should consist of:

- Control panel
- Control processor
- Fire alarm connectivity
- Remote control via network

Each room shall have its own control system. For each control system, the necessary interfaces, relays, etc. should be supplied for interconnecting the control system, system peripherals, motorized screens and other associated equipment. The control processor is mounted in the AV rack or instructor station unless otherwise specified.

The number of inputs and outputs for the control systems shall be based on the specific project program and requirements.

The systems should have the necessary number of inputs and outputs to be able to operate the described functions, devices and connectivity. Additionally, there should be spare inputs and outputs for all relevant types – a minimum of 15 %, and never less than one of each type.

The control system should use serial (RS-232, RS-485 or similar) of control signals and status indicators, alternatively, LAN (Ethernet).

If some of the AV equipment is to be controlled via IR, a wired IR emitter directly mounted to the IR receiver on each device should be used, shielded in order to not disturb or be disturbed by others.

Equipment Mounting

Displays

- When mounting devices such as signal receivers, computers, USB devices, signage players, etc. behind a flay panel display, equipment is not preferred to be mounted directly to the wall surface. A universal component storage panel should be use and attached to the display mount to secure equipment to. This can be a side “fin” style, a version that resides within an in-wall enclosure or display niche or a slide-out unit anchored appropriately to the wall (attached to studs or backing). Articulating mounts shall be used to provide easy access to the rear of the monitor and the other mounted components for servicing.

Projectors

- When equipment is residing at the projector location including signal receivers, etc., a locking equipment box shall be used at part of the projector mount. This will include a slide out compartment for easy servicing and access to the equipment above the projector.

Wiring, Terminations & Cable Dressing

All Audiovisual cabling shall be terminated on a shared wall plate with voice/data connections. AV vendor to coordinate with cabling contractor to arrange outlets. AV terminations to include: HDBT, Speakers using an approved speaker quick-disconnect or “Speakon” style connection, HDMI, USB, ALS systems, etc. Vendor shall provide appropriate length patch cables for both sides of each

connection as required, secured with hook and loop fasteners permanently mounted to each cable for secure storage.

Use only wire pulling lubricants specified by the wire manufacturer.

Provide grommets or chase nipples at cable entry where conduit is not installed.

Provide cable anchors for any cable or cable bundle ≥ 1 inch diameter. Do not use self-sticking adhesive cable anchors.

Provide a service loop for each cable that connects to equipment in racks or AV furniture.

All cables to or from a movable lectern, cart, or desk or lectern shall be highly flexible cable, specifically designed by the manufacturer to be flexed repeatedly. Permanent installation type of cable is not acceptable for this application.

All cable looms shall be open-sock mesh with Velcro closure.

Cable dressing shall be considered from a maintenance standpoint. Suitable service loops shall be provided to allow removal of equipment, or to extend equipment that is mounted in the rack on rack slides. Where there is no rear access to the rack mounted equipment, this requirement shall be carefully addressed, and cabling shall be of sufficient length to enable the removal and replacement of any individual piece of equipment with all others in place.

The Audiovisual Integrator shall determine the desired method of securing cables. All of the following requirements must be met by the system:

- Hook and Loop (Velco™) style ties are the preferred method of cable lacing. Lay-in systems are not acceptable except as applied to a horizontal cable tray. Plastic cable ties are not permitted.
- Wires and cable shall be installed in a neat and orderly fashion, with like cable types following similar paths. Groups of cables shall be neatly combed and harnessed. Harnessed groups of cables shall be anchored at suitable intervals to reduce and relieve wire strain, especially strain on connections. Adequate service loops shall be provided at all cable endpoints.
- For all schemes of cable routing, no point in the path shall be subjected to a bend radius of less than eight (8) times the cable diameter, or minimum cable bend radius specified by the manufacturer.
- Wires and cables shall be segregated according to signal type. In addition, audio cable shall be subdivided into three (3) classes: microphone level circuits, line level circuits, and speaker level circuits.

Where circuits of different types must cross, they shall do so at right angles and then return to the above required separations in as short a distance as possible.

Conductors, wires, and cables shall be continuous between termination points. Splices are not acceptable.

The Audiovisual Integrator's field supervisor shall spot check assemblies using hook and loop cable straps both visually and by touch, thereby detecting any sharp edges of improperly cut cable ties. Install cable straps on all cable runs of two or more cables that are not supported by raceway, cable tray, or other means. Place cable straps approximately six inches (6") apart. Do not use more cable straps than are necessary for a neat installation. Cable straps shall not be applied with excessive force that may damage or deform sensitive and fragile cables.

Rack mounting rails shall not be used for cable lacing. Lacing bars and/or tie mount bases mounted to cabinets or console shall be provided where appropriate.

Labeling

All cables are to be labeled on both ends of a cable. All major active electronic equipment within both the room and equipment rack shall have labels on the front face of the device or in an appropriate

(Labeling, continued)

location visible to the technician (e.g. flat panel displays should not have labels on the front bezel but rather behind near the connection area). All Text should be in CAPS.

“Destination Model” refers to a signal processing device, as such passive/ pass through connections and wall plates should not be listed.

If the listed “Destination Model” is a distribution amplifier (DA) one of the final destinations can be listed in parentheses after the “Input Name”. All labels shall match to their corresponding tags on the as-built system drawings for easy identification.

All labels should be self-laminating cable labels or printed heat shrink. Dry transfer or other types of adhesive labels are not acceptable.

Labels should wrap around the cable with the clear section sealing over the text section.

Grounding

Ground equipment, racks, and audio line shields to a common ground.

Insulate all conductors in conduit, including shields, from the conduit, back boxes, and from each other for the entire conduit length.

Reliability

The systems must be designed in a way that makes it uncomplicated to utilize basic functions (normally a laptop and a video projector) even if some of the central equipment is out of order.

The AV system is to return to normal operation after a power failure. The necessary initialization commands for the various components must be entered into the control system, if needed.

Software reliability (control systems) is related to the number of unwanted restarts per year. Control systems must not have more than 2 unwanted restarts per year.

WARRANTY AND MAINTENANCE SUPPORT

Basic Warranty

The Basic Warranty provided by the Contractor shall include repair or replacement for three years from Final Acceptance on all Audiovisual Equipment provided (including products having a manufacturer's warranty of less than one year) and all Contractor workmanship.

The Basic Warranty shall be provided at no additional cost, except in case of obvious abuse.

Consumable items such as lamps, batteries, filters, etc. shall not be covered by Basic Warranty.

Manufacturers' warranties on Audiovisual Equipment of more than one year shall remain in force beyond the Contractor's Basic Warranty period.

During the Basic Warranty period the Contractor shall:

- Provide telephone support within 4 hours of a call requesting service.
- Provide on-site support within 24 hours of a call requesting service not corrected by telephone support.
- Repair or replace faulty items within 72 hours of on-site service or within manufacturers' specific repair program whichever is quicker.

Contractor shall not involve the LACCD with removing, re installing equipment, shipping or receiving equipment being repaired under Basic Warranty, nor shall the LACCD be responsible for any shipping or freight charges associated with any item under warranty.

LACCD shall be copied with all paperwork related to any and all warranty work during the Basic Warranty period.

The Basic Warranty period will commence no sooner than the date of first beneficial use by the LACCD and no later than the date of contract closeout.

Day-One Support

As part of the warranty, training and installation completion, the Contractor will provide on-site presence on the first day of critical move-in and operation to support the staff and instructors in equipment use.

This date will be coordinated with the District for reasonable staffing requirements. Typically, this will require one certified technician to be present to resolve and issues that may arise and to provide basic operational support in the early usage stages. Programming support should be on stand-by to help resolve more complex issues as they arise.

All programming resources (code, software, configuration files, etc.) should be made available to on-site technicians.

Deliverables & As-Built Documentation

Contractor shall provide a device matrix to record each device as part of the AV system. LACCD will provide a template that will include information required by District, but will not be limited to: Device type, manufacturer, model number, serial number, MAC address, IP address, cable ID, network switch port, default user name and password, location, asset tag information, etc. Note: This applies to CFCI, CFOI, OFOI, OFCI equipment as part of the AV system.

Other information to be provided to the District upon close-out includes:

- The Commissioning form information completely filled-out by contractor/vendor prior to Commissioning identifying all required info (District to provide template with instructions)
- Asset Management Spreadsheet if apply

- Line diagrams for each room placed in each AV rack showing connectivity.
- Custom contractor/vendor created simple one-page instruction sheet laminated and placed under keyboard (Must be approved by District prior to printing).
- All config files that apply (must be saved on each device)
- Training videos for each room (User and Admin video must be created individually and be unique for each room)
- All User Manuals and accessories gathered in box or case, and labeled per room (transmittal with item list to be provided contractor/vendor and signed by District).
- Warranty information for each device and cataloged.
- Cable test results in PDF and Native file format.

All items noted above (including transmittal) must be included in electronic format for download (via a contractor service portable or shared drive link), and also provided on contractor/vendor provided USB portable drive.

Preventative Maintenance

Within the term of the one-year Basic Warranty period the Contractor shall provide, at no additional cost, periodic Preventative Maintenance on the installed Audiovisual System to ensure proper ongoing maintenance and operation.

A minimum of four (4) Preventive Maintenance visits shall be provided.

Preventative Maintenance shall include, but not be limited to, the following:

- Adjustments to video projectors, noting projector life, checking filters and replacing as necessary
- Checking audio system settings, verify performance
- Reviewing control system functionality, verify operation
- Any other maintenance and adjustments necessary to ensure that the Audiovisual System is in proper working order

Any problems or issues noted by the users or other LACCD representatives shall be documented and completely resolved at each of the scheduled visits.

Preventative Maintenance Schedule

- 90 days (±15 days) after the commencement of the Warranty Period.
- 180 days (±15 days) after the commencement of the Warranty Period.
- 270 days (±15 days) after the commencement of the Warranty Period.
- 20 days (±10 days) before the end of the Warranty Period.

Training

The Contractor shall provide sufficient training for the District's designated staff to become proficient in the general operation, routine maintenance, troubleshooting, and other basic system support functions. This training shall include up to 4 sessions of training totaling 12 hours by the Contractor or the equipment manufacturer. This training shall include a session or sessions that are focused on the LACCD's designated technical staff and also a session or sessions that focus on the administrative and/or medical staff. Training of end users will be provided by the District's technical staff.

Times of day for training must be coordinated with District's availability including evening hours if requested for least disruption to District's standard operations.

Training shall be recorded and provided in a digital format for staff to review as needed.

Remote Network System Management

Remote network management system software is required to control, manage and support all attached AV control systems and their related networked AV peripheral devices. This will tie into the LACCD building management system(s) that may be required.

This system can be configured to monitor and manage (but not limited to):

- System or individual peripheral status including power on/off state, network status (disconnected) and peripheral temperature. An email notification will also be sent to the appropriate Campus staff or service technician when critical limits are triggered.
- Projector total operating. Must be configured to notify by email the appropriate LACCD staff or service technician when to clean any projector filters (if required).
- Archival server capacity status (where applicable).
- Room scheduling and helpdesk support.
- Online status. If a device included within the AV system is taken offline (disconnected from the system or network), a notification will be issued to the appropriate Campus staff.
- Other key elements included within each room that are tied to the AV system and can be controlled or monitored.

Contractor Qualifications

Contractor shall have a minimum of three (3) years' experience with the design, engineering, assembly, installation and support of Audiovisual Systems.

The Lead Engineer or Project Manager from the Contractor shall have a CTS-D (Certified Technology Specialist - Design) certificate from AVIXA. Technicians shall have a CTS (Certified Technology Specialist) certificate from AVIXA.

The Contractor shall be able to provide the necessary professional design, engineering, fabrication, installation, and project management personnel to execute the Work and to guarantee a complete, functional system in compliance with the intent of this Specification.

The Contractor shall be factory certified to sell, install, program, and service all audiovisual system components over $500 in value.

The Contractor shall be licensed with all agencies having jurisdiction over the Work.

The Contractor shall maintain permanent fabrication, service and support facilities within (100) miles of the Project site.

The Contractor shall confirm explicitly that the personnel who shall be employed to carry out the Work are suitably trained and experienced in the management and execution of a project of this nature, and in the installation and maintenance of equipment of the type being provided in order to carry out all Work in a competent manner.

All Contractor personnel conducting Work on-site shall be required to complete all safety training required by the project's General Contractor and the District.

All Work associated with the Project shall be undertaken by the Contractor. Subcontracting any of the Work shall only be allowed with the prior written agreement of the District.

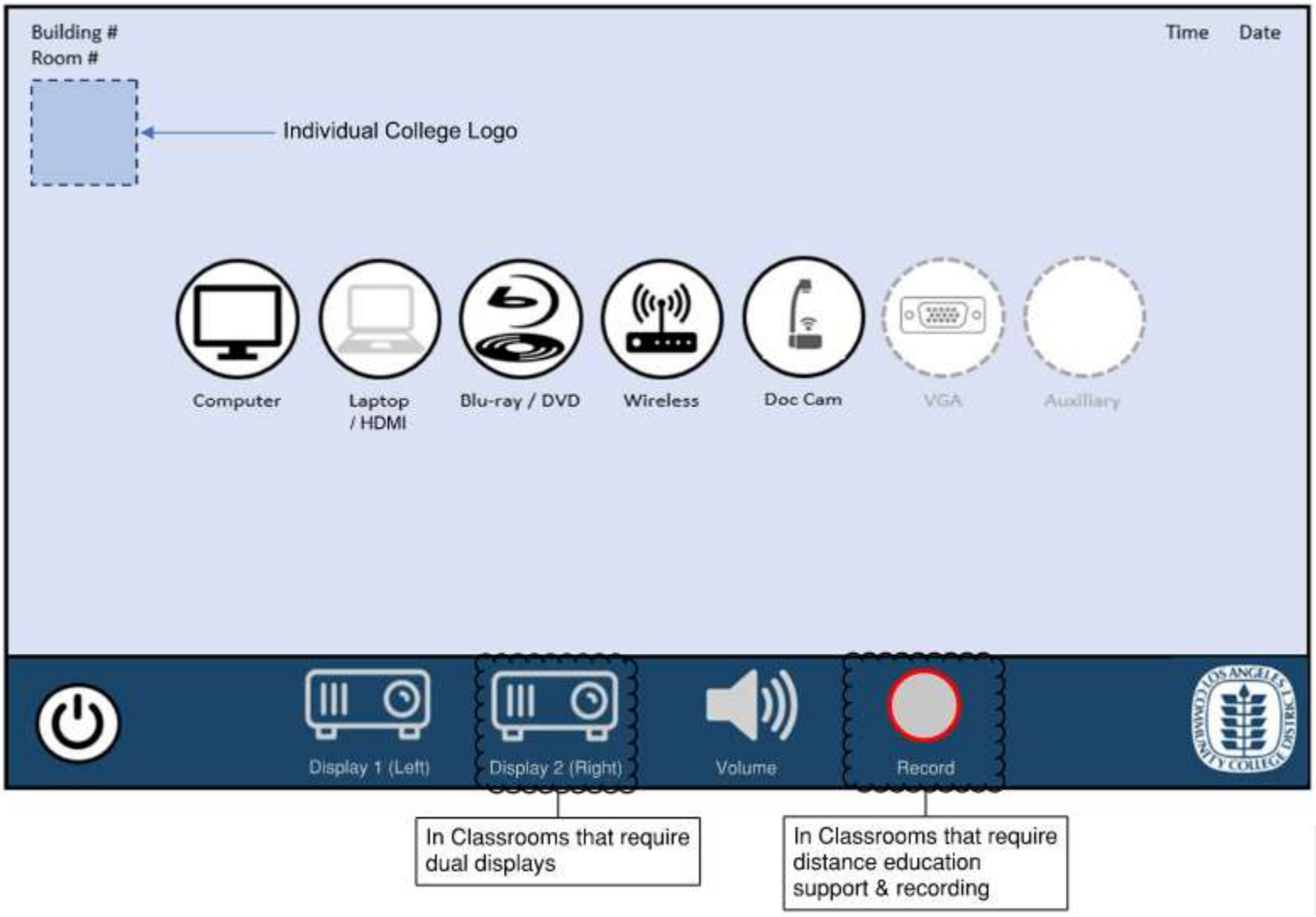
Manufacturer Certifications

The Contractor shall be certified through Extron for digital switching and control systems and will retain current certifications for appropriate digital-based systems (either engineering and/or installation depending on requirement) for key implementation personnel or sub-contractors to the Contractor. All technical staff working on the implementation side shall hold current Extron technical certificates. The lead technician and programmer/commissioning personnel shall hold current Extron certifications. Specific certifications include Extron Electronics and shall be a dealer in good standing with the manufacturer. Relevant Extron certifications include XTP Systems, Extron ProDSP, Network AV Specialist, Extron Authorized Programmer and Extron Control.

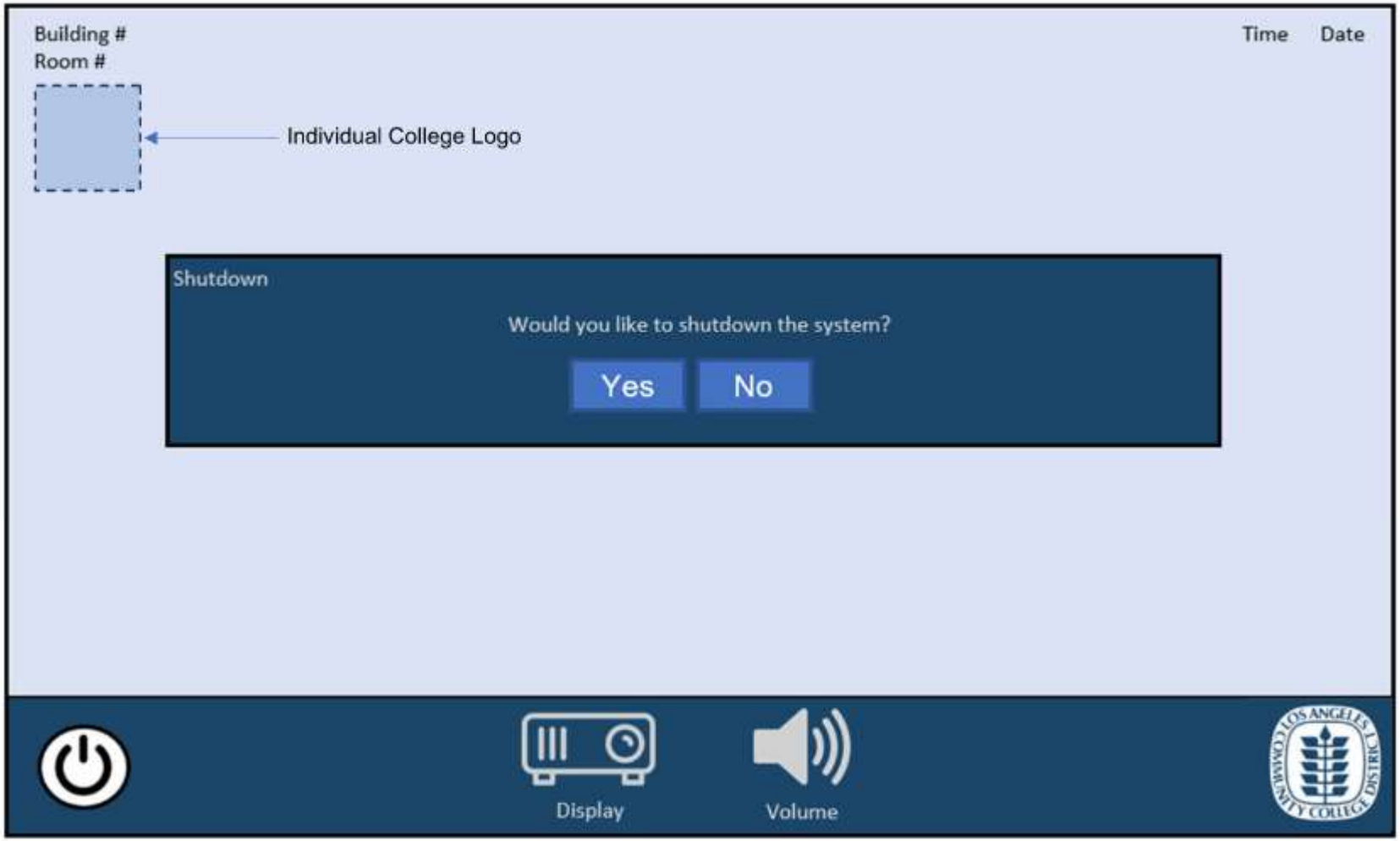
The Contractor shall be certified through Utelogy for the software-based control systems.

APPENDIX A – SAMPLE USER INTERFACE LAYOUTS

Main Landing Page



Exit Screen


Building #
Room #
Time
Date
Individual College Logo
Shutdown
Would you like to shutdown the system?
Yes
No
Display
Volume

APPENDIX B – MANUFACTURER & EQUIPMENT STANDARDS

Video Switching

Video presentation switcher with audio processing, integrated power amplifier and system control processor.

Ceiling Speakers

Flat Field speakers for 2’ x 2’ A.C.T. installation or 6” flush speaker with back-can and 70v transformer

Signal Extension

Active signal extender devices utilizing twisted-pair cabling.

Amplification

Single or multi-channel audio 70V amplifier, wattage sized as required by design.

Operation Controls / Inputs

Recessed surface flip-up cable wall with integrated touch control display.

Control Processor

Networked central control processor with serial, IR and IP control.

Wireless Presentation

Networked-connected wireless input sharing appliance. Include dedicated point-to-point connectivity.

Projectors

LED-laser ceiling projector with standard 2.0:1 lensing (with physical throw adjustment), network connection and control, serial control port, DVI-D / HDMI input and adjustable audio line-level output. 6,500 - 7,000 lumens minimum.

Projection Screens

Wall mounted motorized less than 200” (non-tensioned)

Wall mounted motorized greater than 200” (tensioned)

Ceiling mounted motorized less than 200” (non-tensioned)

Ceiling mounted motorized greater than 200” (tensioned) Non-motorized with controlled spring return (non-tensioned) –

Instructors Desk

Table measures 60”W x 30”D x 32”H. Also included is an area for a removable 14U rack cabinet for storage of all electronic teaching tools (CPU, DVD, controller, amp, etc.). Locking front and rear louvered door are required (front door not shown in image.) All rack mounted AV equipment will be consolidated and housed within instructor desk. All locks are to be keyed-alike to match campus key standards. Must include campus colors and logo approved by each college for each project.

Wireless Lapel Microphone

Provide G50 range RF receiver and corresponding lapel microphone. All frequency settings shall be coordinated with surrounding RF signals and other RF devices for elimination of band conflict. Channels to be coordinated between rooms and with ALS equipment settings.

Media Hub

USB 3.0 connection interface to computer to bridge audio and camera peripherals for web conferencing.

Recording and Streaming Appliances

Recording appliance for classroom lecture capture with support for dual input sources, scaling capability and simultaneous live H.264 streaming. 400 GB on-board storage.

Wired Instructor Desk/Podium Microphone

Fixed or desktop base cardioid microphone with 18” extension neck, dedicated mute switch and shock mount XLR base (recessed for millwork or cabled surface base).

Document Camera

Desktop-style collapsible camera with LED illumination. 5 MP - 720p/1080p. Include Kensington™-style cable lock or physical surface mount to secure to station. HDMI output with USB connectivity. Include VGA signal pass-through. Include surface mounting plate.

Overhead Ceiling Document Camera

Ceiling document camera. 1080p or better resolution. Include ceiling mounting kit to accommodate the specific ceiling conditions for a recessed installation. HDaseT or HDMI output with optional USB connectivity. LAN connection.

Ceiling Microphone Array

White ceiling-mounted 360-degree pendant-style cardioid microphone array.

Web Conferencing Camera

Fixed or pan/tilt/zoom/focus HD camera with USB 3.0 connection.

Classroom Distance Learning Camera

Fixed or pan/tilt/zoom/focus HD camera with HDMI, RJ-45 port (for PoE+ & network) and RS-232 control support. 1080p, 60FPS.

Digital Audio Signal Processing (DSP)

Networked 64-bit 12 analog input / 8 analog output / 4 digital DSP with USB (configure per specific program requirements). Use only when required (in large spaces surpassing presentation switch audio capabilities). Include Dante™ for conferencing/recording applications.

Assistive Listening System Equipment:

Rooms with 50+ occupants – fixed RF transmitter (and antenna kit where required). Number of receivers to be 4% of occupancy or no less than 2. Receivers to include inductive loop lanyard.

Rooms under 50 occupants – Mono RCA connection at rack to support portable RF kit with case, charger, 2 receivers and 1 portable transmitter / microphone. Receivers to include inductive loop lanyard.

Portable RF ALS kit – one per floor

ALS signage shall be installed (coordinate with architect) for each applicable space.

Distance Education / Video Conferencing Camera Wall Box:

Large capacity in-wall housing for camera with extension shelf and ¼" lock hole. Confirm selected camera and cabling fits in selected box. Example camera shown in image. Primed and painted to match wall finishes.

Millwork Recessed Equipment Rack

Pull-out and pivot style rack for easy servicing anchored to the base of the room millwork. Ventilation to be provided within millwork for heat evacuation via fan assisted convection (minimum of 350 BTU/hr) with vents in top/rear and in toe-kick/lower door coordinated with architect. Typical millwork rack installation uses 12 or 13 RU of rack space.

Control Touch Panel

In classrooms where an interactive monitor is not being used, a surface control panel shall be deployed. In medium and large conference rooms, a table-well control panel shall be used to accommodate cabling and connections. In smaller meeting rooms, a wall control panel with a built-in processor shall be used.



Flat Panel Display

LED flat panel display with serial control, LAN and multiple (2+) HDMI ports. Must include adjustable

audio line output that can switch with input selection.

Interactive Flat Panel Display

4K resolution with interactive connection. Include on-board PC as required by design. Connect to data network and USB (through extender kit) to room PC. Unit shall have a minimum of 2 HDMI inputs and shall have a 3.5mm audio output.

Connect to data network.

Flat Panel Wall Mount

Articulating wall mount to permit

Projector Locking Ceiling Mount

Locking ceiling in-line projector mount and equipment enclosure. All locks to be keyed alike to LACCD master key.

Room Computer

Small Form-Factor PC within instructor station (secured to rack shelf as required)*

20” All-in-One PC mounted to instructor station articulating arm*

*PCs to be coordinated with LACCD IT for latest model and build configuration.

IP Ceiling Speaker

Network connected 6” ceiling speaker. Provide grill, speaker and tile bridge support. Provide PoE+ power per manufacturer requirements and connect to the data network.

IP Wall Clock Speaker

Network connected wall mounted clock speaker. Provide grill, speaker and in-wall / on wall enclosure. Provide PoE+ power per manufacturer requirements and connect to the data network. Digital display to have large readable numbers.

Power Distribution Unit

Rack-Mounted 1RU, 15amp power conditioner.

Combination Floor Box

Multi-service, high-capacity 6” deep floor box and protected accessible lid/cover.

Floor box shall have separate bays for Audiovisual, data and power services. High and low-voltage bays shall be divided with a metal partition. Power and data to be on one side leaving the full opposite side available for Audiovisual (and any additional required data) cabling and connections.

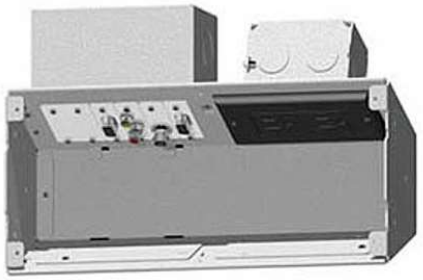
Combination Floor Poke-Through

Multi-service, high capacity deep poke-through and protected accessible lid/cover.

Select 8” or 10” diameter based on conduit and connection requirements as well as system connection and cabling capacity.

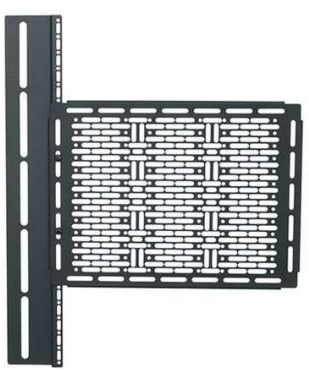
Combination Wall Box

Multi-service, 4” deep floor box and protected accessible paintable cover. Include separate standard gang boxes for services and conduit connection.



Proximity Component Storage Panel

Equipment storage plate mounted to wall or display mount concealed behind flat panel displays.



Dual Monitor Surface Mount

Articulating dual-arm mount (matte black) for through-hole surface clamping for instructor station for monitors up to 27” diagonal.

APPENDIX C – SIMPLIFIED AUDIOVISUAL STANDARDS

Projectors (standard/long throw)

- Must be HDBT (connected directly to switcher) supporting both signal and control
- Must be laser LED with 20,000 hour operation for minimal servicing requirements
- Minimum 7,000 lumens based on space requirements and ambient lighting conditions
- Full HD with WUXGA minimum resolution unless otherwise noted by space and program requirements
- Must be connected to LAN for management and control as needed
- 4K resolution required for specialty classrooms per individual space program requirements (art/film, graphic design, editing, etc.) requiring higher resolution and color capabilities (reviewed with department and academic needs)
- The Designer shall size the image accordingly based on size of the room for maximum viewing from all positions in the room (based on industry standards for viewing)
- Control: Use HDBT (preferred) or LAN
- Connectivity: Requires one LAN Cat6A to local BDF/IDF, and one Shielded Cat6A cable to AV rack. Terminate shielded jack at projector sharing same faceplate (steel) as LAN. On rack side, cable to be terminated on 1U patch panel on top of rack labeled per District standards. This cable must be tested and certified by the low-voltage contractor. Low-voltage contractor to provide 1U brush plate below 1U patch panel for cable management.

Projectors (UST Interactive)

- Must have interactive capability (requires USB extension to be included in design) *Note: shielded connection can be used for USB extension if HDBT
- Must be laser LED with 20,000 hour operation for minimal servicing requirements
- Minimum 7,000 lumens based on space requirements and ambient lighting conditions
- Full HD with WUXGA minimum resolution unless otherwise noted by space and program requirements
- Must be connected to LAN for management and control as needed
- The Designer shall size the image accordingly based on size of the room for maximum viewing from all positions in the room (based on industry standards for viewing)
- Designers responsible to include mounting detail for projector accessories (PEN holders/charging station, USB capabilities, etc.) to allow full functionality.
- Control: Use HDBT (preferred if not part of interactive device) or LAN if available, or use RS232 extended over shielded connection
- Connectivity: Requires one LAN Cat6A to local BDF/IDF, and one Shielded Cat6A cable to AV rack. Terminate shielded jack at projector sharing same faceplate (steel) as LAN. On rack side, cable to be terminated on 1U patch panel on top of rack labeled per District standards. This cable must be tested and certified by the low-voltage contractor. Low-voltage contractor to provide 1U brush plate below 1U patch panel for cable management.

Projection Screens

- LACCD standard is motorized in-ceiling screen, non-tab tensioned models
- Screen material must be 4K ready and shall be GreenGuard™ compliant
- Aspect ratio to match projector image
- Use relay contact closure (preferred) or RS232 for control if Electric
- Up/Down switch to be installed in appropriate location
- Control: Relay contact closure preferred, RS232 for large high-end electric screens where needed. TX to be installed in AV rack and labeled
- Any manual screens shall have a Controlled Spring Return (CSR) feature
- Draw string must be installed correctly for manual screens (not too long, not to short)
- Wall mount for Manual

Flat Panel Displays (Large Screen Monitors)

- Must be 4k for all displays
- The Designer shall size the image accordingly based on size of the room for maximum viewing from all positions in the room (based on industry standards for viewing)
- Support backing to be rated at 350lbs in case interactive overlays are added later
- Control: Use HDBT (preferred) or LAN if available, or use RS232 extended over shielded connection
- Connectivity: Requires one LAN Cat6A to local BDF/IDF, and one Shielded Cat6A cable to AV rack. Terminate shielded jack at projector sharing same faceplate (steel) as LAN. On rack side, cable to be terminated on 1U patch panel on top of rack labeled per District standards. This cable must be tested and certified by the low-voltage contractor. Low-voltage contractor to provide 1U brush plate below 1U patch panel for cable management. Note: shielded connection can be used for USB extension if HDBT. *Note: shielded connection can be used for USB extension if HDBT*
- Use in-wall consolidation enclosure behind the display/mount to support power, data and audiovisual connections.
- Typical use: Conference rooms, huddle rooms, offices, open areas, small classrooms

Note: Need to specify that input selection is configured to stay constant, and/or to lock out displays to avoid repeated issues if users changing sources

Switchers

- Must be 4k
- Must have built-in HDBT port
- Must be sized with 25% port expansion
- Must use Matrix switchers if more than one projector/display is used
- Must have necessary inputs/outputs to accommodate ALS, and Mics together
- Must be labeled per District standards
- Control: Use LAN for classrooms for control processor and PC with software control. Conference rooms need LAN for touchscreen control panel
- Connectivity: Requires one LAN Cat6A to local BDF/IDF

Digital Audio Signal Processors

- Must have Dante™ protocol support and connection
- Must be sized with 25% port expansion
- Must use with spaces requiring remote learning, conferencing and recording/streaming
- Must have necessary inputs/outputs to accommodate ALS, and Mics together
- Must be labeled per District standards
- Control: Use LAN for classrooms and conference rooms and connect to Fire Protection System with relay trigger for audio muting
- Connectivity: Requires one LAN Cat6A to local BDF/IDF

Amplifiers

- Use 70V for all typical classrooms
- Use Stereo for specialty rooms where apply if speakers are placed on front of room
- Must be sized appropriately for size of room and speaker count/type
- Audio must be adjusted for all input sources accordingly to avoid accidental peak from users
- Must be labeled per District standards

Speakers

- Number of speakers must be appropriately dispersed evenly to provide optimal coverage for all areas of classroom
- Appropriate tap setting based on number of speakers, size of room, and amplifier to be adjusted accordingly
- Drop-in ceiling mount preferred for Accessible Ceiling Tile (ACT) types. Flush-mount for hard-lid, pendant mount for open ceiling with appropriate safety mechanism included in design
- Two legs min required for speaker daisy chaining.
- As-build of connectivity to be provided by AV contractor/vendor
- Speaker cable to be terminated at AV rack on faceplate using “Speakon” connection. Contractor/vendor to extend with appropriate cable and termination type to amplifier

Document Cameras

- Must be 1080p min resolution (must provide max resolution available at time of ordering)
- Must use HDMI to switcher input for video
- Must use USB to PC for optional features
- Include cable or surface locking base keyed per college standard
- Must provide custom surface desk mount to lectern (coordinate installation with District accordingly)
- Provide microscope attachment lens for science classes where apply
- Must contain convenience light
- Foldable models preferred
- Must be labeled per district standards
- Control: input selection through AV system, manual power/on off
- Connectivity: HDMI and USB (both required)

Blu-ray Player

- Must be 4K upscaling
- Must have LAN port

- Must be labeled per district standards
- Control: IP control or HDBT if available for typical classroom. In some instances, RS232 can be used (serial port on player must be included as secondary or primary means of control)
- Connectivity: Requires one LAN Cat6A to local BDF/IDF

Auxiliary Connections

- Must have one LAN extended to the desktop surface / connection well.
- Must have one HDMI (highest available standard at time of ordering) and…
- When required by department or specific program requirement, include one VGA over HDMI (use switching manufacturer HDMI to RGB converter) and…
- Must have one USB connection from PC (highest available standard at time of ordering with female connection at lectern for external thumb drive)
- HDMI to include adapter ring set for HDMI conversion to: DVI, DP, Mini HDMI, USB-C, Apple lightning, Apple USB-C (locked to HDMI cable)
- Must all auxiliary connections must have appropriate length to be used anywhere on lectern
- Hook and loop tie must be provided and permanently mounted on all auxiliary cables as needed if retracting Cable Cubby is not used so cables can be stored neatly
- Design must include auxiliary connection box (cable cubby for Extron) or similar to allow all connections to be neatly stored and retracted as needed. Connection box to include 5-15R/5-20R power
- Must be labeled per district standards

Microphones

- Wireless receiver to be rack-mounted in AV rack and labeled
- Wireless lapel to be provided with charging station or hands-free neck loop provided by some switching manufactures
- Ceiling mics preferred in conference rooms with multiple microphone array via Dante™ protocol
- Must be labeled per district standards

Assisted Listening Systems

- Designer to place appropriate (permanent, or portable in accordance with ADA Sections 219 and 706 in the California Building code)
- For portable systems, design must establish an “ALS Out” port wired to system, and terminated on patch panel in AV rack
- Permanent systems must include antenna terminated on faceplate with AV connections at location of AV rack.
- For Antennas requiring power, mounting and electrical considerations must be accounted for accordingly by Designer
- Must be labeled per district standards

Power Distribution Unit

- Must be rated appropriately for AV systems
- Must be metered
- Must be Rack-mounted
- Must be labeled per district standards
- Must contain appropriate number of connections and type per equipment
- Must have appropriate length input cord to wall outlet

Lecterns/Instructor Stations

- Must include college logo
- Must be ADA compliant
- Must have electric up/down mechanism
- Must contain location for dual monitors
- Must have keyboard/mouse tray
- Must have Auxiliary input cutout (Cable cubby for Extron)
- Must have AV rack built-in
- Must have proper ventilation with Fan and thermostat mounted
- Must be universal for AV rack placement (left or right)
- Must be located at appropriate wall for terminations (preferred)

Controls

- Software-based Graphical User Interface for all classrooms – Include license for control platform
- Conference rooms, lecture halls, huddle spaces, offices, etc., to use controls from switching manufacture
- Touchscreen panels of appropriate size and location to be established through BUG meetings (standards will have a recommended location)

PC/Monitors

- All PC monitors and PC require cable or surface locking base keyed per college standard
- Dual monitors with heavy duty monitor arm required
- One Monitor dedicated for PC as main PC monitor
- Second Monitor to be fed from switcher to display switcher input source selection
- When PC is selected, second monitor to be setup as extended display to PC
- Contractor/vendor responsible for installing all necessary AV software (coordinate with District IT PC imaging prior to setup. District IT to provide temporary admin password as needed for AV integrator)

Fire/Life-Safety System integration

- Require dry contact closure (relay) from Fire/Life-Safety (FLS) system to control processor
- Hardwired recommended for all new deployments
- All components to be labeled in large bold print, and be accessible and identified in AV and FLS as-builds

Electrical Requirements (Div 26)

- Dedicated Quad 5-20R outlet for AV rack
- 5-20R for Powered speakers
- 5-20R for Projectors/Displays
- 5-20R for IR ALS antenna
- 5-20R, or hardwired as needed per manufacture recommendations for electric screens

Low-Voltage requirements (Div 27)

- Six (6) Cat6A data min at Instructors lectern/AV rack (Distance Ed may change this requirement)
- One (1) Cat6A data min for each projector/Display
- One (1) Shielded connection for each projector/Display to AV rack
- Two (2) Shielded connection for each Ultra short throw interactive projector (for Audio/Visual, and USB)
- All AV rack terminations to be on faceplate (RF/IR antenna, Speakers, LAN cabling, HDBT, HDMI, USB, etc.), and appropriate length/Type to be extended from wall outlet to equipment in rack
- Shielded connections and “ALS Out” (where apply), to be terminated on a 1U patch panel at top of AV rack and provide 1U brush plate for cable management
- All necessary cables, patch cords and adapters to be provided by AV vendor/contractor as needed

Deliverables

- Device Matrix showing all necessary information required by District (District to provide Template)
- Commissioning form information completely filled-out by contractor/vendor prior to Commissioning identifying all required info (District to provide template with instructions)
- Asset Management Spreadsheet if apply
- Line diagram for each room placed in each AV rack showing connectivity
- Custom contractor/vendor created simple one-page instruction sheet laminated and placed under keyboard (Must be approved by District prior to printing)
- All config files that apply (must be saved on each device)
- Training videos for each room (User and Admin video must be created individually and be unique for each room)
- All User Manuals and accessories gathered in box or case, and labeled per room (transmittal with item list to be provided contractor/vendor and signed by District)
- All items noted above (including transmittal) must be included in electronic format for download, and also provided on contractor/vendor provided thumb drive

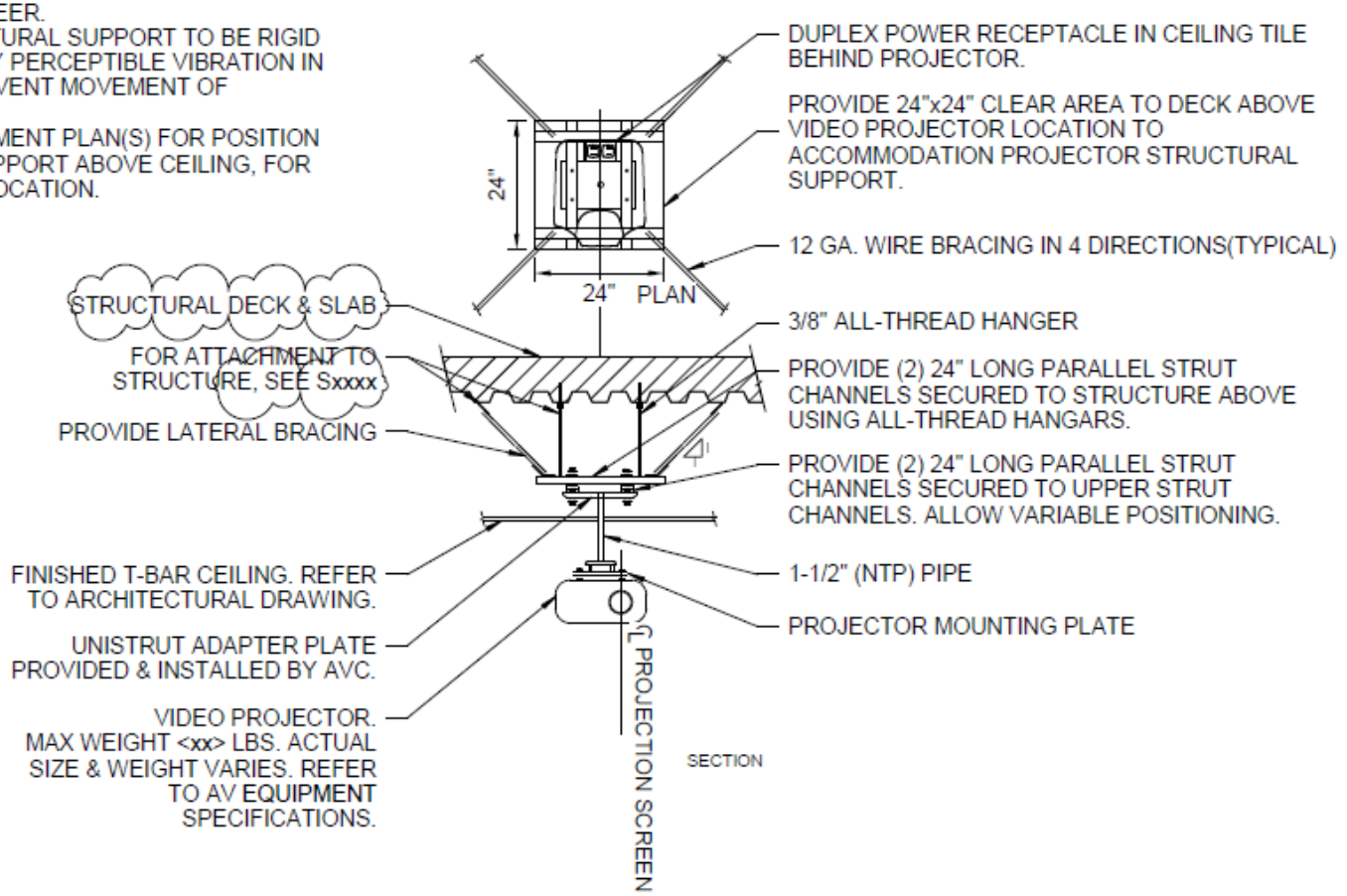
APPENDIX D – TYPICAL REFERENCE DETAILS

The following diagrams (see following pages) are sample details that can be used in audiovisual projects for general contractor information and mounting requirements. All details should be reviewed with a structural engineer for the project for proper attachment method and detailing prior to submittal to any plan checking agency (DSA, etc.).
Recommended submitting any reference details for coordination with structural engineer and architect at end of Schematic Design or beginning of Design Development phases to allow proper time for coordination with engineers for calculations and attachment method.
Where required, provide other relevant data specific to the building and audiovisual system designs including weight, color and min/max heights or protrusion limits to work with ADA guidelines.

Bubbled areas on diagrams indicate critical information notes such as specific references to architectural or structural details, weights, etc. to be coordinated during the project design and specific application.

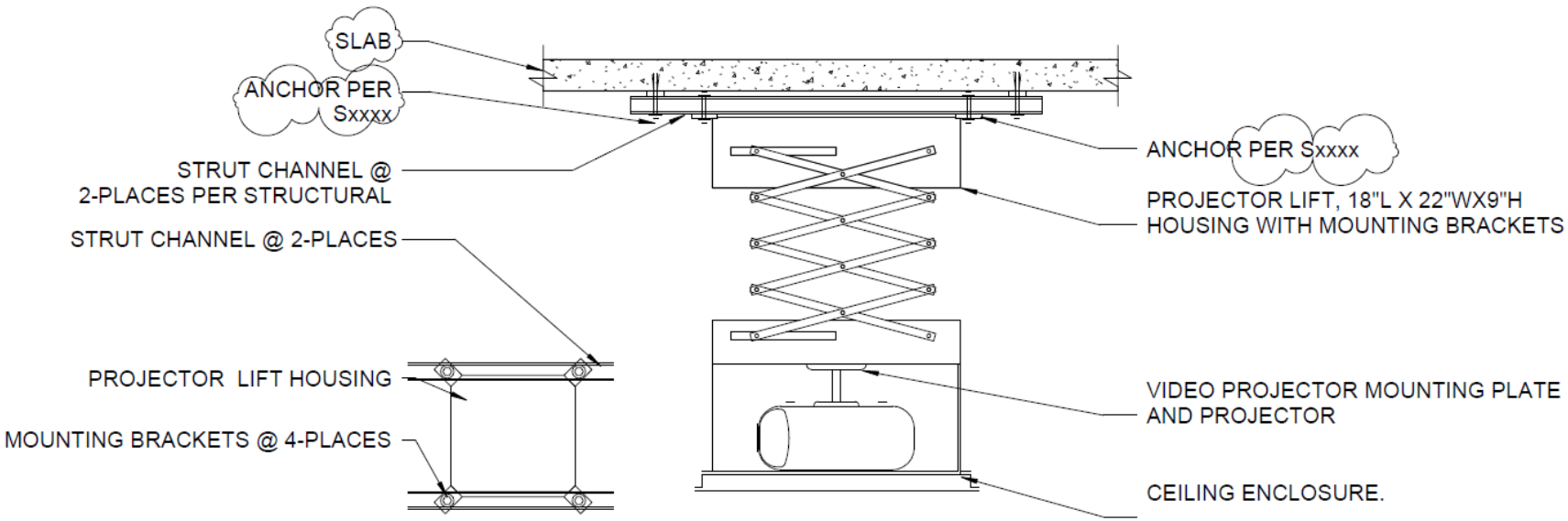
NOTES:

1. DESIGNS & ARRANGEMENT ILLUSTRATED ARE FOR REFERENCE ONLY. ALL STRUCTURAL SUPPORTS TO BE ENGINEERED BY ALICENSED STRUCTURAL ENGINEER.
2. PROJECTOR STRUCTURAL SUPPORT TO BE RIGID AND FREE FROM ANY PERCEPTIBLE VIBRATION IN STRUCTURE TO PREVENT MOVEMENT OF PROJECTED IMAGE.
3. REFER TO AV EQUIPMENT PLAN(S) FOR POSITION OF STRUCTURAL SUPPORT ABOVE CEILING, FOR EACH PROJECTOR LOCATION.



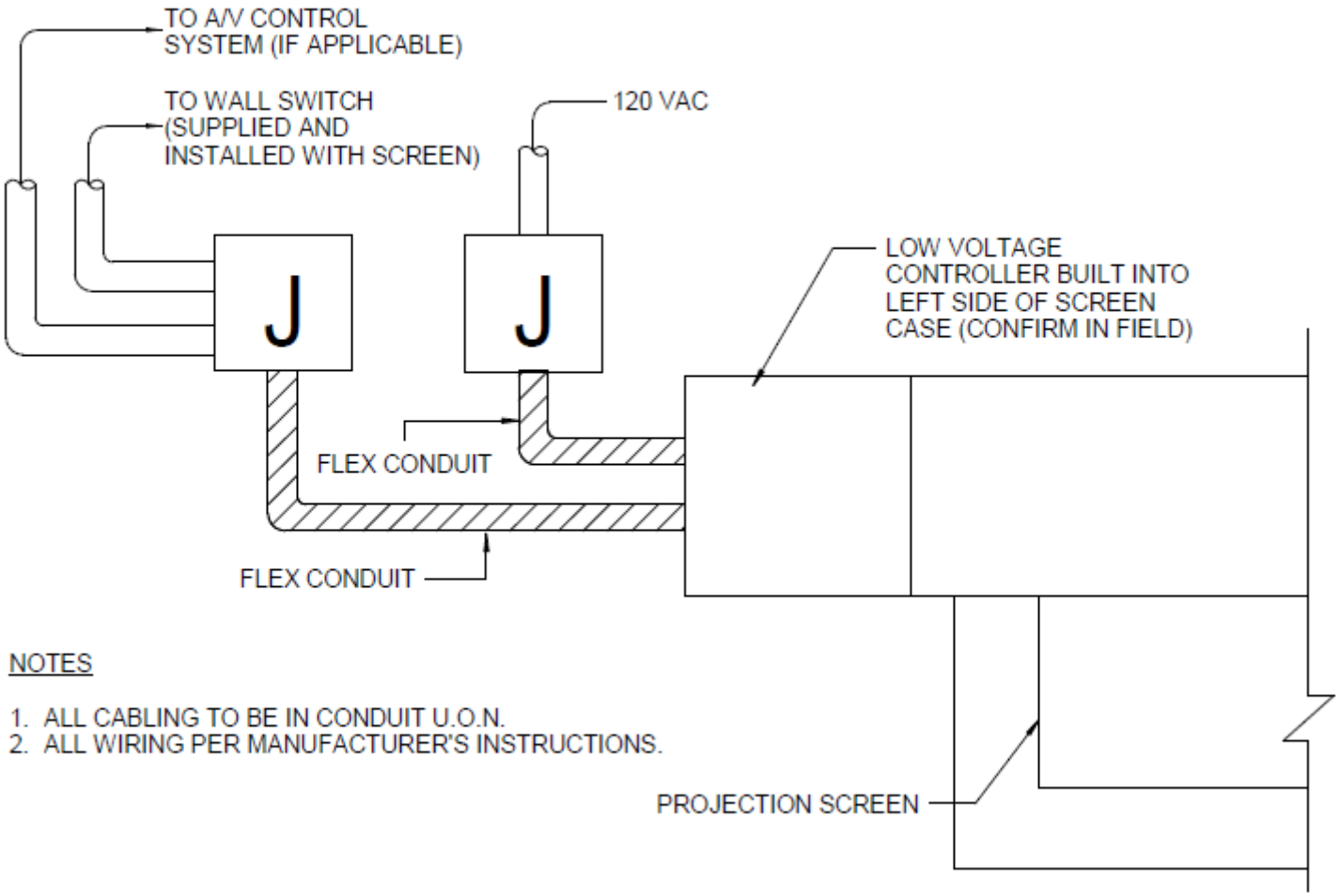
Ceiling Mounted Projector Detail

Identify deck and ceiling type to properly note on detail. Coordinate projector weight based on application. Note proper structural or architectural detail reference within for attachment method. Coordinate with Telecom and Electrical Engineer.



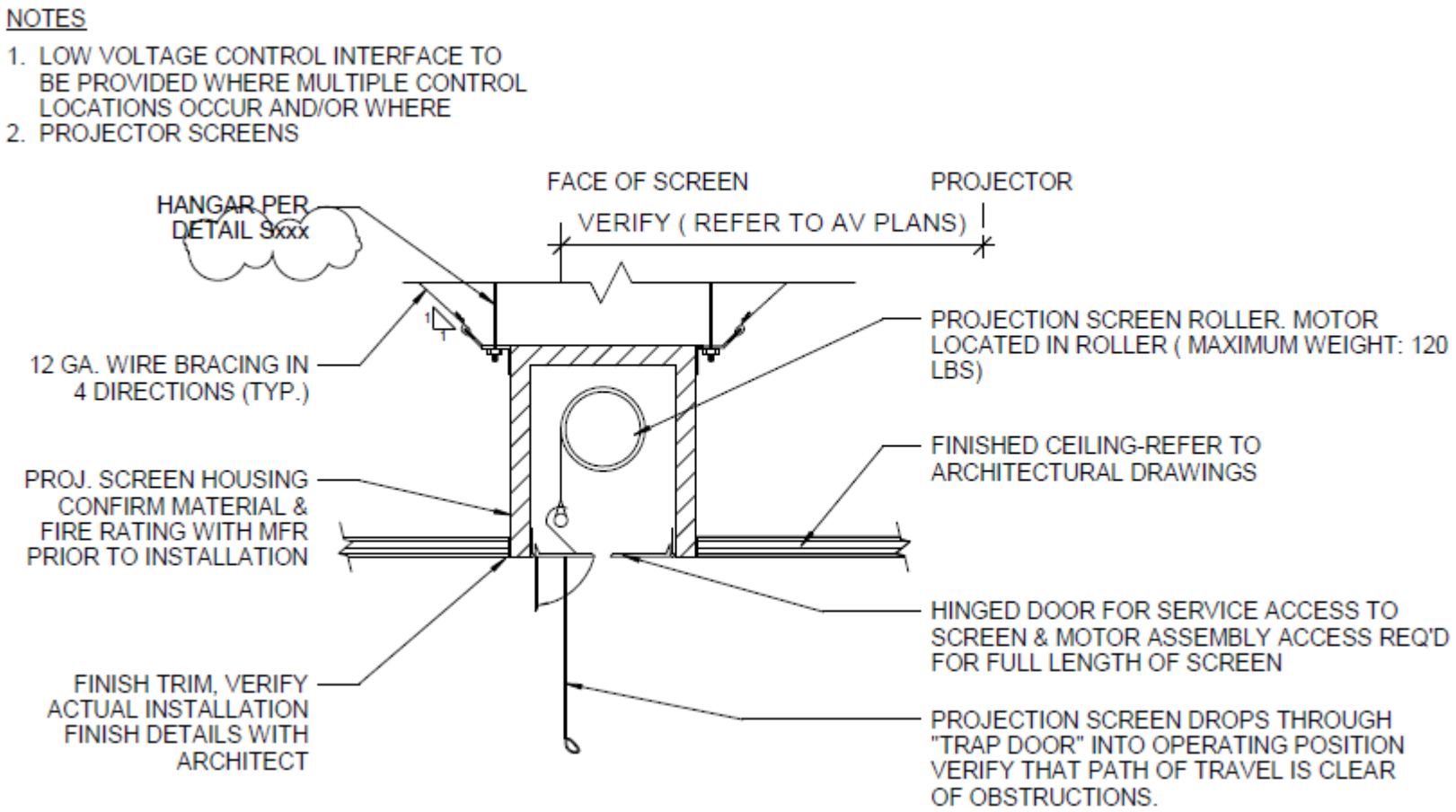
Ceiling Mounted Projector Lift Detail

Identify deck and ceiling type to properly note on detail. Coordinate projector weight based on application. Note proper structural or architectural detail reference within for attachment method. Coordinate with Telecom and Electrical Engineer for power and low voltage control and data / AV cabling within ceiling housing. Identify maximum weight of assembly.



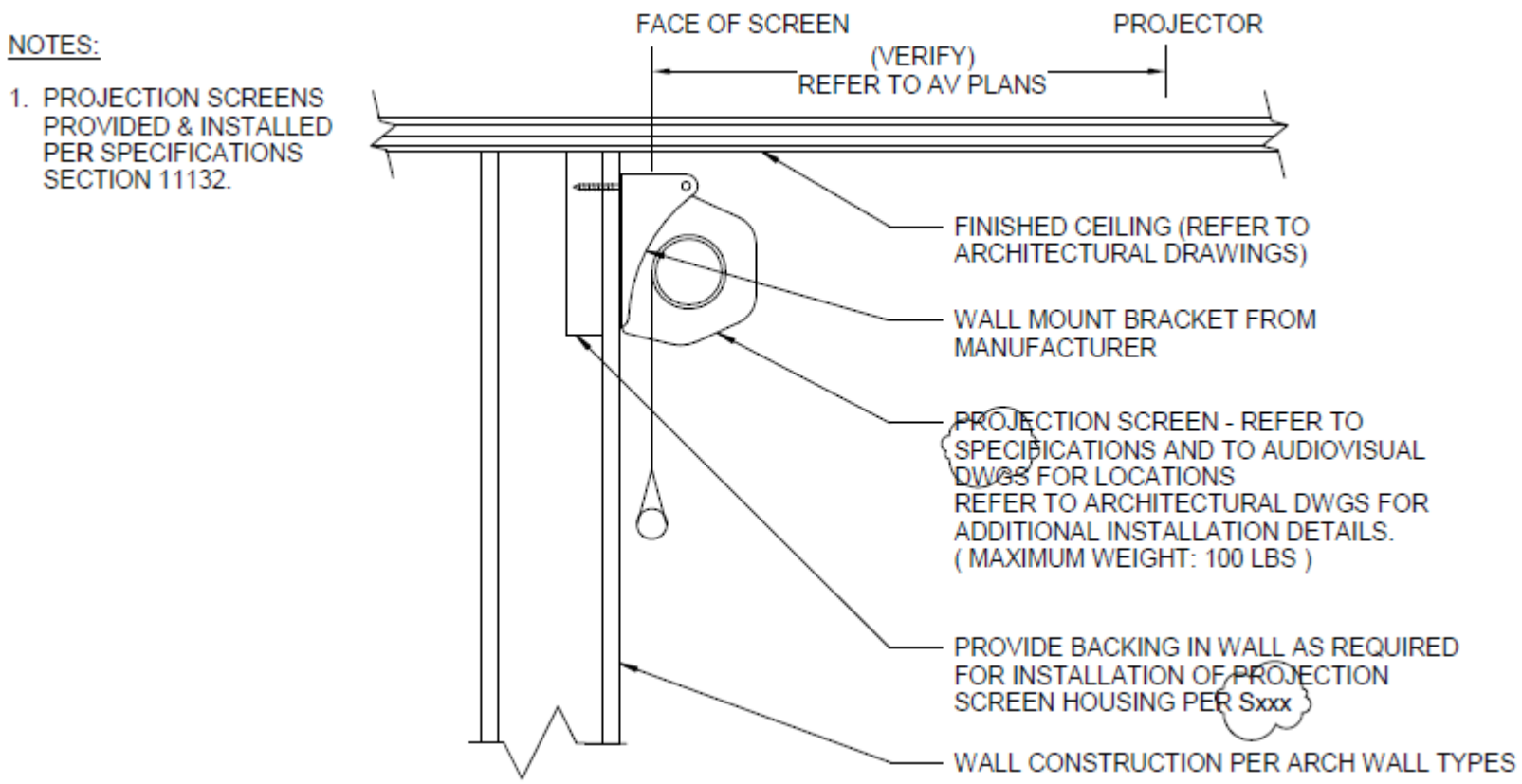
Projection Screen Electrical Connection Detail

Coordinate with low-voltage and Electrical Engineer for power and low voltage control and data / AV cabling within housing.
Coordinate low voltage wall switch / controller location (typically adjacent to screen near door for manual screen override.



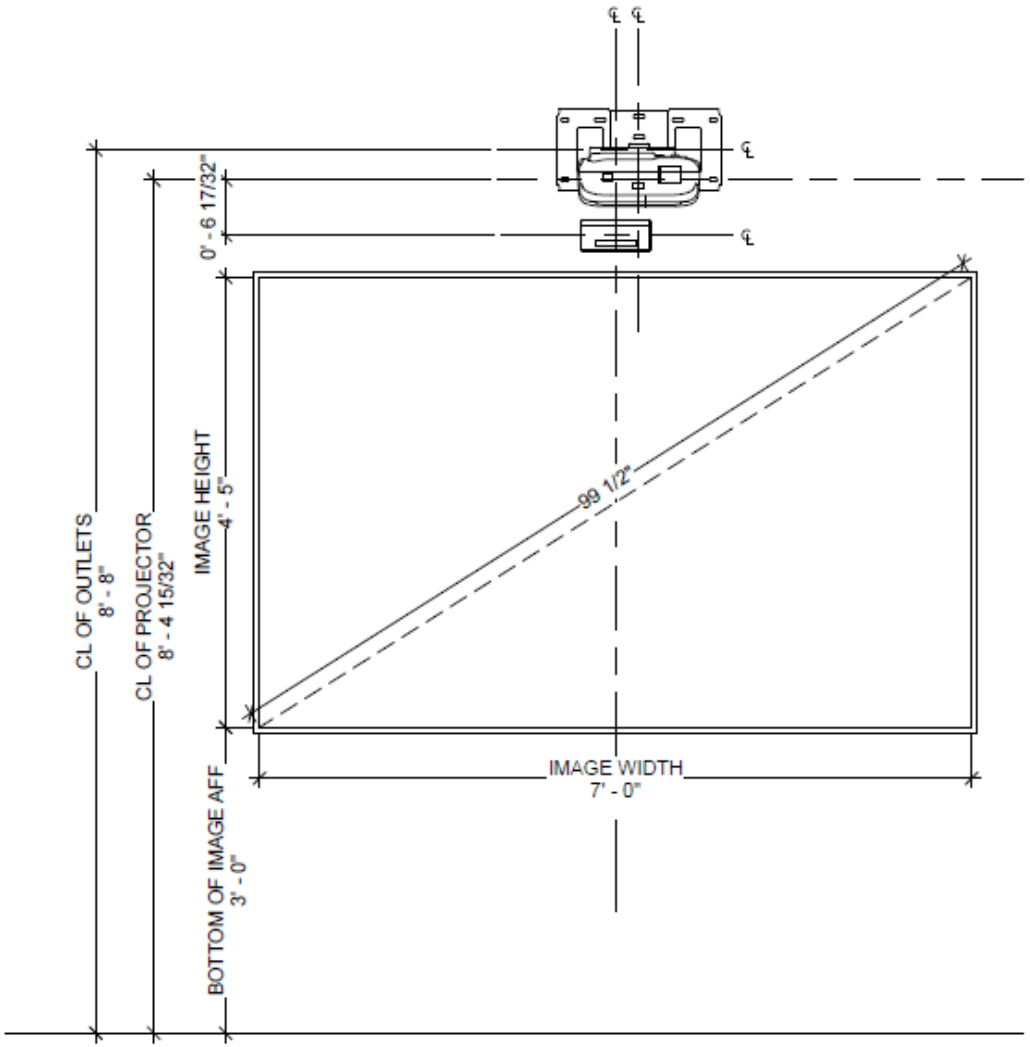
Ceiling Mounted Projection Screen Detail

Identify deck and ceiling type to properly note on detail. Identify maximum weight of assembly.



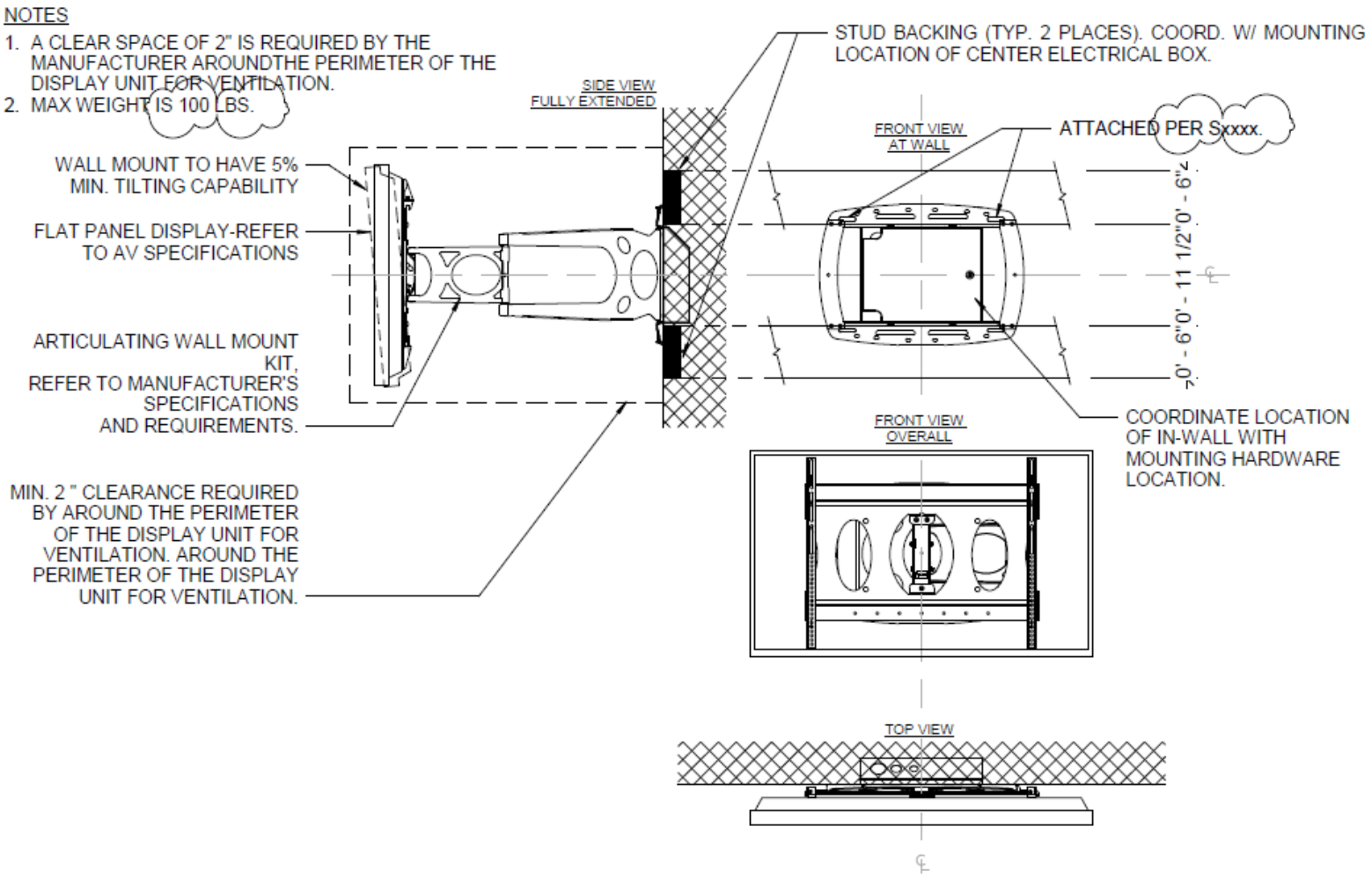
Wall Mounted Projection Screen Detail

Identify wall type to properly note on detail for backing. Include 6” extension bracket to clear wall obstructions as needed.
Identify maximum weight of assembly.



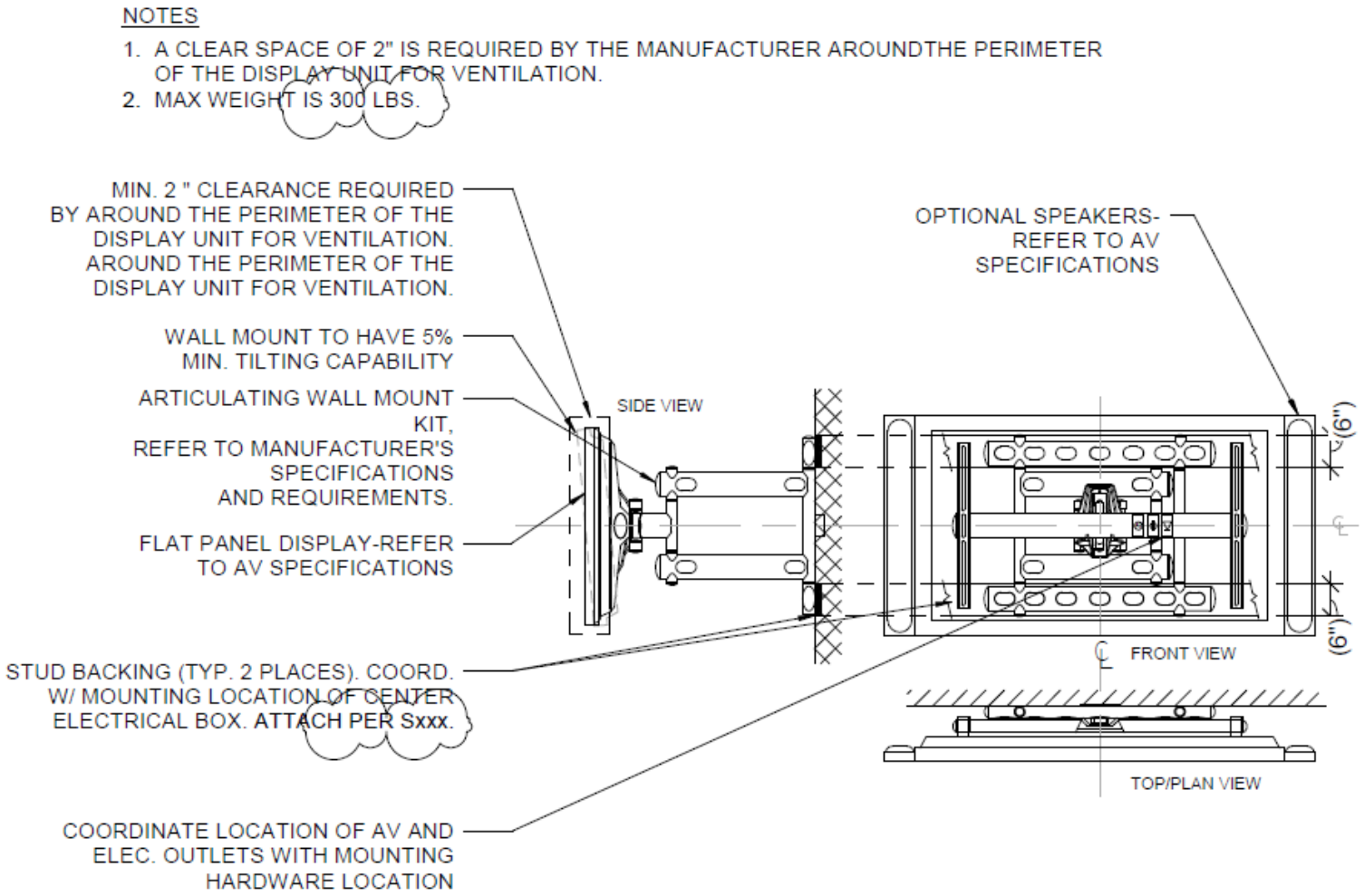
Wall Mounted Interactive Whiteboard Projector Detail

LACCD does not prefer to use these but the detail is included for specific applications that may required per building program.



Wall Mounted Small - Medium Flat Panel Display Detail

Coordinate articulating mount model type and size per display size and weight. Typical small to medium mounting brackets accommodate displays from 32” to 55”.

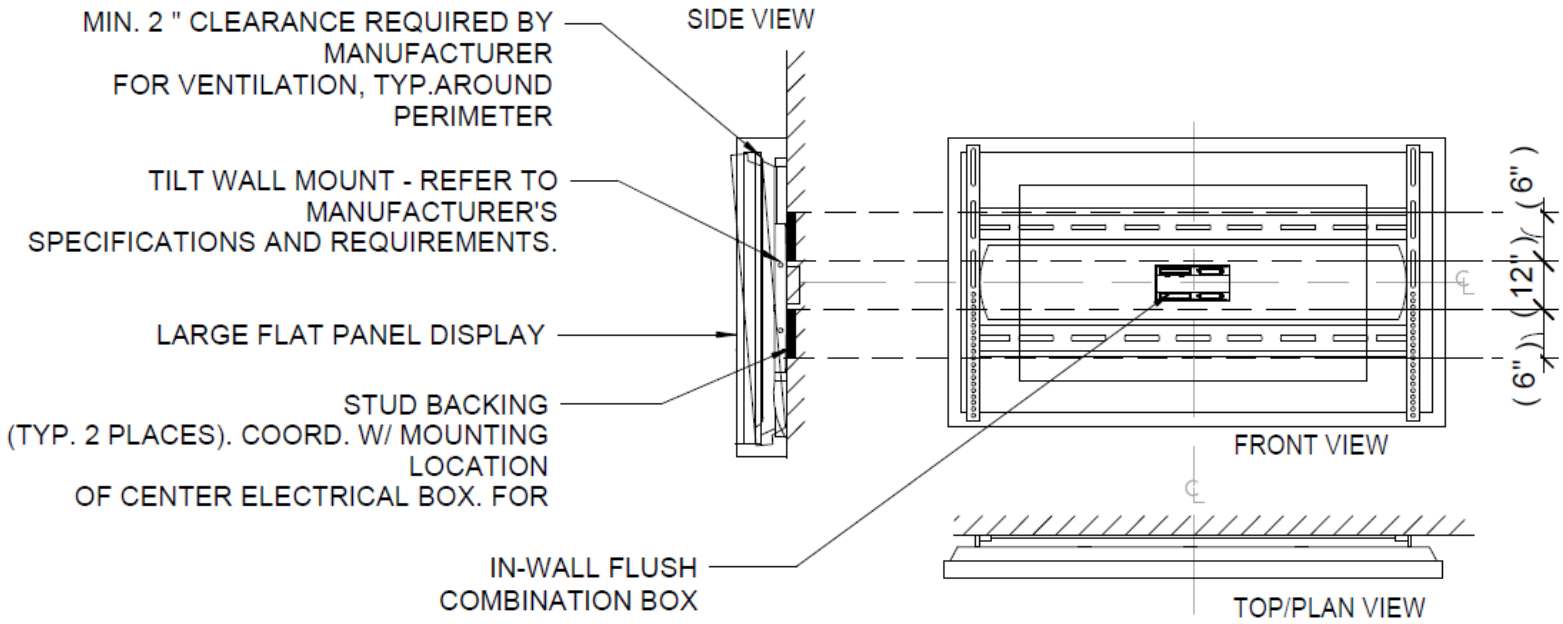


Wall Mounted Medium - Large Flat Panel Display Detail

Coordinate articulating mount model type and size per display size and weight. Typical small to medium mounting brackets accommodate displays from 55” to 75”.

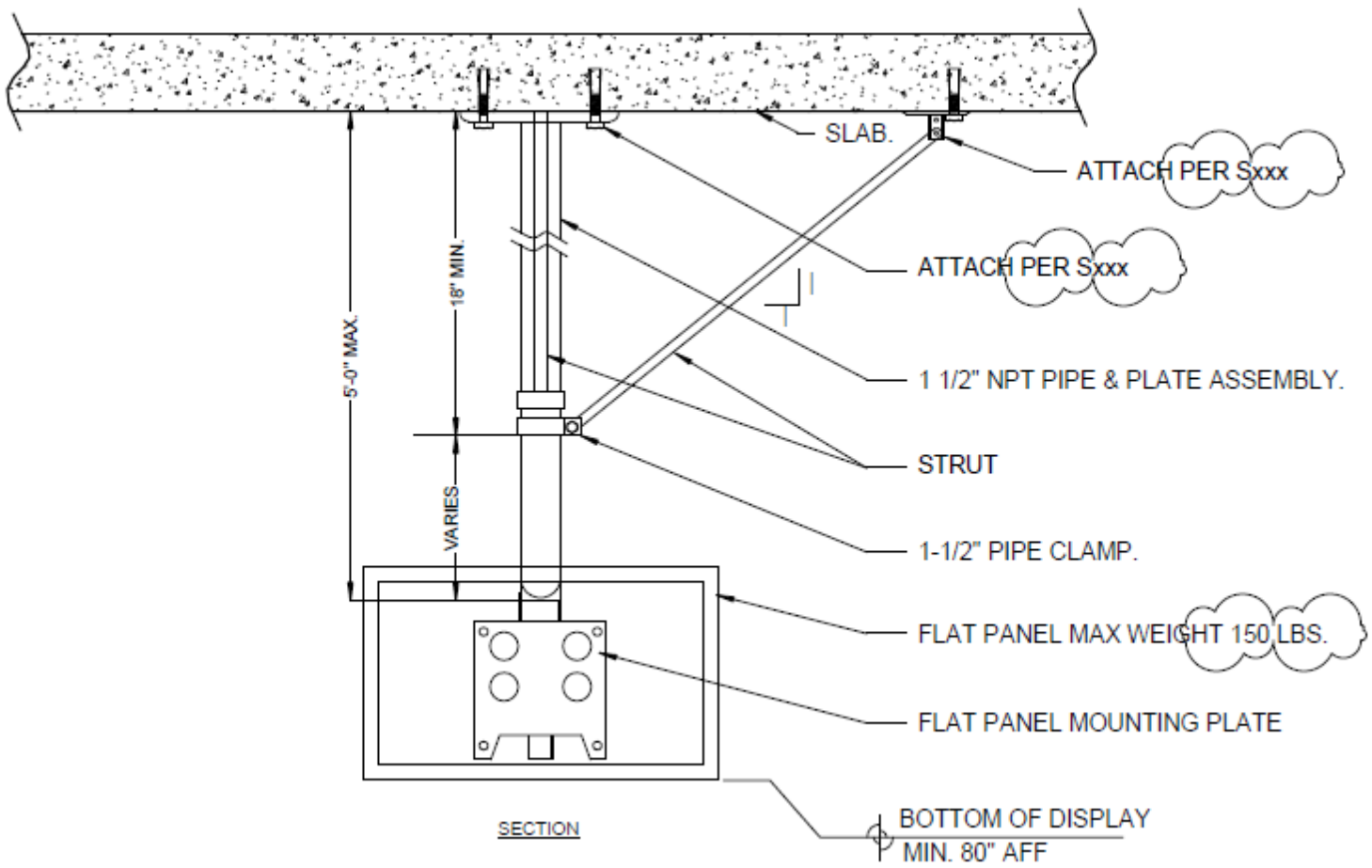
NOTES

1. A CLEAR SPACE OF 2" IS REQUIRED BY THE MANUFACTURER AROUNDTHE PERIMETER OF THE DISPLAY UNIT FOR VENTILATION.
2. 80" DISPLAY IS 270 LB.
3. 90" DISPLAY IS 300 LB.



Wall Mounted Large (Interactive) Flat Panel Display Detail

Coordinate wall mount model type and size per display size and weight. Typical large fixed heavy-duty mounting brackets accommodate displays from 80” to 90”.

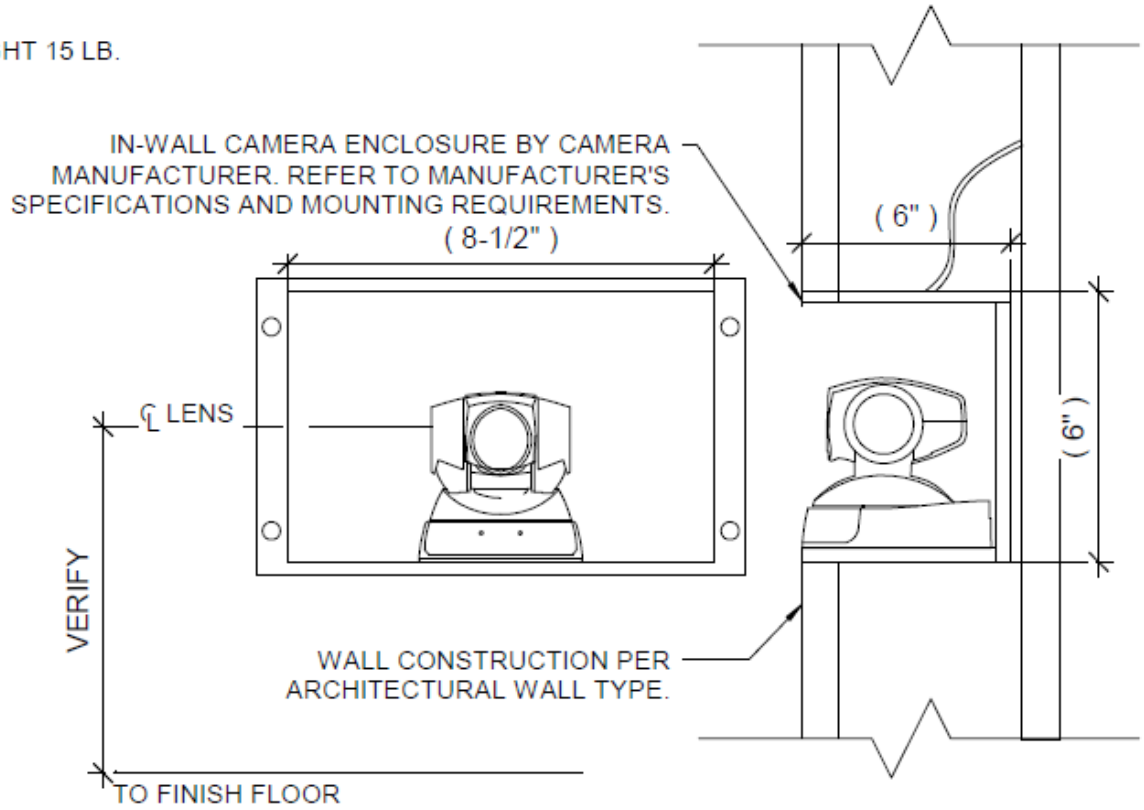


Ceiling Mounted Flat Panel Display Detail

Identify deck and ceiling type to properly note on detail. Coordinate display weight based on application. Note proper structural or architectural detail reference within for attachment method. Coordinate with Telecom and Electrical Engineer.

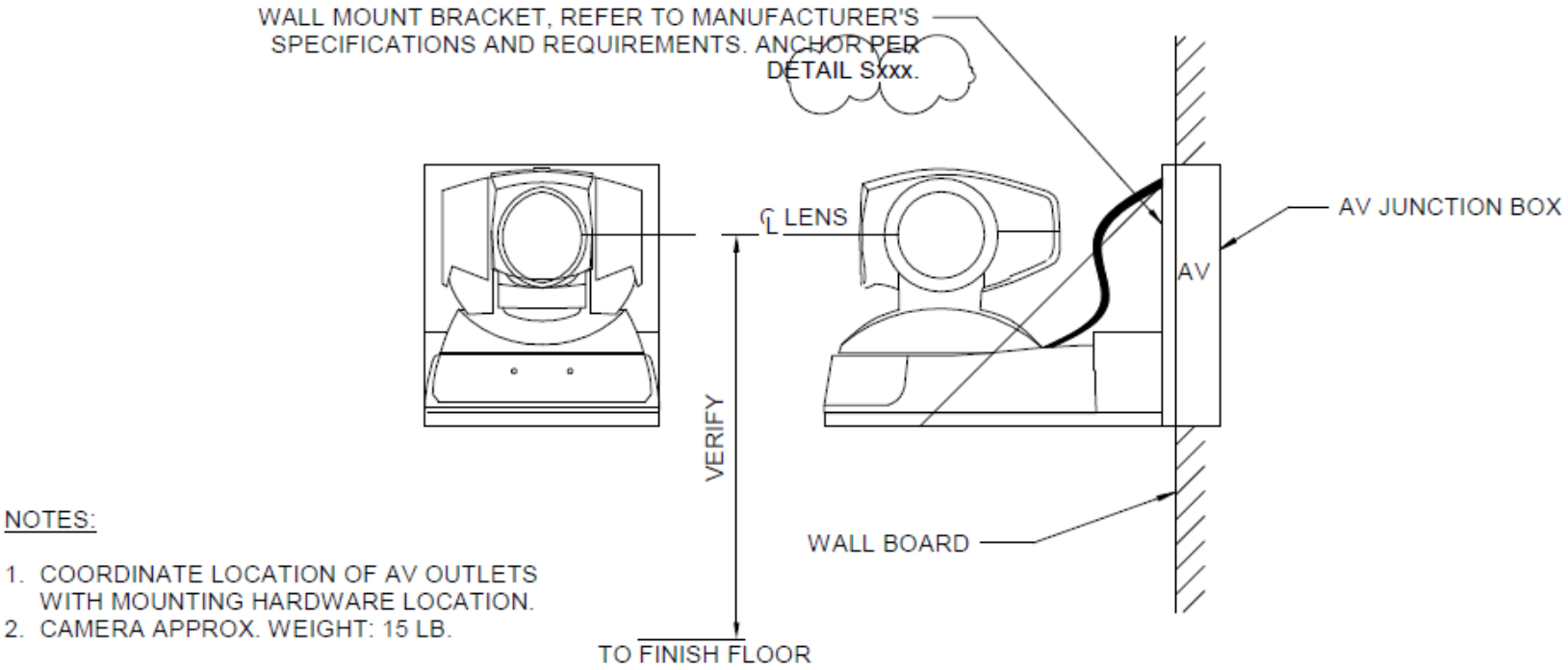
NOTES:

1. COORDINATE FINAL LOCATION WITH ARCHITECT AND AV CONSULTANT.
2. CAMERA : APPROX. WEIGHT 15 LB.



In-Wall Mounted Camera & Niche Detail

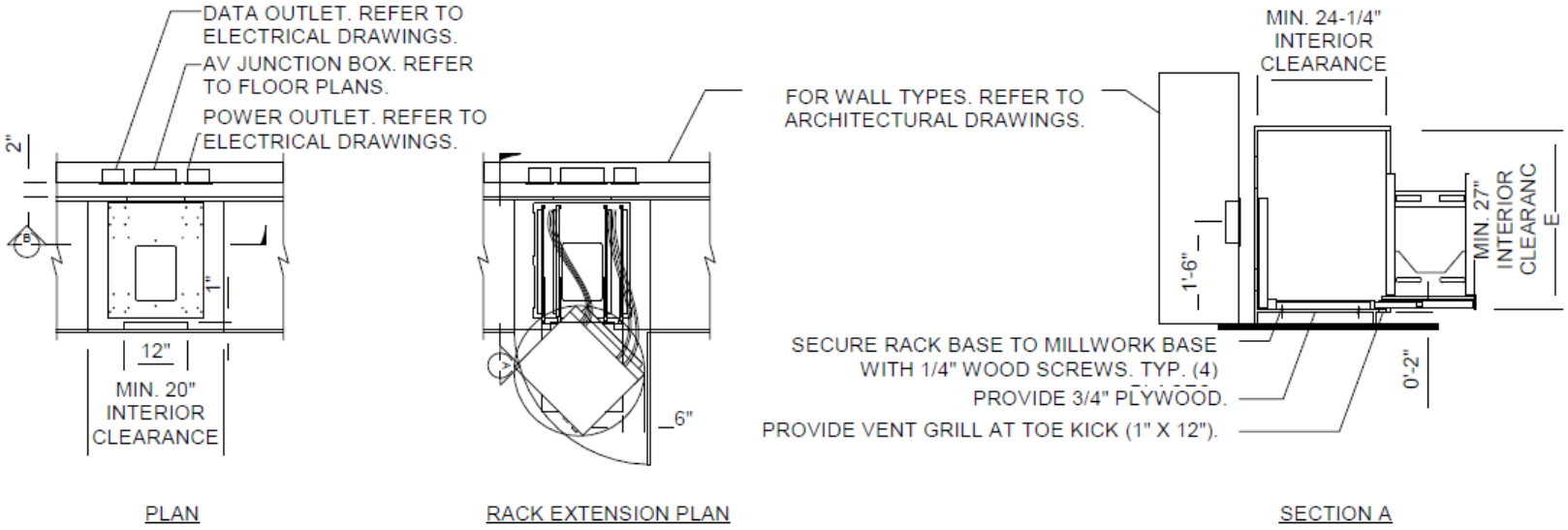
Coordinate 4” deep camera box with manufacturer installation instructions (refer to Appendix B for equipment standards for typical model). Include in detail any specific notes for priming and painting enclosure to match specific architectural wall finishes. Include mounting shelf as required based on camera size and protrusion. Camera to not protrude from wall greater than 4” per ADA guidelines if under 7’-6” AFF.



Wall Mounted Camera Detail

Coordinate camera and mounting bracket/shoe with manufacturer installation instructions (refer to Appendix B for equipment standards for typical model). Include in detail any specific notes for priming and painting bracket to match specific architectural wall finishes. Camera to not protrude from wall greater than 4” per ADA guidelines if under 7’-6” AFF.

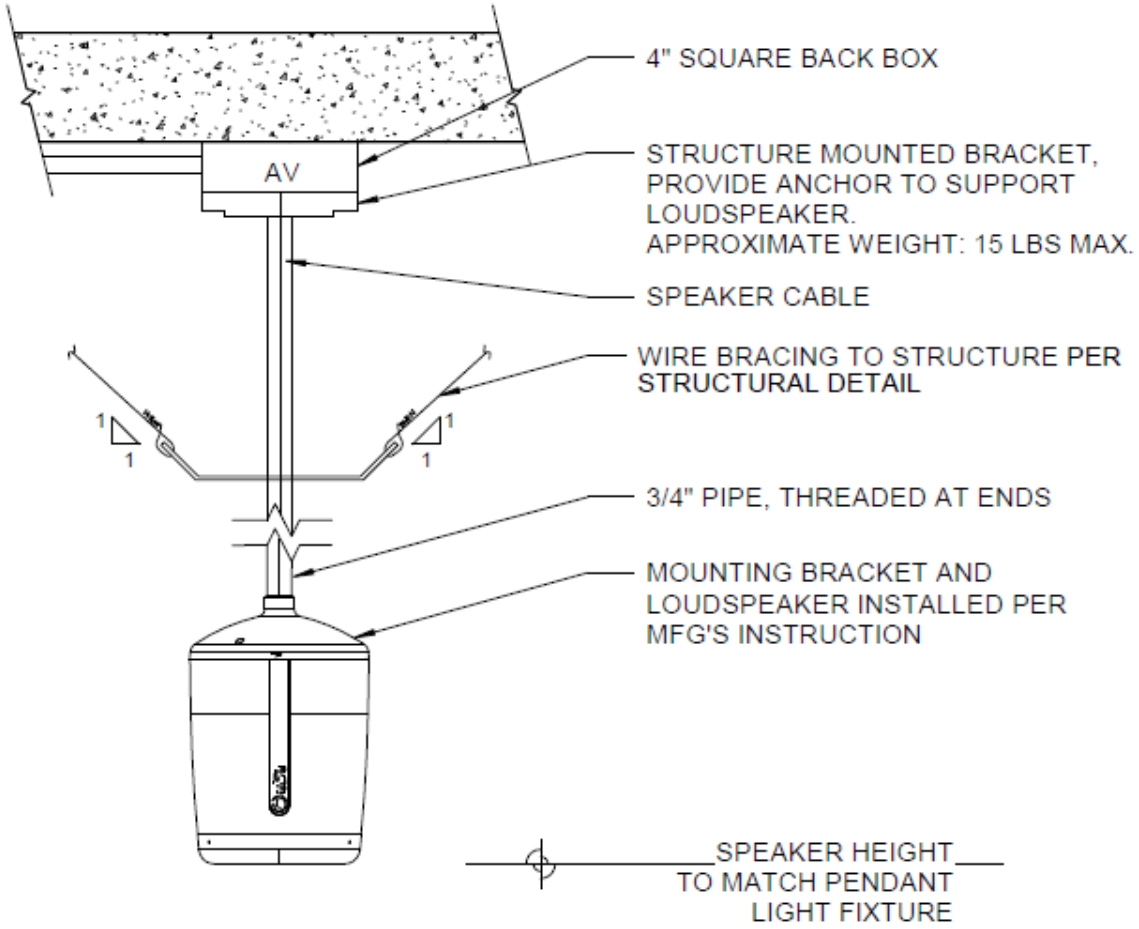
NOTE:
1. FOR NUMBER OF BAYS, REFER TO ARCHITECTURAL DRAWINGS.
2. PROVIDE MINIMUM 2" CLEARANCE BETWEEN MILLWORK AND WALL.
3. PULL-OUT 12RU RACK.
4. ASSISTED CONVECTION COOLING AT xxx BTU/HR.



PLAN | RACK EXTENSION PLAN | SECTION A

Credenza / Millwork Equipment Rack Detail

Coordinate equipment rack within millwork with architect. Coordinate ventilation cutouts for both incoming air and exhaust adding thermal switch and fan kit(s) as required in each bay required. Coordinate rear cutouts for incoming services. Include base supports to floor (millwork ribbing) to accommodate multi-bay base deflection due to weight. Accommodate load on base when rack is extended.

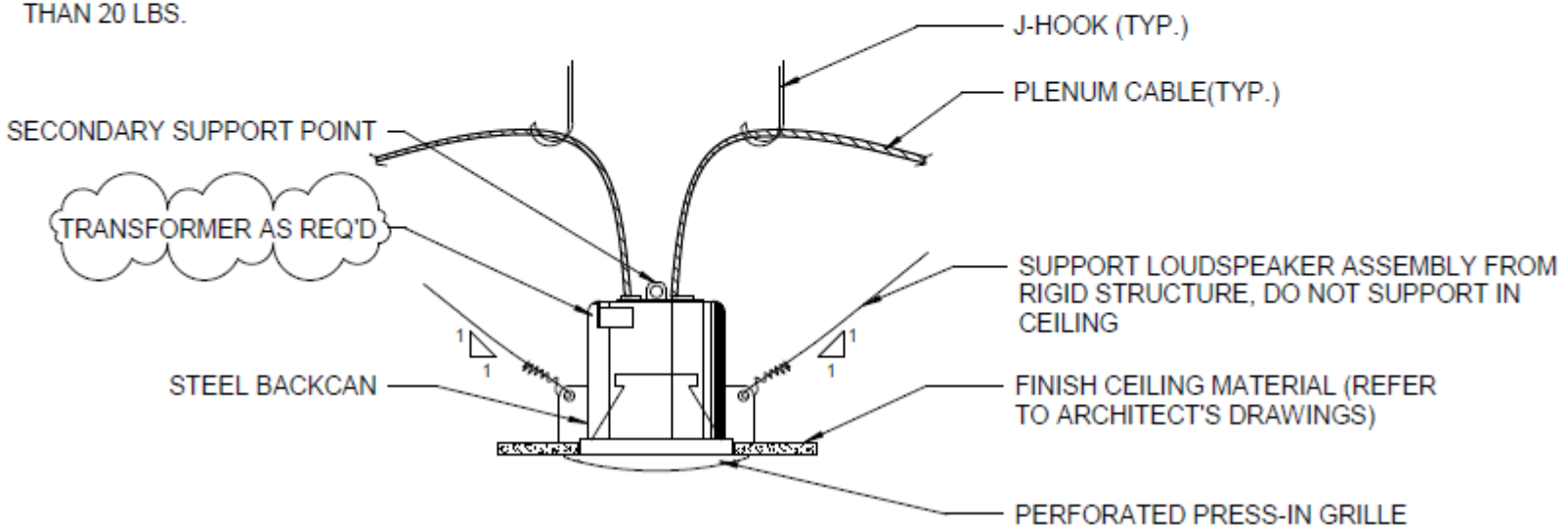


Pendant Speaker Detail

Coordinate structural mounting to deck with structural engineer. Pendant speaker can be supported by cable or conduit assembly (use ceiling fan 4S box cover for sway). Paint speaker assembly including conduit and box to match open ceiling as required per architect finish schedule.

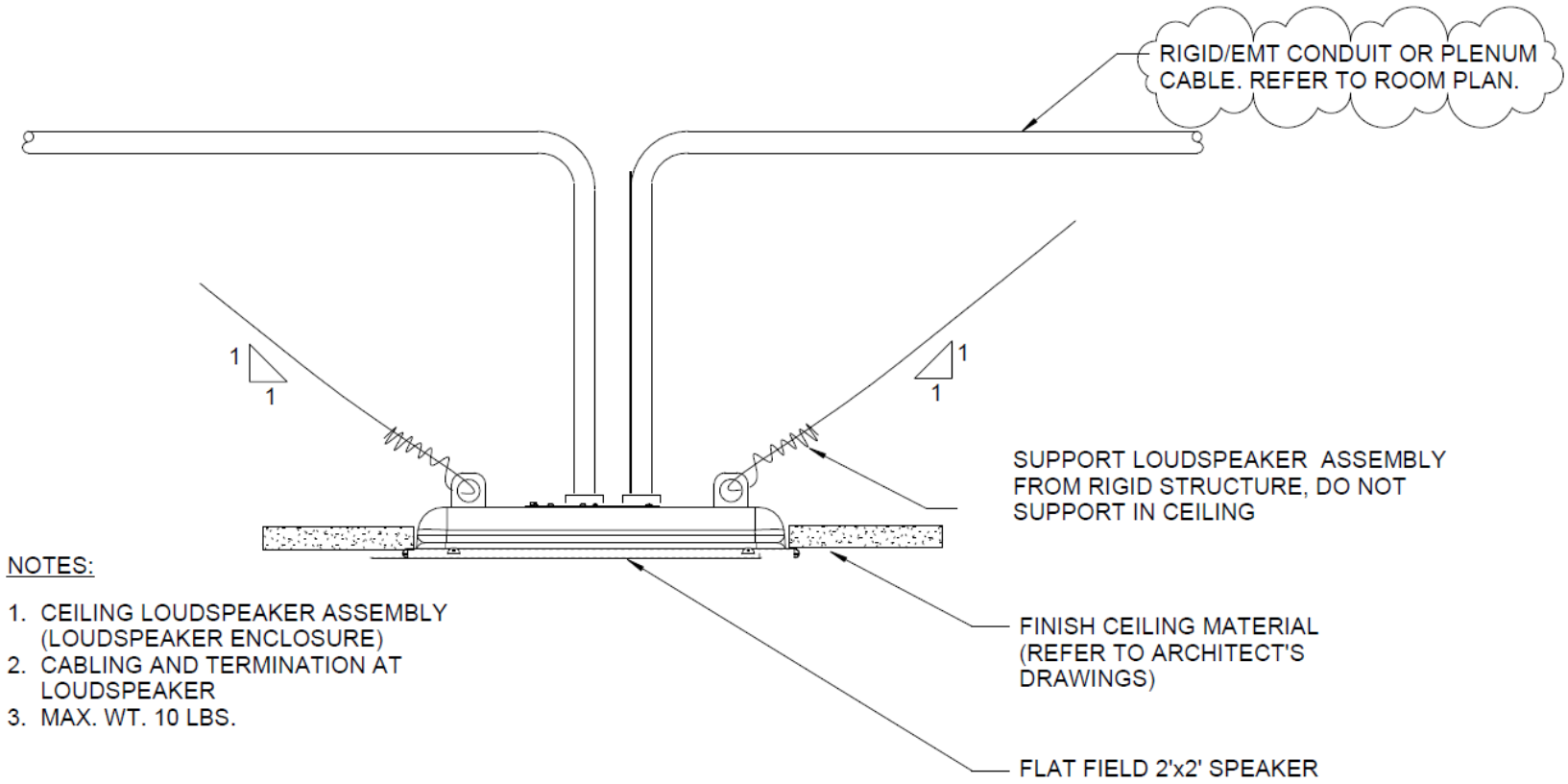
NOTES:

1. CEILING LOUDSPEAKER ASSEMBLY (ENCLOSURE, LOUDSPEAKER, AND GRILLE)
2. CABLING AND TERMINATION AT LOUDSPEAKER TO BE PROVIDED
3. GRILLE FINISH REQUIREMENTS AS SPECIFIED BY ARCHITECT
4. APPROX. WEIGHT OF SPEAKER: LESS THAN 20 LBS.



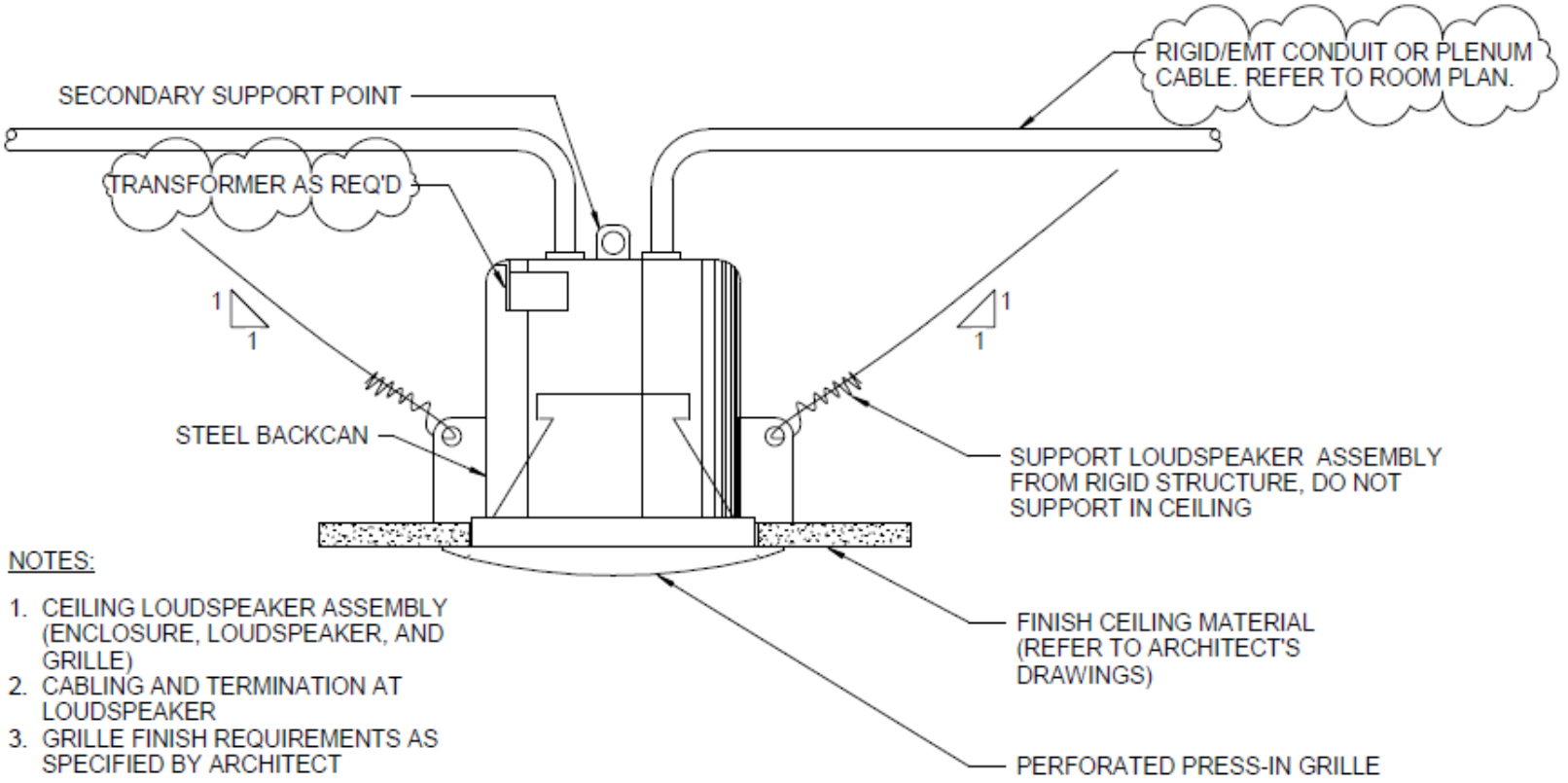
A.C.T. Ceiling Speaker Detail

Coordinate structural mounting to deck with structural engineer. Speaker can be supported in access ceiling tile (ACT) with support ring and ACT tile bridge as required. Paint speaker grill to match ceiling as required per architect finish schedule. Leave 3 ft. service cable for speaker installation and service. Include plenum backcan as required (unless speaker is one assembly). Include transformer as required in speaker ordering option in spec to accommodate 70/100V chain installation. Coordinate locations with above-ceiling ductwork and other obstructions.



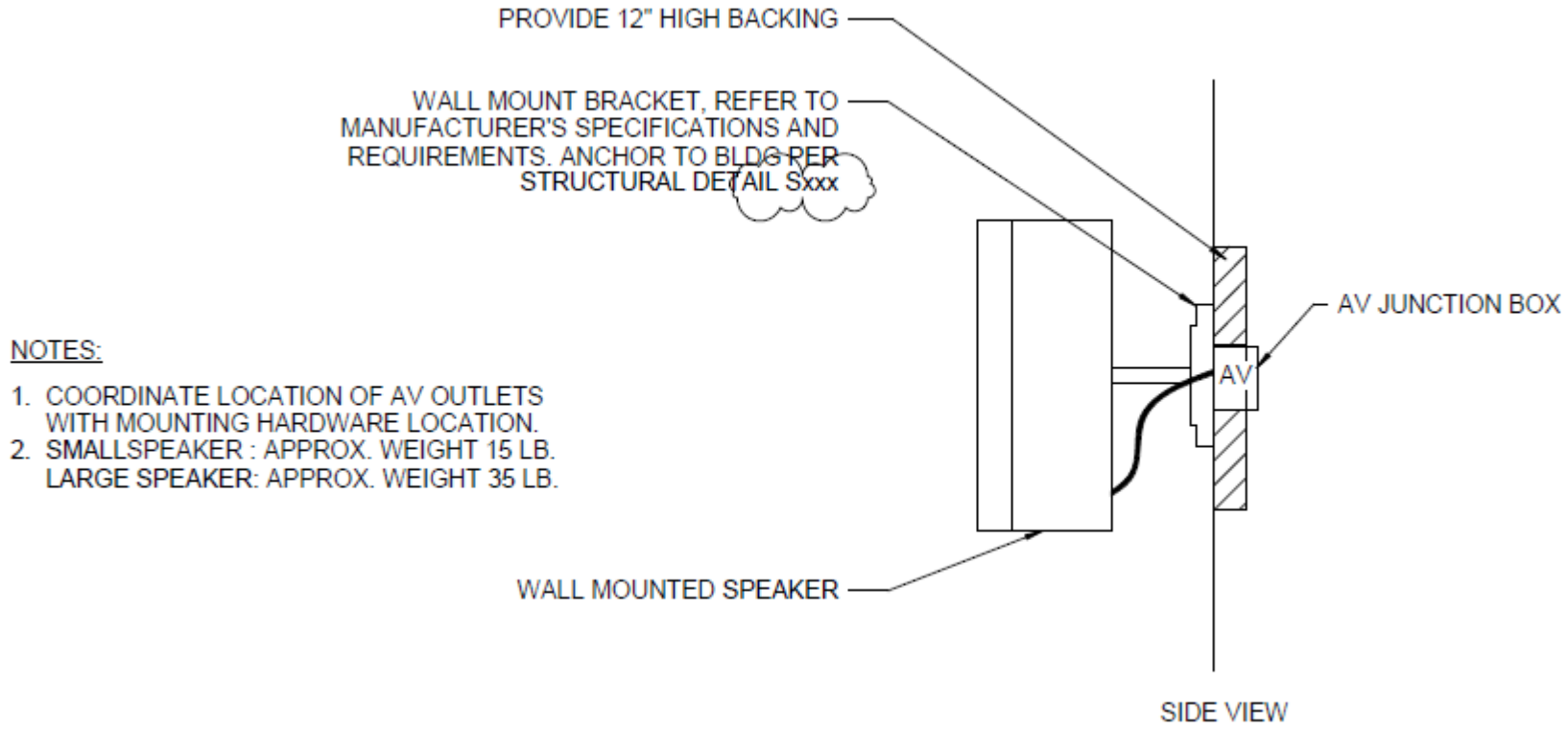
Flat Field A.C.T. Ceiling Speaker Detail

Coordinate structural mounting to deck with structural engineer. Speaker can be supported in access ceiling tile (ACT) with secondary cable support attachments as required. Leave 3 ft. service cable for speaker installation and service. Speaker is one assembly and is white in color to match typical ACT ceiling tiles. Include transformer as required in speaker ordering option in spec to accommodate 70/100V chain installation. Coordinate locations with above-ceiling ductwork and other obstructions. Speaker depth is 3.5”.



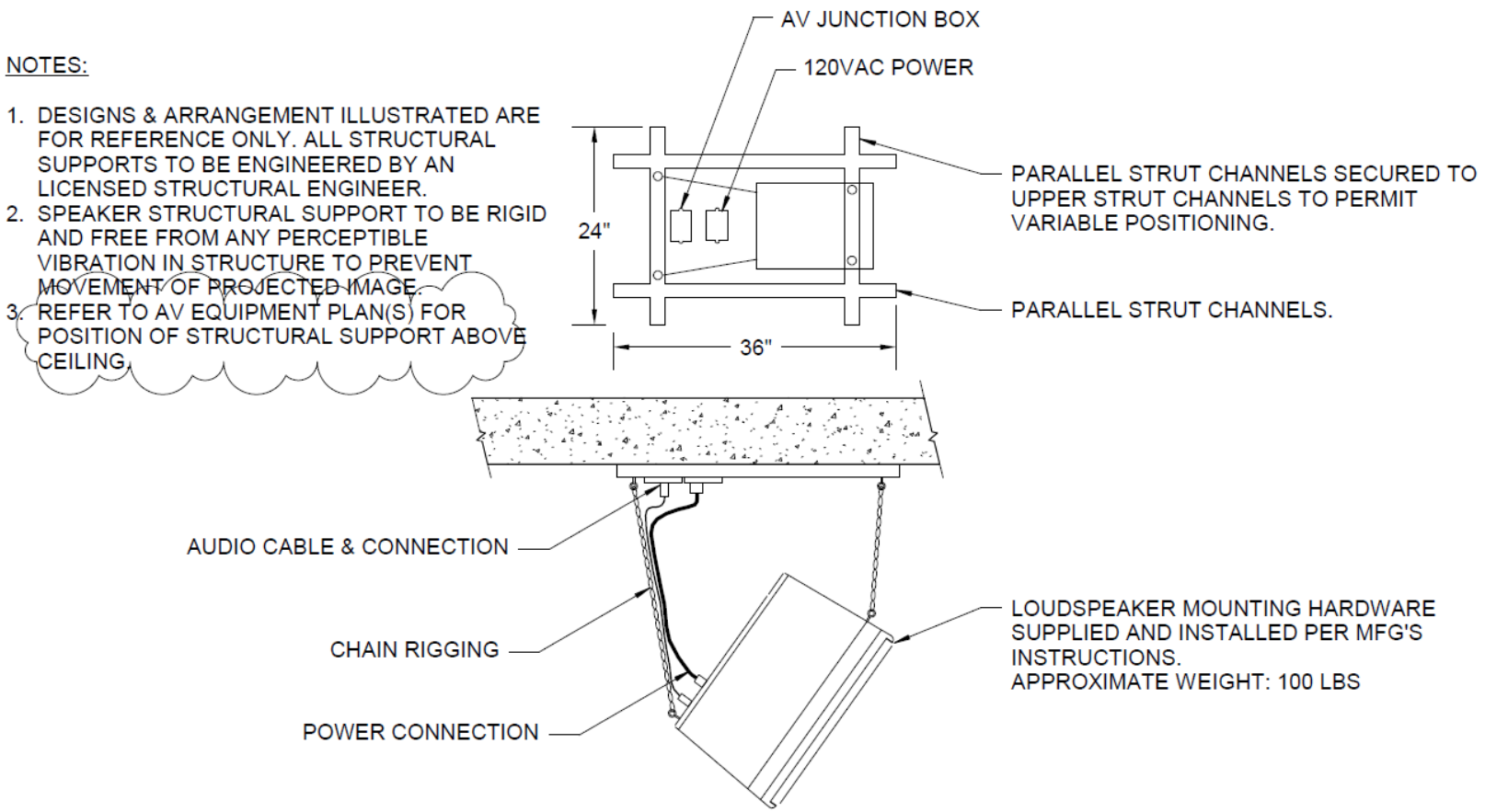
Hard Lid Ceiling Speaker Detail

Coordinate structural mounting to deck with structural engineer. Speaker can be supported in hard-lid with support ring as required. Paint speaker grill to match ceiling as required per architect finish schedule. Leave 3 ft. service cable for speaker installation and service. Include plenum backcan as required (unless speaker is one assembly). Include transformer as required in speaker ordering option in spec to accommodate 70/100V chain installation. Coordinate locations with above-ceiling ductwork and other obstructions.



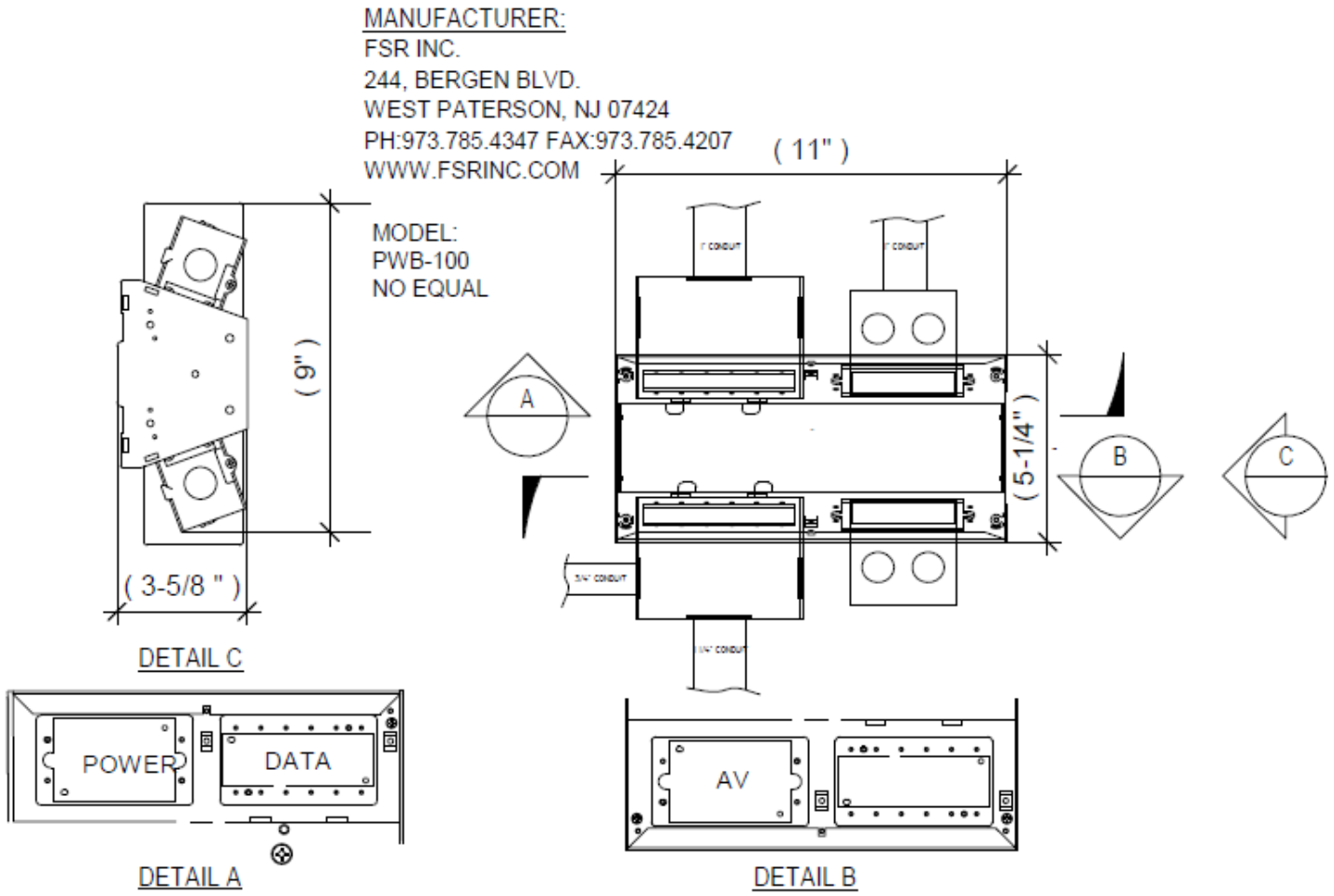
Wall Speaker Detail

Coordinate structural mounting to wall with structural engineer. Include appropriate wall mount bracket by application requirements. Paint speaker assembly to match wall as required per architect finish schedule if applicable. Include secondary cable tether as required for anchorage. Include transformer as required in speaker ordering option in spec to accommodate 70/100V chain installation. Mount speaker assembly to clear 7'-6" to the bottom of the assembly per ADA guidelines.



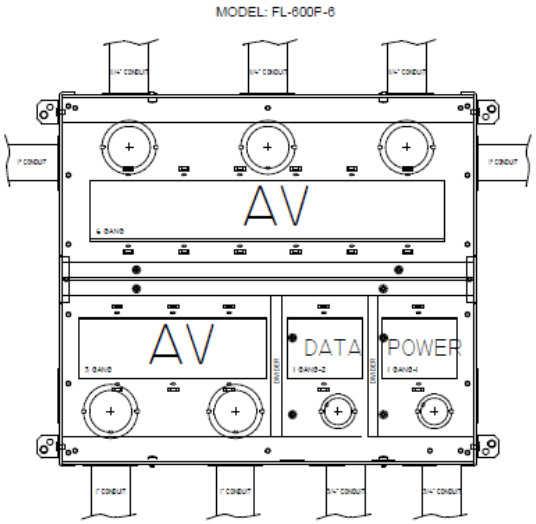
Flown Powered Speaker Detail

Coordinate structural mounting to wall with structural engineer. Include appropriate wall or ceiling mount attachment by application requirements. Paint speaker assembly to match as required per architect finish schedule if applicable. Include secondary cable tether as required for anchorage. Provide 120VAC power for active speaker unit.



Recessed In-Wall Consolidation Box Detail

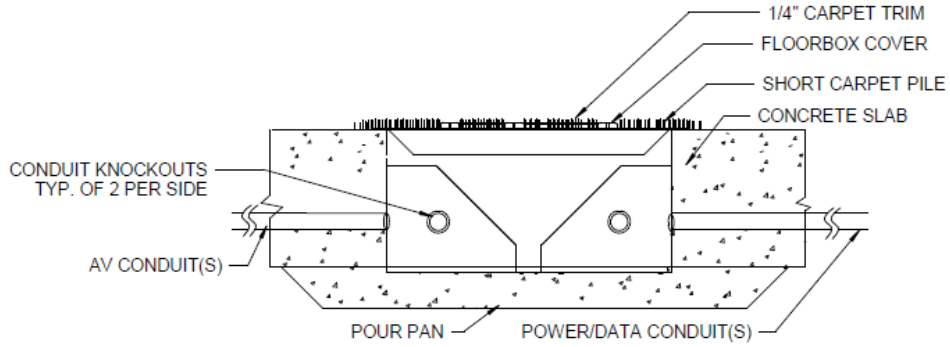
Coordinate services with Telecom and Electrical Engineer for co-location of services as well as conduit access into the desired bay / junction-box. Include cover plate and coordinate cover finish with architect to match wall as required. Coordinate location of in-wall enclosure with display mount bracket.



MANUFACTURER:
FSR INC.
244, BERGEN BLVD
WEST PATERSON, NJ 07424
PH:973.785.4347 FAX:973.785.4207
WWW.FSRINC.COM

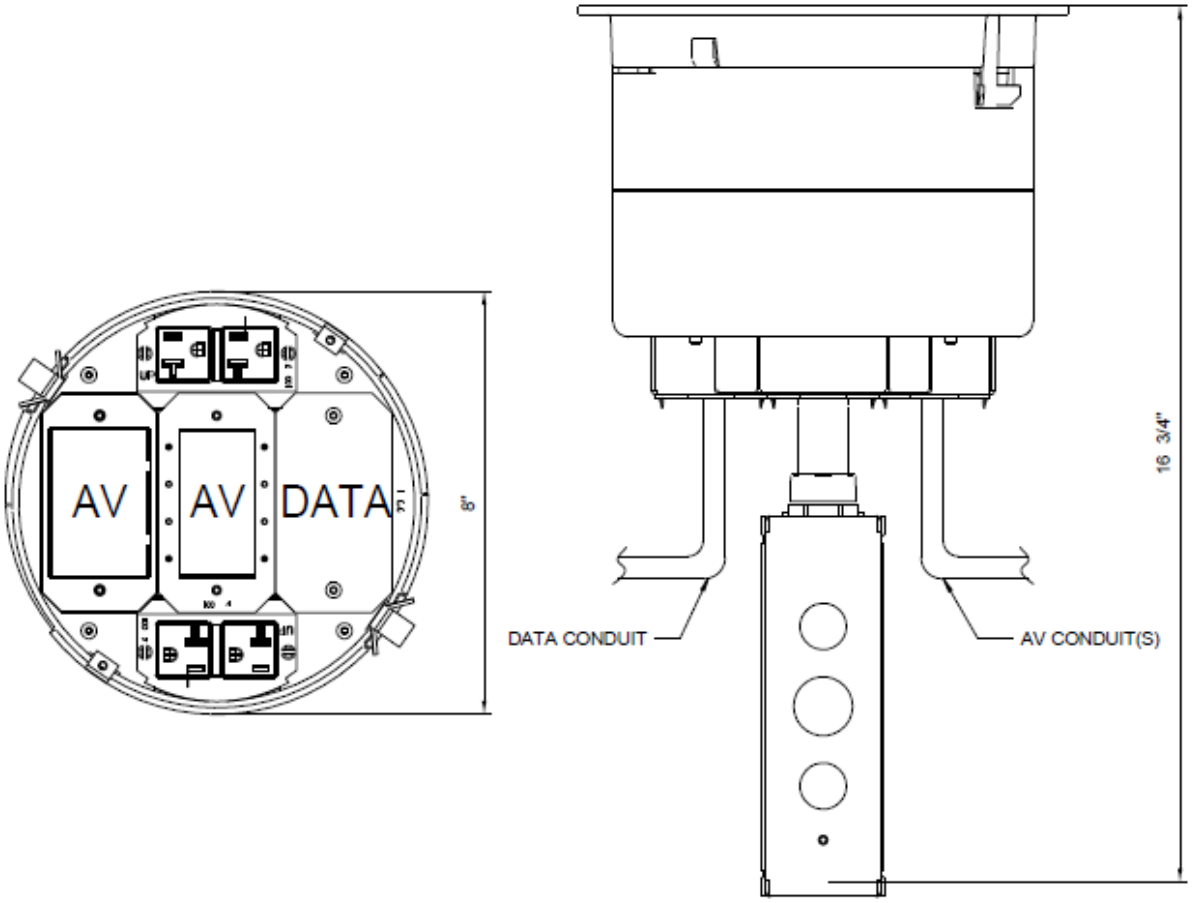
NOTES:

1. COORDINATE CARPET/TILE FLANGE HEIGHT AND FINISH WITH ARCHITECT
2. ALL CONDUITS FOR AV ARE RUN PER AV INFRASTRUCTURE PLAN
3. CONDUITS FOR POWER AND DATA ARE RUN PER ELECTRICAL AND I.T. PLAN RESPECTIVELY
4. AV CONDUITS SHOWN ARE REPRESENTATIVE. SEE AV DRAWINGS FOR EXACT REQUIREMENTS
5. FLOORBOX COVER MUST BE FLUSHED WITH FINISHED FLOOR.
6. SEAL EDGES OF PAN TO CREATE DEPRESSED SLAB AT FLOOR BOX LOCATION.



Multi-Service Combination Floor Box Detail

Coordinate services with Telecom and Electrical Engineer for co-location of services as well as conduit access into the desired bay / junction-box. Include cover lid and coordinate cover material finish with architect to match wall as required (solid plate, carpet/flooring insert & access type. Coordinate with structural for pour pan as required with slab conditions. For raised floor conditions, specify correct box type and structural support. Coordinate cable bundle diameter for all services to fit through access notch to ensure lid closes properly flush under instructor station.

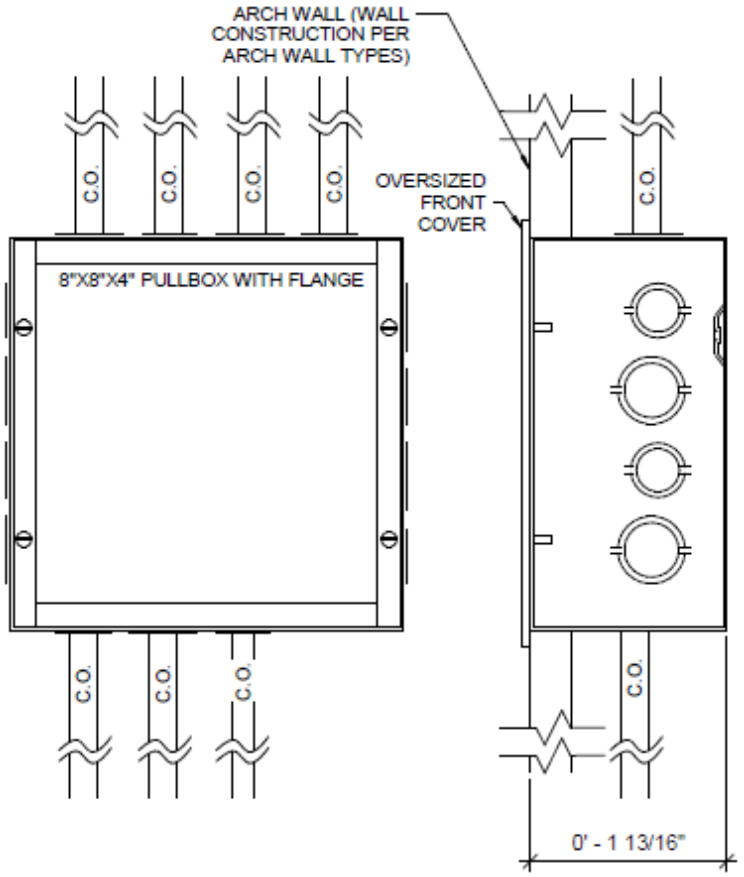


Multi-Service Recessed Combination Floor Poke-Through Detail

Coordinate services with Telecom and Electrical Engineer for co-location of services as well as conduit access into the desired bay / junction-box. Include cover lid and coordinate cover material finish with architect to match wall as required. Coordinate position for coring for structural support in slab conditions (proximity to other cores). Coordinate box size (4", 6", 8" or 10") based on services connectivity requirements by location. Coordinate cable bundle diameter for all services to fit through access notch to ensure lid closes properly flush under instructor station.

NOTES:

1. OVERSIZED FRONT COVER SHOULD BE PAINT GRADE AND PAINTED TO MATCH INTERIOR COLOR SCHEME.
2. ALL CONDUIT FOR AV RUN PER AV INFRASTRUCTURE PLAN
3. AV CONDUITS SHOWN ARE REPRESENTATIVE. SEE AV DRAWINGS FOR EXACT REQUIREMENTS.



In-Wall Junction Box Detail

Coordinate services with Telecom and Electrical Engineer for co-location of services to be in close proximity to AV wall box. Typically, a larger capacity in-wall NEMA box can be located behind millwork or for free-standing equipment carts to accommodate multiple conduits and cabling in a recessed system. Box to be flush with wall surface. Include NEMA box cover coordinated with wall finish per architect. Covers can include a corner notch or “mouse hole” to accommodate cable passage through the lid (to help contain cabling and ensure better aesthetics) and should be sized to accommodate bundled cabling. Box and cover assemble to be sized to accommodate the number of conduits.

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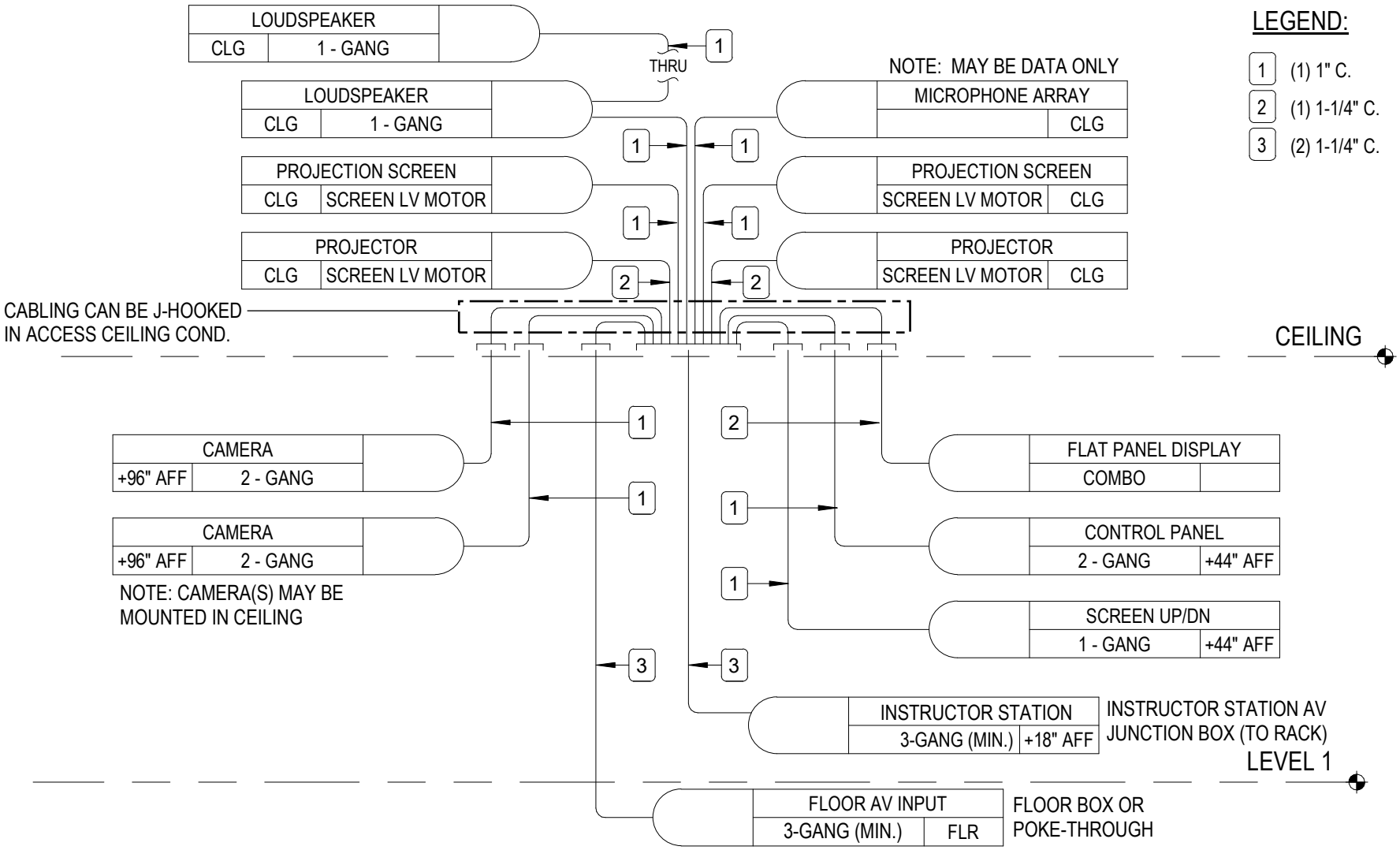
APPENDIX E – TYPICAL INFRASTRUCTURE DIAGRAM

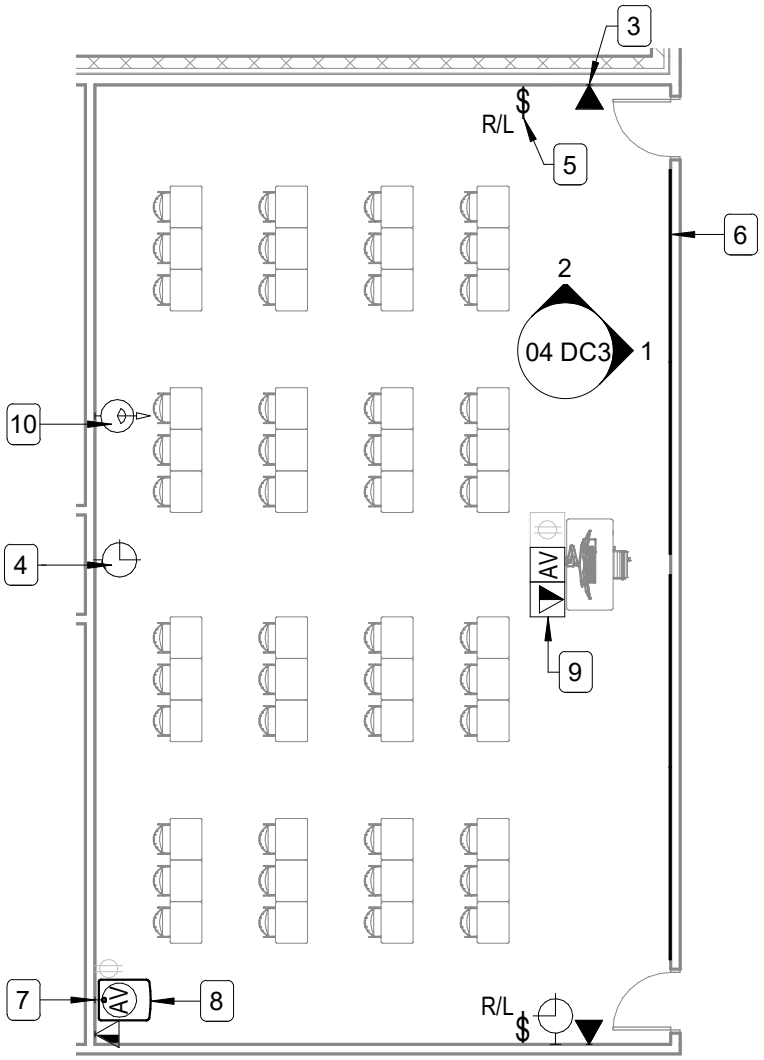


ROOM TYPE: ALL AS APPLICABLE

DRAWING: AUDIOVISUAL CONDUIT DIAGRAM

NOTE:
POWER AND TELEDATA CONDUIT AND BOX INFRASTRUCTURE IS NOT SHOWN ON THIS DIAGRAM BUT SHALL BE COORDINATED WITH THE AV INFRASTRUCTURE BASED ON THE PLANS AND ELEVATIONS INCLUDED IN THIS DOCUMENT.

APPENDIX F – TIER 3 CLASSROOM (HYFLEX LEARNING SPACE)

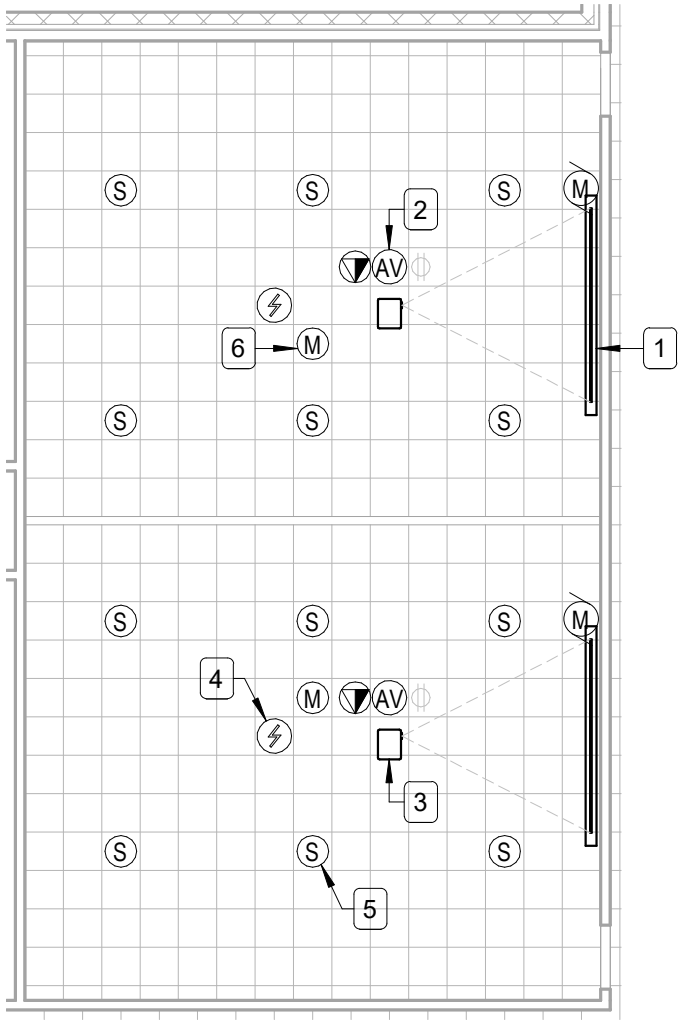


LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. PROJECTION SCREEN SWITCH (FOR MOTORIZED SCREENS).
6. WHITEBOARD.
7. IN-WALL AV EQUIPMENT BOX.
8. AV EQUIPMENT RACK.
9. AV FLOOR-BOX.
10. WALL CAMERA.

ROOM TYPE: TIER 3 CLASSROOM: DUAL SCREEN CLASSROOM WITH DISTANCE LEARNING

DRAWING: AV FLOOR PLAN OVERVIEW

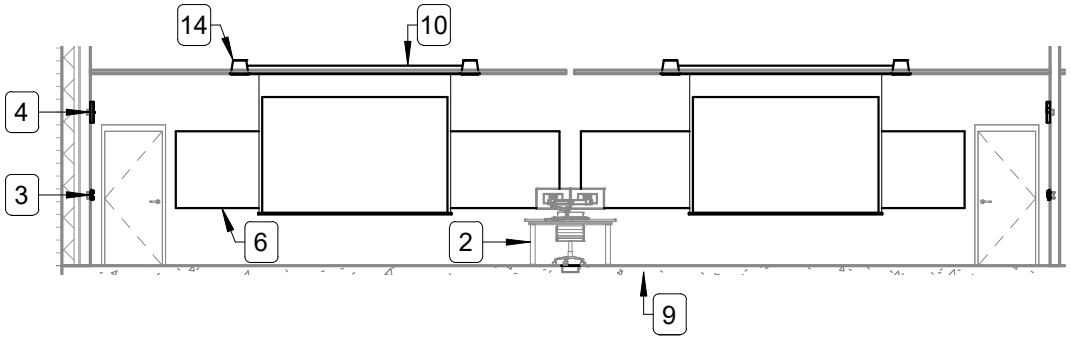


LEGEND:

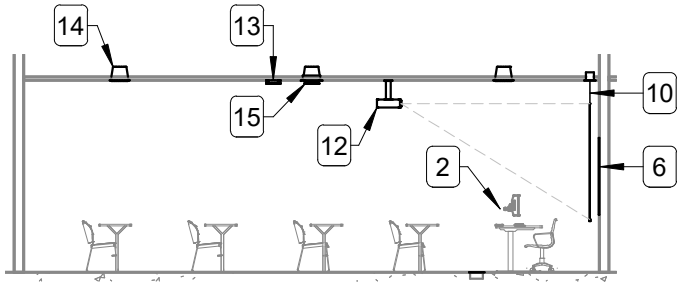
1. CEILING MOUNTED PROJECTION SCREEN.
2. CEILING MOUNTED AV CONTROL.
3. PROJECTOR.
4. WIRELESS ACCESS POINT.
5. CEILING SPEAKER - TYPICAL OF 12.
6. CEILING MICROPHONE ARRAY - TYPICAL OF 2.

ROOM TYPE: TIER 3 CLASSROOM: DUAL SCREEN CLASSROOM WITH DISTANCE LEARNING

DRAWING: AV REFLECTED CEILING PLAN OVERVIEW



1 ELEVATION A



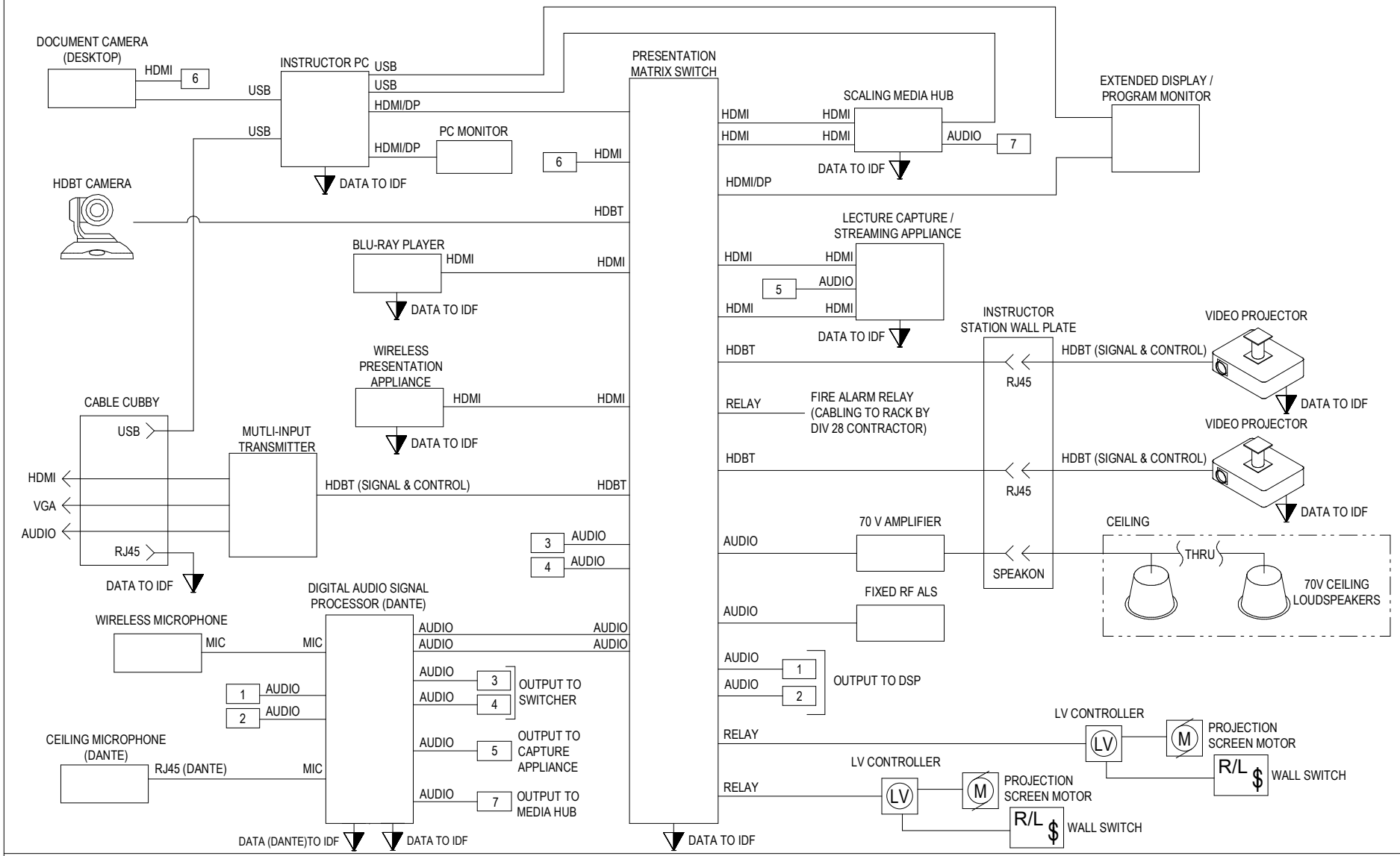
2 ELEVATION B

LEGEND:

1. MULTI-SERVICE WALL BOX.
2. INSTRUCTOR STATION.
3. WALL MOUNTED PHONE.
4. WALL CLOCK.
5. PROJECTION SCREEN SWITCH (FOR MOTORIZED SCREENS).
6. WHITEBOARD.
7. IN-WALL AV EQUIPMENT BOX.
8. AV EQUIPMENT RACK.
9. AV FLOOR-BOX.
10. CEILING MOUNTED PROJECTION SCREEN.
11. CEILING MOUNTED AV CONTROL.
12. PROJECTOR.
13. WIRELESS ACCESS POINT.
14. CEILING SPEAKER - TYPICAL OF 12.
15. CEILING MICROPHONE ARRAY - TYPICAL OF 2.

ROOM TYPE: TIER 3 CLASSROOM: DUAL SCREEN CLASSROOM WITH DISTANCE LEARNING

DRAWING: AV WALL ELEVATIONS OVERVIEW



ROOM TYPE: TIER 3 CLASSROOM: DUAL SCREEN CLASSROOM WITH DISTANCE LEARNING

DRAWING: AV SIGNAL DIAGRAM

ROOM TYPE: TIER 3 CLASSROOM: DUAL SCREEN CLASSROOM WITH DISTANCE LEARNING

DRAWING: ISOMETRIC

APPENDIX G – COMMISSIONING FORMS

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APPENDIX H – DOCUMENT REVISION TRACKING

DOCUMENT REVISION TRACKING

Rev. No.	Rev. Date	Description & Reason of Change	Section Affected	Approval Signature / Date
0	12/22/2019	Initial Release		
1	02/02/2022	Update to Version 1.2	Body, Diagrams	