



# AUDIO/VISUAL DESIGN GUIDE

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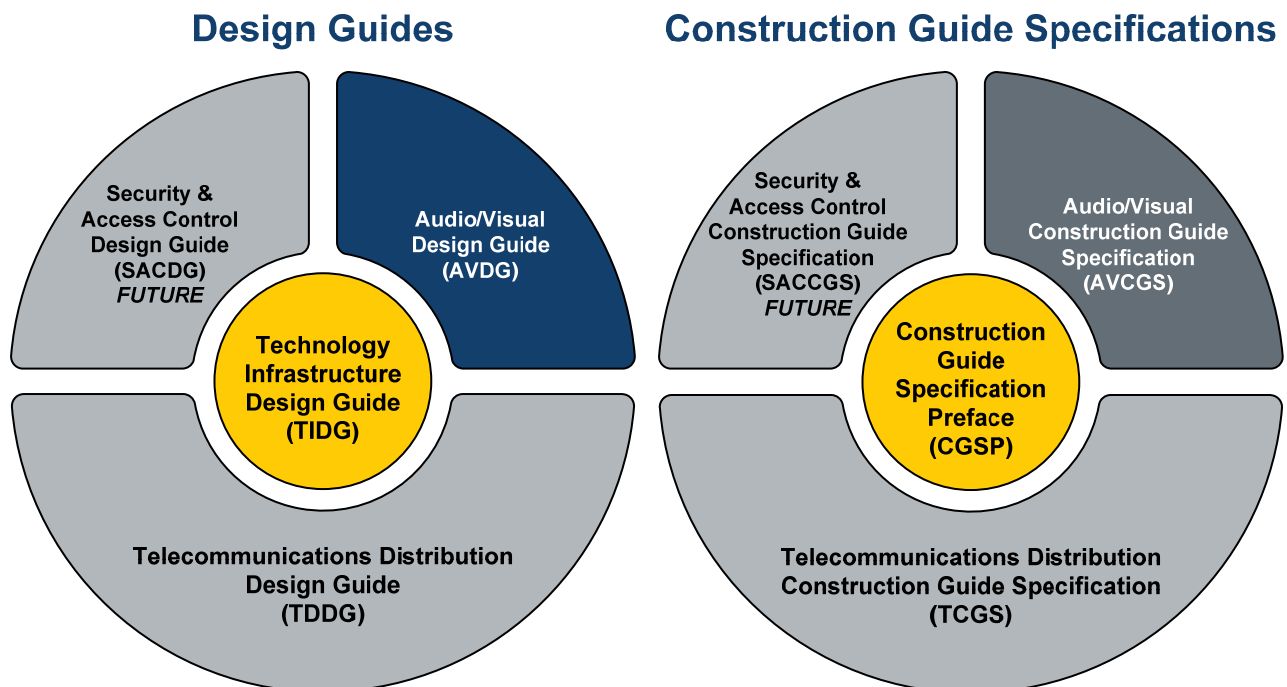
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# 1 Preface

## 1.1 Introduction

- A. The Audio/Visual Design Guide (AVDG) is written to communicate the requirements of Utah Valley University (UVU) for the design and installation of audio/visual systems and infrastructure at UVU facilities.
- The AVDG is written for an audience of Architects, Engineers, and Designers who are responsible for the design of new or remodeled facilities for UVU where audio/visual systems currently exist or will be installed.
  - It is also intended for Audio/Visual, Electrical, and other Contractors installing audio/visual systems at UVU facilities.
  - This document also applies to infrastructure designed and installed by UVU Audio/Visual Services & Engineering (AVSE) staff and will be used to develop formal designs on projects.
- B. The AVDG belongs to a set of documents (depicted below) that encompass the standard design and installation practices for all facets of technology infrastructure and systems at UVU facilities.

## Technology Infrastructure Standards Document Set



- C. The Technology Infrastructure Design Guide (TIDG) contains information common to all of UVU's Design Guides and is applicable to all involved parties: Engineers, Architects, Contractors, and Integrators.
- D. The Audio/Visual Construction Guide Specification (AVCGS) is a key companion to the AVDG.
  - Designers shall adapt the AVCGS "as written" for creating specifications for a particular project according to the instructions in the AVDG. In other words, Designers shall use the electronic specification section documents (provided by UVU in MS Word format) and then shall make any project-specific adjustments to the specifications in those documents. Any changes to the specifications shall be done using the "Revision Tracking" features in MS Word.
  - Rewriting the AVCGS or modifying the format structure or requirements will not be accepted. All changes are subject to review by UVU AVSE, and approval of any changes is at AVSE's discretion.
- E. It is the responsibility of the audio/visual systems Designer to coordinate with the other designers on a project (architectural, electrical, mechanical, etc.) to determine that other systems are both compatible with and complementary to the audio/visual systems. It is critical to coordinate between disciplines during the design phase of a project, rather than making adjustments in the field during construction.
- F. This document was prepared by the Information Technology Services department at Utah Valley University and by Summit Engineering & Consulting, P.S. As technology and needs progress, the document will be periodically updated.
  - January 4, 2016 – Originally published
  - June 1, 2022 – Updated

## 1.2 Standards and Guidelines

- A. Generally speaking, UVU follows guidelines and standards endorsed or published by the International Communications Industries Association, Inc. ([www.infocomm.org](http://www.infocomm.org)).
- B. Audio/visual system designers and installers shall adhere to the following guidelines (or newer editions) for audio/visual system design:
  - *Basics of Audio and Visual Systems Design*, published by the International Communications Industries Association, Inc. ([www.infocomm.org](http://www.infocomm.org)).
  - *Audio Visual Best Practices*, published by the International Communications Industries Association, Inc.

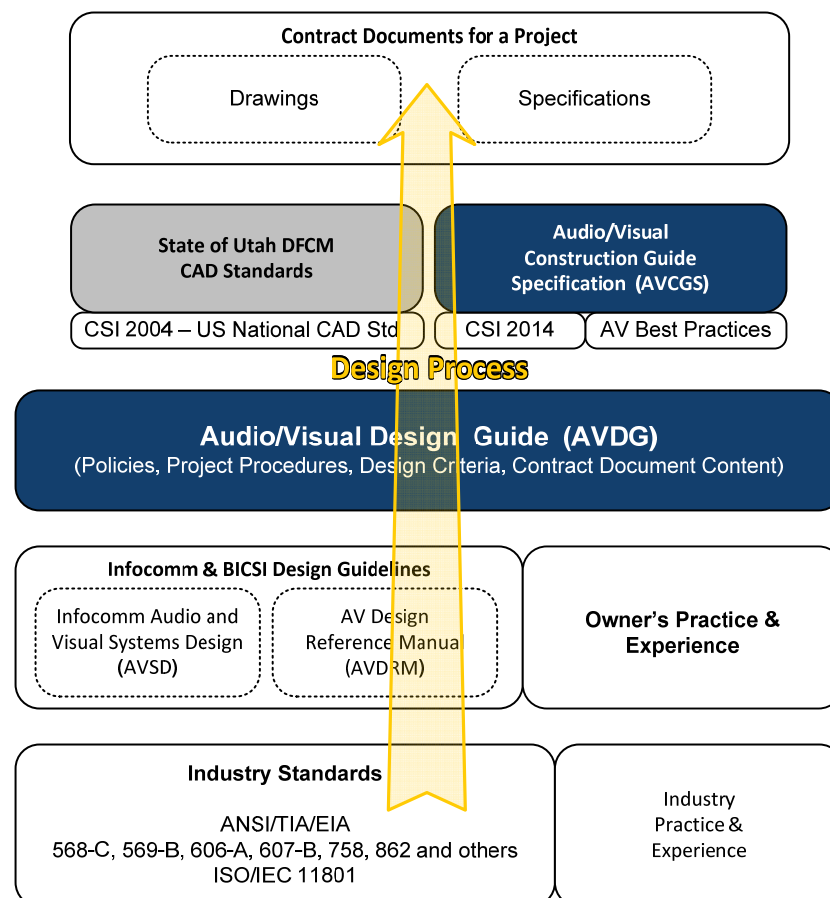
- *AV Design Reference Manual*, jointly published by Infocomm and BICSI ([www.bicsi.org](http://www.bicsi.org)).
  - *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*, ANSI S12.60-2002 from American National Standard.
  - *Standard Guide for Audiovisual Systems Design and Coordination Processes*, ANSI/INFOCOMM 2M-2010.
  - *AV Systems Performance Verification*, InfoComm 10-201x.
  - *2010 ADA Standards for Accessible Design*, ([www.ada.gov](http://www.ada.gov)).
- C. While lighting and lighting control are to be managed under the current UVU Facilities standard for buildings, lighting control for conference rooms and classrooms shall comply with ANSI InfoComm Standard 3M-2011: Projected Image System Contrast Ratio. The projected image contrast ratio shall not be less than the “Basic Decision Making Level” as set forth in that standard. Areas that have audio/visual resources also require additional coordination for projection and preset control.
- D. Audio/visual infrastructure shall fully comply with the current UVU AVDG (this document), the UVU Telecommunications Distribution Design Guide (TDDG), and the National Electrical Code (NEC).
- E. Any request to deviate from the requirements of the National Electrical Code will not be accepted.
- F. Audio/visual systems shall be designed for construction following UVU standards and using materials from current product lines of the manufacturers upon which UVU has standardized.
- G. The Designer shall seek approval for designs and equipment models that are not consistent with UVU AVDG requirements. Standards Variance Requests (SVR) to deviate from industry standards or UVU design solutions will be considered on a case-by-case basis by the UVU Audio/Visual Project Manager (AVPM). Designers shall contact the AVPM to discuss proposed alternatives before spending significant time pursuing the option. See the TIDG for more information about the roles of UVU technology project managers.
- H. The Designer and Integrators are to use only the manufacturers and models listed in this document and the AVCGS in the design and implementation of systems (unless otherwise directed by UVU), and to design systems that will be suitable for the use of products from these manufacturers. The construction documents shall require that the A/V Contractor’s installation workmanship fully comply with the current installation requirements from the manufacturers of these products and remain consistent with UVU’s best practices as outlined in this document.
- I. The requirements contained in the AVDG are considered to be in addition to those required under contract with the State of Utah. Where the requirements differ, the issue shall be brought to the attention of the UVU

Facilities Project Manager and the UVU Audio/Visual Project Manager (AVPM). Generally, the more stringent requirement shall apply.

## 1.3 Document Intent

- A. The Design Process diagram below depicts the relationships between the ANSI/TIA/EIA Standards, the BICSI Design Guidelines, the UVU documents (AVDG, AVCGS), and the project-specific Construction Documents. Audio/visual infrastructure at UVU facilities shall be designed based on industry guidelines (primarily from InfoComm and BICSI) and compliant with the ANSI/TIA/EIA Standards as applied by and illustrated in the UVU AVDG.

### The Design Process Based on Industry Standards and Guidelines and UVU's Design Guide and Standard Specifications



- B. The AVDG is intended to be used in conjunction with the industry standards and guidelines listed above in order to reinforce selected content as well as highlight any restrictions and/or limitations that are specific to UVU's requirements.

- C. This document provides directions for making standards-compliant design decisions that will, in due course, be reflected in Construction Documents. The Construction Documents for a project shall be composed of drawings and specifications that properly incorporate audio/visual infrastructure within a project. The AVDG shall be used in conjunction with the AVCGS. Drawings shall conform to the guidelines contained in this document for content and completeness, and the specifications shall be based upon the AVCGS.
- D. The AVDG is not intended to serve as a master specification, nor for stand-alone use on design-build projects but in conjunction with the AVCGS and the other listed resources.

## 1.4 Document Structure

The AVDG is organized in the following sections:

- 1. The **Preface** (this section) describes this document, its intent, and its relationship to industry standards, practices, and the various audiences affected by the document. It also describes how to use this document.
- 2. The **Project Procedures** section discusses the activities that should occur during each phase of a project.
- 3. The **Physical Infrastructure for A/V** section describes the physical infrastructure components that are required to support audio/visual systems for UVU.
- 4. The **A/V Features, Functions and Service** section defines and describes the features, systems, materials, equipment, furnishings, and services that shall be used as components in audio/visual systems for UVU.
- 5. The **Application Spaces** section describes how the components introduced in the A/V Systems section shall be deployed in specific room types.
- 6. The **Construction Document Content** section describes the content that a complete set of drawings and specifications shall contain.
- 7. The **Appendices** contains documentation and references for use with all other sections. It also contains the change order form and other form letters for distribution.

## 1.5 UVU Personnel

- A. There are several specific UVU personnel roles defined in the TIDG and referenced in this document. The Designer shall interact with these individuals as direct points of contact.
- B. The UVU Audio/Visual Policies section of this document applies specifically to UVU personnel. In addition to the UVU Audio/Visual Policies section, UVU personnel should be aware of the instructions, requirements, and guidelines for Designers contained in the other sections of this document. Also, the AVCGS contains additional requirements related to audio/visual system materials and installation methods applicable at UVU facilities.
- C. UVU personnel should be familiar with these requirements with respect to their application on both large-scale audio/visual distribution projects and smaller-scale projects. These requirements also apply to remodels, in-house operations, and maintenance of existing audio/visual systems.

## 1.6 Audio/Visual System Designers

Audio/visual system Designers shall be responsible to apply the guidelines, instructions, and requirements in this document, and to adapt the AVCGS specifications in the course of designing audio/visual systems for UVU facilities.

## 1.7 Contractors and System Integrators

Contractors and System Integrators involved in projects without a formal engineering and design process shall be fluent with and adhere to the requirements of this document and also the requirements for audio/visual systems, materials, and installation methods contained in the AVCGS.

## 1.8 Copyright

Summit Engineering & Consulting retains the copyright for this document, excluding Appendix 9. Utah Valley University is authorized to edit, adapt and use this document.

Summit Engineering & Consulting has authored similar documents for many other organizations. This document is intended (in part) to describe best practices that are found in some segments of the industry. As a result, portions of this document are similar to comparable content in documents previously prepared by Summit Engineering & Consulting for other organizations. This document does not contain any information that is proprietary or confidential to other organizations.



## 2 Project Procedures

The Project Procedures section contains guidelines for architects, engineers, and audio/visual systems designers regarding the procedures that UVU requires for projects that include audio/visual systems. This applies both to projects that entail primarily audio/visual work (such as classroom or conference room upgrade projects) as well as to architectural projects and other work (such as a new building or campus) that involve audio/visual design.

This section is not intended to supersede State of Utah contract requirements, but rather to complement them, providing additional requirements that apply specifically to audio/visual design projects at UVU facilities.

It is intended that the requirements in this section be considered contractually binding for professional design firms providing audio/visual design services.

### 2.1 Designer Qualifications

- A. For the purposes of this document, the term “Designer” shall mean an InfoComm Certified Technology Specialist (CTS) who is currently in good standing with InfoComm (<http://www.infocomm.org>). This means that the audio/visual design shall be produced by the Designer. UVU’s communications with the audio/visual design consultant shall be mainly through the Designer. On projects where the CTS-certified Designer is not the prime consultant, the Designer shall keep the prime consultant (Architect/Engineer (A/E)) informed of all direct communications with UVU.
- B. In addition, the CTS-certified Designer shall have the following qualifications:
- The Designer shall demonstrate a minimum of 5 years of experience in the design of audio/visual systems.
  - Experience not directly related to the design of audio/visual systems, such as sales and/or marketing, project management, or installation experience, is not an acceptable substitute.
  - The Designer shall demonstrate that he/she has designed or has had personal design oversight of a minimum of five projects similar in size and construction cost to the current UVU project.
  - The Designer shall be independent from and unaffiliated with any manufacturer associated with the audio/visual equipment industry.
  - The Designer shall be completely familiar and conversant with applicable industry standards.
- C. In addition to the CTS certification, it is preferred that the Designer have one or more of the following qualifications:
- Professional Engineer (P.E.) in the electrical engineering field
  - Certified Technology Specialist – Designer (CTS-D) from InfoComm
  - Crestron Certification:
    - Crestron CAPE Certified Programmer

- Crestron Digital Media Certified Designer (DMC-D) (required for systems with digital media features)

## 2.2 Cross-Discipline Coordination

During the design phases, the Designer shall coordinate the audio/visual design with the following features designed by other members of the A&E Team:

- Make sure that fire sprinklers do not occupy the same space as video projectors, nor obstruct the projection path.
- Make sure that lighting does not obstruct the projection path and that fixtures are not mounted near screens and displays. Light fixtures wired to be “always on” shall be placed in the rear of the room, away from screens and video panels.
- Work with the designer of the lighting control system to group the front row of light fixtures adjacent to the projection surface(s) onto a single switch/dimmer.
- Work with the electrical designer to verify placement and density of power outlets for A/V applications.
- Work with the designer of the HVAC systems to provide adequate cooling and ventilation for A/V equipment.

## 3 Physical Infrastructure for A/V

This section defines and describes the physical infrastructure components that are required to support audio/visual systems for UVU. The Designer shall design these into the various application spaces (classrooms, conference rooms, etc.) in UVU facilities as described in Section 4. The Designer shall incorporate this content into the construction drawings and specifications.

### 3.1 Acoustics & Color

Some A/V applications have more stringent acoustic or color treatment requirements than others. It is dramatically more expensive to retrofit a space with acoustic treatments if they are not provided at the time of original construction.

The Designer shall investigate with UVU the possibility that any of the A/V application spaces in a building might possibly need higher levels of acoustic treatment in the future. If so, such spaces shall be designed for the higher levels of acoustic treatment during original construction.

According to the recommendations of ANSI S12.60-2002, a noise coefficient of NC 35 and a reverberation time of 0.6 seconds are the maximum allowable (worst-case) acoustics parameters for some spaces, whereas a noise coefficient of NC 25 is desirable, and NC 30 is the maximum permitted for other spaces.

Wherever video broadcasting will occur, the background colors shall be neutral, such as beige or light gray.

### 3.2 Furniture

#### 3.2.1 TEACHER STATIONS

##### 3.2.1.1 CODE/REGULATORY CONSIDERATIONS

Section 802.1 in the ADA Standards for Accessible Design addresses the requirements for wheelchair-accessible spaces. In order to meet this requirement, adjustable-height Teacher Stations are required, and they must be open beneath the work surface to permit a wheelchair to roll underneath.

However, since the A/V Equipment Rack and other equipment are mounted inside the Teacher Station beneath the work surface, there is not space for a wheelchair to roll underneath.

Exception Advisory 226.1 of the ADA Standards for Accessible Design explains that ADA requirements do not apply to work surfaces for employees. Accommodations for employee work surfaces are allowable on an “as needed” basis.

UVU’s Accessibility Services Department administers campus policies related to ADA topics.

### 3.2.1.2 DESIGN GUIDELINES

Teacher Stations shall be custom designed on a project-by-project basis. The Designer and Architect shall work closely with the AVPM to create a solution that will meet the needs of the application. The Architect shall verify that the design is ADA-compliant and meets the needs of the project and shall then include the built-in millwork as part of the project. The Designer shall contact the AVPM prior to specifying the furniture to request the latest version drawings are being used as the basis of design.

On the back side of the Teacher Station (facing the classroom) the furniture shall have a hinged door to allow access to the A/V equipment mounted inside the cabinet portion of the Teacher Station. See Appendix 8.1 for drawings depicting each Teacher Station style. There are two main styles of Teacher Station:

- Desk style form-factor (two versions)
- Sit-stand style form-factor

The space surrounding the Teacher Station shall comply with the ADA Standards for Accessible Design.

UVU will accommodate wheelchair-bound instructors and students by specifying a work surface on the side of each Teacher Station, sized 30" wide (minimum) at a height of 34". Preferably this work surface would fold out from a hinged attachment on the Teacher Station, but it could also be a table beside the Teacher Station. The control system used to operate the audio/visual equipment and other instructional technology shall be reachable by a person working from the fold-out work surface.

The arrangement of the equipment that sits on the top of the table shall be cooperatively designed by the Designer and the AVPM. The Designer shall coordinate with the AVPM, the Telecommunications Designer, and the Electrical Engineer to cooperatively specify appropriate quantities of modular device inserts for power outlets, data cables, auxiliary plates, and audio/visual inputs to be installed in tabletop boxes.

### 3.2.2 INSTRUCTIONAL MEDIA WORKSTATION

Workstation furniture will be required for some spaces where instructional media are produced or edited. This furniture shall be a hybrid office desk/credenza. A user will sit at the desk while using A/V equipment located on the desktop and rack-mounted inside the credenza portion of the furniture.

The floor inside a desk/credenza shall have an opening for cabling to enter from a floor box or a poke-through. There shall be no cabinet face structure behind the door, allowing an A/V equipment rack to slide out of the desk/credenza for service.

The furniture shall provide adequate ventilation to prevent overheating of the equipment inside. The following two features shall be provided in each door for air circulation:

- Near the top of all doors: four ¼" slots (10" long), spaced ¾" apart. Mesh screen material shall be applied to cover the backside of the slots to prevent foreign matter from being inserted into the slots.
- Below all doors: approximately five 1" ventilation holes in the top portion of the toe-kick plate.

### 3.2.3 CONFERENCE ROOM CREDENZAS

UVU prefers to use single-bay and double-bay credenzas in conference spaces depending on the application and need of the space. Credenzas will host rack-mounted A/V equipment, with accessibility as follows:

- If the back of the credenza is accessible, a rear access door shall be provided, and equipment will be mounted on secured rack rails.
- If the credenza is placed against a wall, the furniture shall have Middle Atlantic pull-out racks.

All credenzas will meet the need and match the interior design and other furniture of the space and be coordinated through the AVPM.

### 3.2.4 CONFERENCE TABLES

Conference tables shall meet the needs of the room. The table shall be designed to support cable routing from a floor box to a tabletop power/data/A/V access portal via a table leg. The floor box location(s) shall be correlated with the cable routing leg, which ideally shall fully conceal the floor box.

UVU requires that a tabletop box with power, data and A/V cables be installed in the top of each conference table. The Designer shall coordinate with the Telecommunications Designer and the Electrical Engineer to cooperatively specify appropriate quantities of modular device inserts for power outlets, data cables, and audio/visual inputs for each application.

- Tables 15' long or shorter require one tabletop power/data/A/V access portal in the center of the table.
- Tables longer than 15' require two or more tabletop power/data/A/V access portals, one each at the one-third points along the length of the table.

When selecting the conference table, consider how cables for wired networking, desktop microphones, A/V inputs, and power wiring shall be routed from the floor box up through a table leg. It is recommended that tables be manufactured with integrated cable raceways and pop-up devices that provide tabletop access to electrical power, A/V features, and the network.

Some applications (such as Boardrooms) benefit from table systems that are open in the center. In all such cases, modesty panels are required.

### 3.2.5 COLLABORATION PODS CLASSROOMS AND LABS

A collaboration pod is an integrated table and A/V enclosure. Collaboration pods can either be custom-manufactured or prefabricated, depending on the application and design needs of the space. The finishes of all collaboration furniture shall match the interior design and other furniture. The Designer shall coordinate the finish selection with the AVPM.

### 3.2.6 HALLWAY HUDDLE SPACES

In most cases these spaces will not have furniture. However, if furniture is desired in Hallway Huddle spaces, it shall be coordinated through the AVPM.

### 3.2.7 MOVABLE PRESENTATION LECTERNS

Movable presentation podiums shall be sized for the application, with casters so that the podium can be easily moved when not required for a presentation.

For lectern drawings see Appendix **Error! Reference source not found.**

### 3.2.8 MOVABLE DEMONSTRATION TABLES

Movable demonstration tables shall be sized for the application, with locking casters so that the table can be easily moved when not required for events.

### 3.2.9 KIOSKS

For projects that require informational kiosks, the Designer shall consult with the AVPM for guidance on a case-by-case basis.

## 3.3 Equipment Racks and Cabinets

UVU prefers racks and cabinets from Middle-Atlantic.

### 3.3.1 GROUNDING/BONDING

All racks and cabinets shall be bonded to building ground (not isolated).

### 3.3.2 FIXED RACKS IN TEACHER STATIONS

One or two fixed racks (approximately 14 rack units) shall be mounted inside teacher stations. The Designer shall coordinate rack size and configuration with the AVPM.

In cabinets where the back of the equipment is not accessible, UVU prefers to use Middle Atlantic racks that pull out on rails.

### 3.3.3 RACKS IN CREDENZAS

A mid-height rack (approximately 14 rack units) shall be used to host equipment stored inside credenzas for applications such as conference rooms.

In cabinets where the back of the equipment is not accessible, UVU prefers to use Middle Atlantic racks that pull out on rails.

### 3.3.4 EQUIPMENT CABINETS

A 6-foot tall cabinet shall be used to host larger quantities of equipment in dedicated A/V spaces and applications such as A/V Equipment Rooms. The cabinets shall be bolted to the floor.

Full-height cabinets shall have full-height, vertically mounted PDU strips on rear of the rack and shall have a rack-mounted UPS, both Owner-provided.

Cabinets shall have lockable, vented front and rear doors.

Products from Middle Atlantic are desirable.

## 3.4 Pathways

It is essential to the long-term cost-effective operation of each building that the infrastructure be in place to support the technology of the future. It is much less expensive to install physical infrastructure during construction than to retrofit spaces while the building is in use.

Pathways and boxes shall be designed to serve the life of the building, not just day-one applications.

A/V pathways that are concealed from public view shall be routed to be as direct as possible, including angled runs to a device. It is important to reduce the length of A/V cables wherever possible.

### 3.4.1 WIRE BASKET CABLE TRAY

A wire basket cable tray shall be designed above the ceiling to distribute audio/visual cabling within the room. This tray shall connect to the main low-voltage distribution cable tray in the building.

- A 6" wide, 2" high tray is typically sufficient for most in-room A/V applications.

### 3.4.2 BOXES AND CONDUITS

Device boxes and outlet boxes serving A/V applications shall comply with UVU's telecommunications standards. Box sizing shall be as follows:

- Typically 4" square, 2 1/8" deep (minimum depth). With the mud ring/extension ring, the overall internal minimum depth shall be 2 1/2" minimum.
- Where thick/stiff cabling is terminated (having large bend radius requirements), device boxes shall be 5" square boxes. See RANDL Industries, Inc. [www.randl-inc.com](http://www.randl-inc.com)
- Device boxes that receive 2" conduit will typically be 4" square, 3 1/4" deep (minimum depth) with the mud ring/extension, such as the Hubble-Raco RAC260.
- For wall-mounted devices (such as speakers and assistive listening transmitters), provide a single-gang faceplate with a feed-through plate for cable pass-through.

Conduits serving A/V applications shall comply with UVU's telecommunications standards (see TDDG). In addition, the following requirements apply:

- All conduits shall be 1 ¼" trade size minimum.
- Conduits intended to pass large connectors shall be a minimum 1 ½" trade size, but larger if required to accommodate the sizes of factory-terminated connectors (VGA, DVI, and other A/V cabling).
- Provide a separate conduit for speaker wiring.

### 3.4.3 A/V JUNCTION PANEL

The A/V Junction Panel is a junction box that shall be recess-mounted into the wall in the backs of the credenzas serving A/V cabinets. The A/V Junction Panel shall be sized 18"W x 14"H x 4"D and be finished to match the interior décor of the space. The FSR Wall Box (painted the color of the wall) is one possible acceptable solution. Common electrical junction boxes with screw covers are typically not acceptable.

Conduits from the A/V Junction Panel shall route to the following locations:

- A/V equipment locations
- A/V floor box
- Above ceiling A/V junction box (plenum-rated where required)
- Above ceiling wire basket cable tray (if applicable).

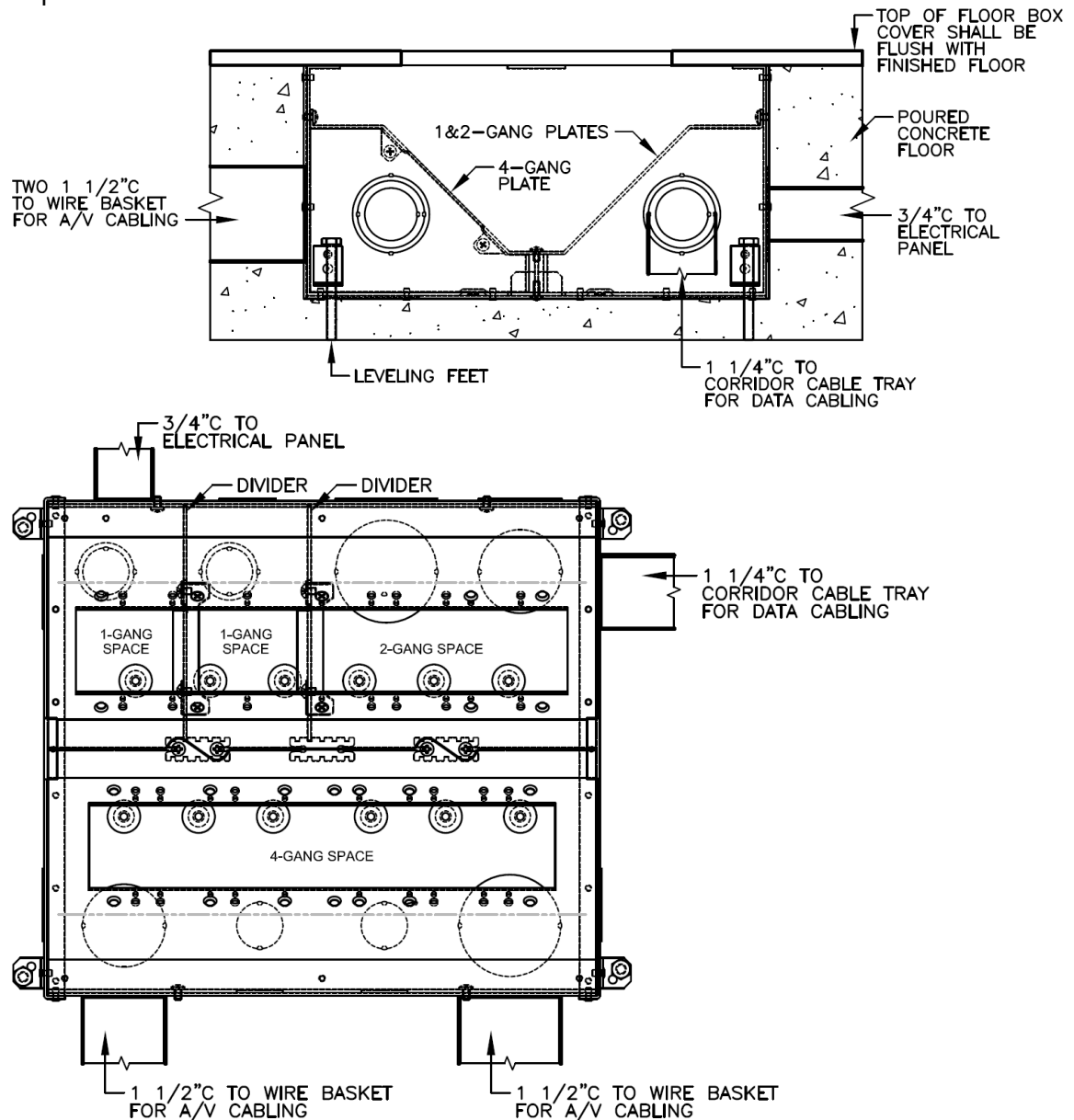
### 3.4.4 A/V FLOOR BOXES

A/V floor boxes are required to accommodate the quantity of A/V cables, data cables, and power outlets that compose A/V systems. Many A/V cables have limited bend radius due to the size and stiffness of the cables. UVU's preferred A/V floor box solution is from FSR, Inc. [www.fsrinc.com](http://www.fsrinc.com) (or a Hubbell equal when pre-approved):

- For all applications:
    - FL-500P-8 or FL-600P-8-B with 8" depth.
    - Single-gang for power, with a ¾" conduit
    - Double-gang for data, with a 1 ¼ conduit
    - Four-gang for A/V, with a 1 ½" conduit
  - For slab-on-grade applications:
    - Use the FL-GRD2/4 pour pan with one of the above boxes.
  - For fire-rated floor applications:
    - Use the FL-FRK-500P or FL-FRK-605P firestop box assembly with one of the above boxes.
- A. Large floor boxes serving an instructor podium shall have a cover that will incorporate a finish (carpet, tile, etc.) that matches the finish of the floor. Floor boxes shall have three separate partitions serving power, data and audio/visual terminations.



- A/V terminations require a 4-gang partition with two 1 1/2" conduits.
  - Telecommunications cabling requires a double-gang partition with a 1 1/4" conduit.
  - Electrical power requires a single-gang partition with a 3/4" conduit.
- B. The basis of design is the FSR FL-500P-x Series floor box. It is desirable because it is available in 4", 6", 8", and 10" depths.
- C. The diagrams below depict the plan view and side view of a floor box with the required conduits:



- D. Some applications may require a high-capacity floor box, such as the FL-600P-x manufactured by FSR Inc. The Designer shall inquire with the ITPM on a project-by-project basis.

## 4 A/V Features, Functions & Services

This section defines and describes the features, systems, materials, equipment, furnishings, and services that shall be used in audio/visual systems for UVU. The Designer shall design these into the various application spaces (classrooms, conference rooms, etc.) in UVU facilities as described in Section 4. The Designer shall incorporate this content into the construction drawings and specifications.

UVU prefers to consistently use the same equipment from project to project wherever possible to optimize spare parts management. When a component fails, it is very desirable to replace it with an identical make and model so that the control logic programmed into the system will work with the replacement device. The manufacturers and equipment models for equipment currently used at UVU are referenced below in each category. The Designer shall:

- Verify that this equipment will be available at the time the building is constructed.
- If this equipment will not be available, work cooperatively with the UVU AVPM to select a replacement, preferably from the same manufacturer and product family as the listed equipment.
- Design the systems using UVU-approved standards and equipment.

### 4.1 General

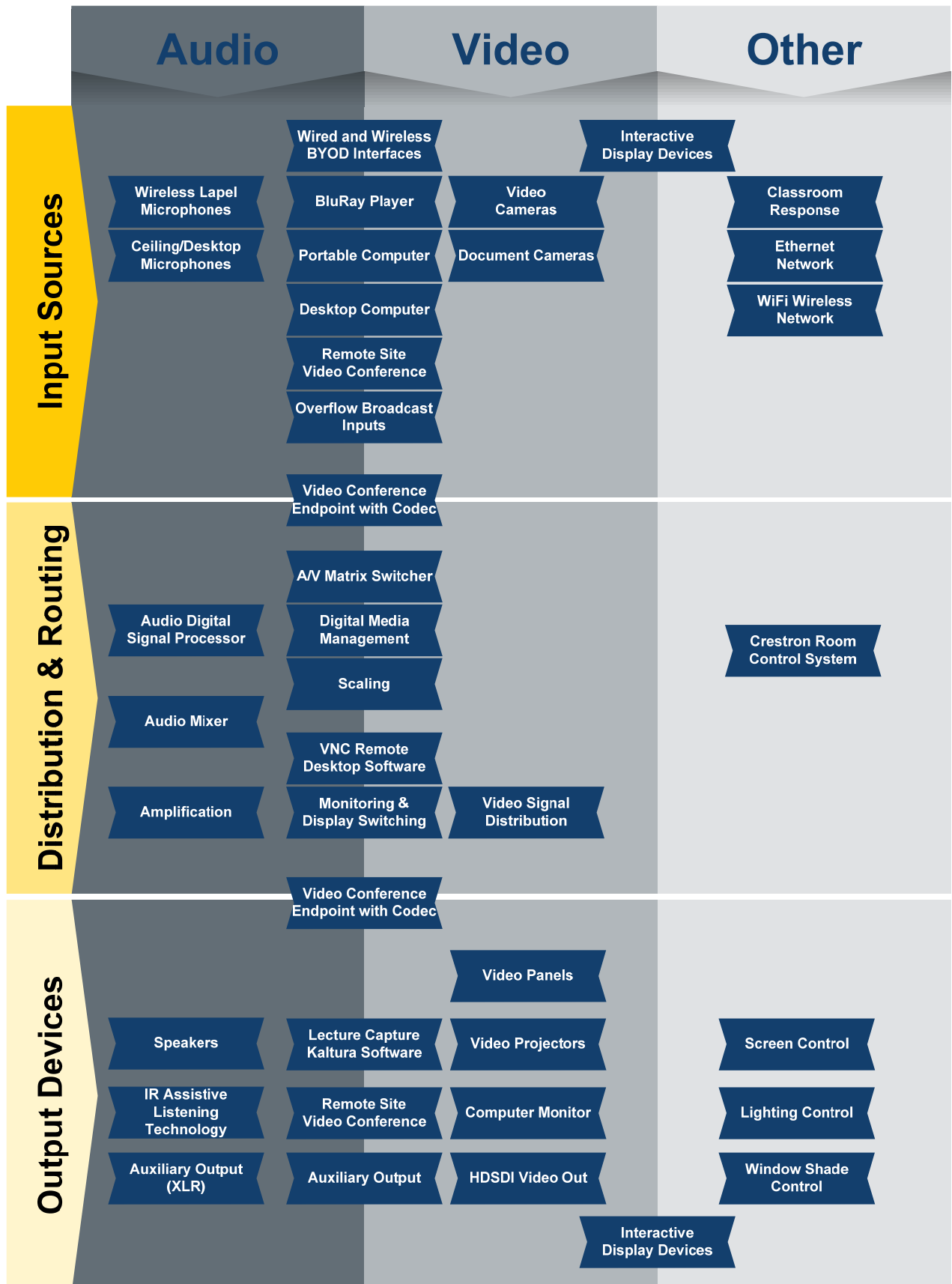
Generally speaking, audio/visual systems are composed of devices and functions in three categories:

- Sourcing and Input
- Distribution and Routing
- Output

Also, audio/visual and event lighting equipment can serve audio, video, production, and other functions.

See the AVCGS for the full specifications of each device and its associated cabling.

The following diagram depicts the various types of devices that generally compose UVU's audio/visual systems:



## 4.2 Sourcing and Input Devices

The audio/visual system shall support audio and video content from the following sources and input devices:

### 4.2.1 MICROPHONES

#### 4.2.1.1 CEILING-HUNG

Ceiling-hung microphones shall be digital, three-element, Dante-based devices from Shure. They shall be installed according to the manufacturer's specifications in sufficient quantity and necessary spacing to adequately cover the entire classroom seating and teaching area.

Ceiling-hung microphones shall be supported using wire from the building structure. Coordinate with the installer of the ceiling grid to shoot-in extra ceiling wires to support microphones, speakers, and electronics boxes for microphones.

#### 4.2.1.2 CEILING TILE BEAM-FORMING

Ceiling tile beam-forming microphones shall be Dante-based, multi-element devices that automatically steer microphone pickup via phased microphone elements. They shall be installed according to the manufacturer's specifications for quantity and spacing to appropriately cover the entire classroom seating and teaching area. UVU typically uses the Shure beam-forming microphone product line, including the MX710 and MX910a.

#### 4.2.1.3 DESK-MOUNTED

Dante-based wired microphones shall be provided for any classroom lab or conference space that has a capacity exceeding 45 people. The Designer shall inquire whether wired microphones are required for just the presenter or on a two-to-one ratio for the entire space. The Designer shall also inquire which of the following three options should be used for a given area:

- Option 1:  
Ceiling-hung microphones may be required in some applications. In these cases, the system shall be programmed to activate or mute the corresponding ceiling microphones with a desktop control interface.
- Option 2:  
Desktop puck microphones can be either single- or double-sided. The system shall be programmed to activate or mute the microphone as the button is pressed. Three distinct indicator conditions are required to display the status of the microphone: on (green), muted (red), and powered off (dark, no light).
- Option 3:  
Gooseneck microphones shall be shock-mounted. The system shall be programmed to activate or mute the microphone as the button is pressed. Three

distinct indicator conditions are required to display the status of the microphone: on (green), muted (red), and powered off (dark, no light).

#### **4.2.1.4 WIRELESS MICROPHONES**

Wireless microphones require the use of a receiver/transmitter in each application space. The receiver shall be located in a position near the control equipment of the other audio/visual systems. All wireless microphones shall be UHF, tunable, with the ability to self-determine available radio frequencies. All microphone installations shall be done in accordance with good engineering practices and coordinating frequencies with nearby users. UVU currently prefers the Shure ULXD and QLXD products.

The microphone shall be wired into the sound system to provide voice reinforcement to the space without feedback and also to the audio record output. Antennas should be adequately placed throughout the space for proper coverage. Volume adjustment for the microphone shall be immediately available to the instructor.

Wireless microphones shall be provided for any classroom lab or conference space that has a capacity exceeding 40 people. The Designer shall inquire how many microphones are required for each space and which of the following four options shall be used for a given area:

Wireless Microphone options:

- Option 1: Lapel – used in instructional and lecture spaces
- Option 2: Handheld – used as a secondary preference option in lecture and instructional spaces
- Option 3: Countryman – used in theater applications
- Option 4: Headset – used in dance studios and exercise facilities

#### **4.2.2 CAMERAS**

All cameras shall be at least high definition 1080p 60Hz (16:9 aspect ratio) and preferably 4k. Standard definition (4:3 aspect ratio) devices are prohibited.

Camera tracking systems may be required for certain applications.

##### **4.2.2.1 DOCUMENT CAMERAS**

Document cameras shall be at least 1080P 60Hz (16:9 aspect ratio) and preferably 4k, and be mounted on the top of the teacher station. Each camera shall be connected to the video switcher/scaler to enable quick and easy change of sources.

Some cases warrant the use of ceiling-mounted document cameras. All document cameras shall be controlled via a touch panel. Serial control shall be used if the equipment supports it.

If an application has a computer installed, a PC based document camera shall be integrated.

#### **4.2.2.2 CONFERENCE ROOM SOFT CONFERENCING CAMERAS**

USB cameras are the most frequently used solution for soft video conferencing applications.

Soft conferencing cameras shall have a USB output and a minimum resolution of 1080P at 60Hz. Some situations may warrant a more professional fixed, Pan Tilt Zoom (PTZ) or tracking camera with higher resolutions and other output types (HDSI, HDMI etc.).

#### **4.2.2.3 CLASSROOM CAMERAS**

UVU currently uses professional PTZ, tracking or fixed cameras for distance education and collaborative classroom applications.

The Designer shall discuss with the AVPM the cameras to be used.

#### **4.2.3 BLU-RAY PLAYER**

The Designer shall discuss with the AVPM whether Blu-ray player equipment is required on a per-space basis.

Blu-ray players require serial control or plug-in IR control. Adhesive IR “bugs” are not allowed.

#### **4.2.4 MEDIA PLAYER FOR DIGITAL SIGNAGE APPLICATIONS**

The Designer shall discuss with the AVPM if a media player is required, and if so, which device shall be provided.

#### **4.2.5 COMPUTERS**

Computers shall be furnished by UVU in accordance with established campus standards and pursuant to the design requirements of the application.

The Owner will install all Owner-furnished computer equipment.

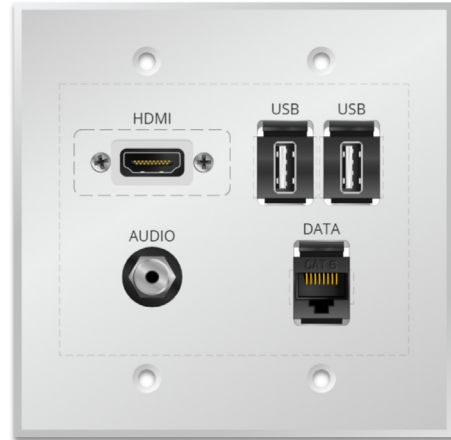
The monitor shall be attached to the top of the Teacher Station, typically on the side of the station away from the classroom door. The monitor shall be secured to the furniture with a suitable rigid mount, cable, and lock assembly to impede theft.

#### **4.2.6 PORTABLE DEVICES (BYOD MODEL)**

Audio/visual systems shall be compatible with BYOD devices and able to receive audio and video inputs, including but not limited to laptop computers (PC and Mac), tablets, smartphones, and other multimedia devices.

UVU currently requires the following auxiliary inputs:

- HDMI audio/video
- 3.5mm audio inputs
- An XLR input for a microphone
- USB 3.0 type-A connection
- Ethernet jack for teacher network connection
- UVU also requires a set of commonly used Mac adapters be provided by the contractor, attached to digital cables, including
  - Mini Display to HDMI
  - USB-C to HDMI



Auxiliary inputs shall be implemented using cable retractor devices or auxiliary input plates, depending on the need and use of the space, for both Teacher Stations and Conference Room tables.

When interface plates are used, the plates shall be custom manufactured from anodized aluminum and have beveled edges. The Designer shall work with the AVPM on a project-by-project basis to design a suitable custom interface panel for each application.

#### 4.2.7 CLASSROOM RESPONSE APPLICATIONS

UVU does not currently provide an enterprise-class classroom response system for new projects.

### 4.3 Distribution and Routing Equipment

#### 4.3.1 AUDIO/VIDEO DIGITAL MATRIX SWITCHING EQUIPMENT

Audio and video digital matrix switching and processing is done using pro-grade solutions. Device control shall be present and interfaced with control systems. The Designer shall discuss with the AVPM specific model selection for a given project.

#### 4.3.2 AMPLIFIERS

The Designer shall discuss the audio requirements and options with the AVPM prior to starting the design.

Audio systems shall be designed in such a manner as to provide (at every location within the classroom) a clearly intelligible monaural speech (Public Address) audio signals and independent stereo audio signals. Audio levels front-to-back and side-to-side shall not vary by more than 2dB at any point within the seating area. Audio enhancement shall provide a level of not less than 55 dB SPL at 48 inches above finished floor in the classroom seating area.

Amplifiers shall typically be Class D type, providing a minimum of 75W RMS per channel and supporting speakers of 4 and 8 ohms for the stereo system. Amplifiers will be 70V line outputs for public address audio.

### **4.3.3 VIDEO CONFERENCING ENDPOINTS**

UVU primarily uses Microsoft Teams (soft codec), but also provides Cisco High Definition Group Series Video Conferencing Endpoint (VCE) (containing an integrated codec) as needed.

VCEs connect to IT networks via a standard 10GB Ethernet jack.

Three video sources connect directly to the VCE inputs:

- Cameras
- Content video
- Classroom technology: Auxiliary plate, document camera, Blu-ray player, computer etc.

Two audio sources connect directly to the VCE inputs via an Audio DSP/router/mixer:

- Microphones
- Content audio

Input and output switching as well as volume are controlled via the room control system.

## **4.4 Output Devices**

The audio/visual system shall output video and audio content to the following devices:

### **4.4.1 VIDEO OUTPUT DEVICES**

#### **4.4.1.1 PROJECTORS**

Video projectors shall have the following performance characteristics:

- Standard-throw projectors are preferred.
  - Short-throw projectors are not normally desirable, and require pre-approval by the UVU AVPM, as well as coordination with pendant lighting.
- The minimum acceptable resolution for projectors is WUXGA 1920x1200 native resolution with 16:10 aspect ratio.
- Only three-Chip DLP or LED/Laser projectors shall be used at UVU. Bulb-based projectors are not acceptable.
- The Designer shall discuss with the AVPM the minimum ANSI lumens output rating to meet the space requirements in compliance with industry standards, taking into account windows and other sources of ambient light.
  - Standard Rooms (less than 150 seats) typically require 5,000-7,000 lumens. Large rooms (more than 150 seats) may require up to 20,000 lumens.



- No keystone adjustment shall be required with a properly installed system.

WUXGA resolution or better is required. Acceptable manufacturers of projectors include:

- Ultra short-throw: Christie, Panasonic, NEC, and Epson
- Standard-throw: Christie, Panasonic, NEC, and Epson

Wiring for projectors shall consist of the following telecommunications cables terminated in an outlet and faceplate mounted near each projector. The cables shall be designed per the requirements of the TDDG. The cables shall be installed and tested per the requirements of the TCGS by a certified telecommunications cabling installer:

- One Category 6A cable for Ethernet data, routed to the telecommunications room.
- One Category 6A cable for Control, routed to the A/V rack.
- One shielded serial control cable for RS232, routed to the A/V rack.
- One HDMI cable, routed to the A/V rack, where the distance between the rack and projector is within 40 feet.
- One Category 6A cable (10GB rated) for video signal (such as HDBaseT/DXLink), field connectorized and passed through a faceplate space (not terminated on jacks), and routed to the A/V rack.

See Sections 5.1.1.3.3 and 7.1 below for more information about projector wiring.

Projectors shall be ceiling-mounted, and may be attached to the building structure. Mounts require manufacturer-approved and Code-approved seismic bracing or security attachments to the structure. Ceiling-mounted projectors shall be no lower than eight feet above the finished floor with a clear and unobstructed path to the screen to produce a clear image without keystoneing. Light fixtures shall be installed so as not to obstruct the projection image.

Acceptable manufacturers of ceiling mounts for projectors include:

- Chief Manufacturing (use the model-specific mount, a custom plate specific for each projector). If a model-specific mount is not available for the projector, then the Designer shall request direction from the AVPM.

#### **4.4.1.1.1 IN-CEILING PLENUM-RATED BOXES**

UVU uses plenum-rated, in-ceiling boxes (Chief CMA473) to enclose the power outlet, data outlet, and A/V cable feed-through box supporting each projector application.

This box allows power outlets to be installed in the ceiling space in a Code-compliant manner. The Designer shall be prepared to defend this installation method during construction.

#### **4.4.1.2 WRITEABLE PROJECTION SURFACES**

Whiteboards mounted on the projection wall shall be 16:10 aspect ratio to allow the projection image to align with the whiteboard surface.

#### 4.4.1.3 PROJECTION SCREENS

Projection screen shall be sized appropriately to the room size. Each screen shall be tensioned, electrically operated, with a 16:10 aspect ratio, and have a matte white surface.

Screens shall be low-voltage controlled (by the A/V system) and shall also have a low-voltage control switch located near the Teacher Station, but not behind the screen. A service shut-off switch above the ceiling is also required, allowing a technician to cut power to the screen for servicing.

Screens shall be sized according to the following formula:

- The height of the projected image shall not be less than one sixth of the distance to the farthest viewing position in the room, as defined by ANSI/INFOCOMM 3M-2011.

#### 4.4.1.4 VIDEO PANELS

##### 4.4.1.4.1 PRODUCT GRADE

Video panels can be professional grade, prosumer-grade, or consumer-grade equipment, depending on the amount of usage time per day expected for the application.

Grade	Usage (hours per day)	Typical Warranty
Professional	18-24	3 years
Prosumer	8-18	3 years
Consumer	Less than 8	1 year

For new construction, the Designer shall not use consumer-grade products.

Consumer-grade video panels are only permitted with the approval of the AVPM.

##### 4.4.1.4.2 CHARACTERISTICS

The minimum acceptable resolution for video panels is 1080P native resolution. 4k Ultra High Definition with 4096x2160 native resolution is preferred.

The minimum acceptable refresh rate for video panels is 240Hz.

##### 4.4.1.4.3 VIDEO PANEL MOUNTING

Displays are to be hung on wall mounts which have panel security locking provisions or with structure-attached ceiling mounts. Depending on the application, mounts shall be articulation, tilt, or flat-fixed style. The Designer shall work with the AVPM to select the appropriate mount for each application.

For all video panels, the wall shall be reinforced for mounting purposes.

- For articulating mounts, a backbox shall be installed with the mount attached inside the box. This application requires that wood studs be provided to support the backbox per the manufacturer's requirements. See the diagram in Section 5.6.2.1.4.1.
- For flat-fixed mounts, the mount attaches directly to the wall. This application requires that wood backing be added to the studs to support the mount per the manufacturer's requirements. See the diagram in Section 5.6.2.1.4.1.

The Architect shall specifically consider the weight of heavier video panels when designing the wall and backing materials.

#### **4.4.1.4.4 VIDEO PANEL WIRING FOR CLASSROOMS & CONFERENCE ROOMS**

Wiring for video panels shall consist of the following telecommunications cables terminated in an outlet and faceplate mounted behind the video panel. The cables shall be designed per the requirements of the TDDG. The cables shall be installed and tested per the requirements of the TCGS by a certified telecommunications cabling installer:

- One Category 6A cable for Ethernet data, routed to the telecommunications room.
- One Category 6A cable for Control, routed to the A/V rack.
- One shielded serial control cable for RS232, routed to the A/V rack.
- One HDMI cable, routed to the A/V rack, where the distance between the rack and projector is within 40 feet.
- One Category 6A cable (10GB rated) for video signal (such as HDBaseT), field connectorized and passed through a faceplate space (not terminated on jacks), and routed to the A/V rack.

The wiring required for video walls is defined in Section 5.10.3 below.

#### **4.4.1.5 VIDEO PANELS FOR DIGITAL SIGNAGE**

Video panels for digital signage applications shall be professional grade and rated for a minimum of 16 hours of operation per day.

##### **4.4.1.5.1 WIRING FOR DIGITAL SIGNAGE**

Digital signage wiring shall include the following:

- One Category 6A cable for Ethernet data to the media player, routed to the telecommunications room.
- One Category 6A cable for Ethernet data to the display, routed to the telecommunications room.
- One HDMI cable, between the media player and the video panel.
- See Sections 5.10.1 and 7.1 below for more information about video panel wiring.

#### **4.4.1.6 LECTURE CAPTURE SYSTEMS**

Kaltura is UVU's existing content management platform. Any lecture capture solutions used at UVU shall interface directly with Kaltura's content management platform. Kaltura also provides cloud-based lecture capture service.

#### **4.4.2 SPEAKERS**

UVU typically uses 70V and 8-ohm speaker configurations.

Speaker quantity, arrangement, and spacing shall be designed sufficient to provide for an even coverage of the entire seating area with a volume level of not less than 15 dBA above the average ambient room sound.

##### **4.4.2.1 CEILING-MOUNTED SPEAKERS**

Ceiling-mounted speakers shall be spaced appropriately for the broadcast pattern of the specified speakers.

Ceiling-hung speakers shall be supported using wires attached to the building structure or using suspension systems designed for use with T-bar ceiling materials.

UVU typically uses JBL Control Series speakers.

##### **4.4.2.2 WALL-MOUNTED SPEAKERS**

Wall-mounted speakers are also used at UVU where a room application requires stereo and/or surround sound. The device box serving the speakers shall have a feedthrough faceplate for wire exit. The Designer shall discuss this situation in advance with the AVPM.

UVU typically uses JBL Control Series speakers.

#### **4.4.3 ASSISTIVE LISTENING DEVICES**

UVU typically uses radio frequency (RF) assistive listening equipment from ListenTech.

In accordance with the ADA Standards for Accessible Design, UVU provides assistive listening devices for all spaces that feature audio amplification. UVU's Accessibility Services department delivers this service in a two-part strategy:

- Loaning RF receivers to people who request them.
- Deploying RF transmitters (mounted in the Teacher Stations) in the rooms used by people who request RF receivers.

The Designer shall include in the design a program-out audio feed located on an interface plate on the Teacher Station. This output also serves as an auxiliary audio record output.

UVU is currently transitioning to loop-based systems in larger spaces for compatibility with hearing aid wearers. Theaters shall have full phased array loop/double loop coverage in the floor. Other spaces shall have a single loop installed in a portion of the room, covering an area that is designated for the hearing-impaired.

Table 219.3 in the ADA Standards for Accessible Design provides information about the number of receivers required depending on the number of seats in a given room.

The Designer shall include in the specification a requirement that the A/V Contractor provide RF transmitters, loop wiring, loop transmitters, and loop receivers according to the following table:

Seating Capacity of Space	Number of RF Transmitters	Number of Wired Loops in Room	Number of Transmitters for Loop Based systems	Minimum Number of Loop Receivers
65 or less	1 per 10 rooms 65 seats or less*	1	1 per 10 rooms 65 seats or less* (furnish uninstalled)	2
66 to 250	None	1	1 per 5 rooms over 65 seats* (furnish uninstalled)	2, plus 1 per 25 seats over 65 seats*
251 to 500	None	1	1 per 5 rooms over 250 seats* (furnish uninstalled)	2, plus 1 per 25 seats over 250 seats*
501 to 1000	None	1	1 per room over 500 seats (installed)	20, plus 1 per 33 seats over 500 seats*
1001 to 2000	None	phased array loop/double loop coverage	2 per room over 1000 seats or as required to serve the loops in a room (installed)	35, plus 1 per 50 seats over 1000*
2001 or more	None			55, plus 1 per 100 seats over 2000*

\* or fraction thereof

## 4.5 Room Control Systems

### 4.5.1 CONTROL SYSTEMS

A room control system shall be provided for device control and audio level control in each space.

The control system shall automate projectors, screen functions, audio functions, and video switching. It shall also provide for an orderly startup and shutdown of the classroom electronic devices and room environment features, such as lighting and window shades.

The University has standardized on the Crestron brand control system. The system includes a central processor, touch panels, current sensors, occupancy sensors, partition sensors, and relay or RS-232 controls for electric projection screens, lights, window shades, projectors, video panels, switchers, scalers, audio mixers, amplifiers, cameras, source devices, codecs, and other hardware devices. All programming for the control processor and all touch panels shall be coordinated with the UVU AVPM. Every touch panel in use throughout the campus has the same page layout and button nomenclature, and all new touch panels shall follow suit.

All Crestron programming developed within a UVU project shall become the property of UVU and shall become part of the project deliverables in the current standard Crestron source code (uncompiled) format for both graphic interface and automation.

Power on/off and input selections on the projector are selected by the Crestron system. The Crestron system shall also control the lighting and automatically lower and raise the projection screen with the projector on/off control. The Crestron system shall provide control for the devices depicted on the diagram discussed in Section 4.1 – A/V Features, Functions & Services.

### **4.5.2 TOUCH PANEL**

A Touch Panel shall be used as the control interface. In smaller applications, the AVPM may choose to use a button panel.

## **4.6 Signal Transport Methods**

All A/V cables routed through the ceiling or wall space shall be plenum-rated.

### **4.6.1 HDBaseT**

The Designer shall always deploy shielded Category 6A cabling for HDBaseT to all video panel and projector locations.

Where the cable distance exceeds the 40-foot distance limitation of HDMI, the Designer shall also deploy HDBaseT equipment to deliver video, audio, and control signals to the video output devices using the shielded Category 6A cable described above.

Shielded Category 6A cabling shall be terminated with a CAT6A jack, and a CAT6A patch cord shall be used between equipment and the jack. UVU has standardized on Seimon brand Z-MAX terminations, and is willing to consider alternates that meet or exceed the performance of the Siemon products.

In larger venues, the AVPM may require the use of a patch panel in the A/V Equipment Rack for HDBaseT applications.

Where distances exceed 295 feet, a fiber optic extender shall be used in lieu of HDBaseT cabling.

### **4.6.2 HDMI**

Generally speaking, UVU prefers that connections to input devices and output devices be accomplished using HDMI cabling, limited to a maximum cable length of 40 feet.

Regardless, a shielded Category 6A cable for HDBaseT shall always be provided for future applications, even when the distance is within HDMI limitations.

Fiber HDMI cables may be used where applicable, where cost or space limitations may exist.

### **4.6.3 DANTE**

The use of Dante audio signal transport solutions within a single application space is acceptable at UVU facilities. This solution is required in all large event/performing spaces for distribution of digital audio.

Provide two dedicated network switches for Dante-based systems.

All Dante plate connections shall be Ethercon.

Primary and secondary Dante ports shall be provided at every Dante location.

At least 1 Dante Breakout Box (minimum 16 in and 8 out) shall be provided for each space where Dante is installed.

## 4.7 Specialty Lighting

### 4.7.1 HOUSE LIGHTING

In large presentation and performing spaces, house lighting shall be linearly dimmable from 0% to 100%, and be controllable separately from any other zone. Lighting shall be controlled by dimmers located near the presenter, in the back of the room, and from the room A/V control system.

### 4.7.2 PODIUM LIGHTING

Multiple light fixtures shall be used to provide proper light coverage with full overlap and redundancy. ETC brand fixtures shall be used, and LED lights are preferred.

Spot locations shall be designed for the podium and other key positions, such as where panel discussions would take place.

## 4.8 Administration/Labeling

### 4.8.1 NUMBERING SCHEME

UVU's standard numbering scheme is required for all audio/visual infrastructure:

All sequential numbering consists of a 2-digit number with a leading zero for numbers less than 10. All sequence numbers are preceded by a hyphen (dash).

#### 4.8.1.1 EQUIPMENT

Each piece of equipment receives a unique identifier:

Equipment Type	Abbreviation	Sequence	Example
Controller	IC	. ##	IC. ##
Touch Panel	TP	. ##	TP. ##
Camera	CAM	. ##	CAM. ##
Codec Video Conference	VC	. ##	VC. ##
Video Switcher	SW	. ##	SW. ##
Computer	PC	. ##	PC. ##
Computer Monitor	MON	. ##	MON. ##
Doc Cam	DOC	. ##	DOC. ##
Laptop	LPTP	. ##	LPTP. ##
Video Wall Processor	VWP	. ##	VWP. ##
Audio Mixer	MIX	. ##	MIX. ##
Digital Signal Processor	DSP	. ##	DSP. ##
Projector	PRJ	. ##	PRJ. ##
Video Panel	VP	. ##	VP. ##
Distribution Amplifier	DA	. ##	DA. ##
Assistive Listening	ADA	. ##	ADA. ##
Speaker	SP	. ##	SP. ##
Projection Screen	SCR	. ##	SCR. ##

Blu-ray Player	BDP	. ##	BDP. ##
Wireless Mic	WMIC	. ##	WMIC. ##
Wired Microphone Input	MIC	. ##	MIC. ##
Line Input	AUX	. ##	AUX. ##

(## = 2-digit number with leading zero for numbers less than 10)

#### 4.8.1.2 CABLES

Each cable receives a unique identifier.

Cable Type	Abbreviation	Sequence	Example
DVI-D	DVI	. ##	DVI. ##
VGA	VGA	. ##	VGA. ##
HDMI	HDMI	. ##	HDMI. ##
DisplayPort	DP	. ##	DP. ##
HDBaseT	HDBT	. ##	HDBT. ##
DC Power	PWR	. ##	PWR. ##
Mic Cable	MIC	. ##	MIC. ##
Speaker Audio	SP	. ##	SP. ##
Ethernet	DATA	. ##	DATA. ##
RS232 Serial Control	RS232	. ##	RS232. ##
RS485 Serial Control	RS485	. ##	RS485. ##
Infrared Control	IR	. ##	IR. ##
Relay/Dry Contact Control	RLY	. ##	RLY. ##
Crestron Cresnet	CRES	. ##	CRES. ##
GPIO Control	I/O	. ##	I/O. ##

(## = 2-digit number with leading zero for numbers less than 10)

#### 4.8.1.3 CABLE LABELS

Cable labels are composed of three parts:

- Cable Number
- Source (where the near end of the cable terminates)
- Destination (where the far end of the cable terminates)

Each cable shall be labeled with its own cable identifier plus the piece of equipment and connection point (source) on which the cable terminates (destination), as follows:

[CABLE#]      SOURCE → DESTINATION
------------------------------------

For example, the first RS232 control cable, connected to RS232 port #1 on Crestron Controller #1, to Video Switch #1 would be given the following label:

RS232.01	IC.01 →	SW.01
----------	---------	-------



## 4.9 Services

Video content service providers (cable television, satellite television, etc.) shall deliver their services to the campus and terminate at the main campus service demark. The services shall then be carried via campus backbone cabling to their desired destination. This applies to both UVU and non-UVU tenants.

New television service provisions shall be established in coordination with UVU OIT. Occupants of UVU facilities shall not contract directly with content providers to establish new service.

A dedicated fiber optic cable connection shall be provided for high-bandwidth services such as IP television streaming.

# 5 Application Spaces

See Sections 3 and 4 for the definitions and specifications of the features and equipment described in each application space below.

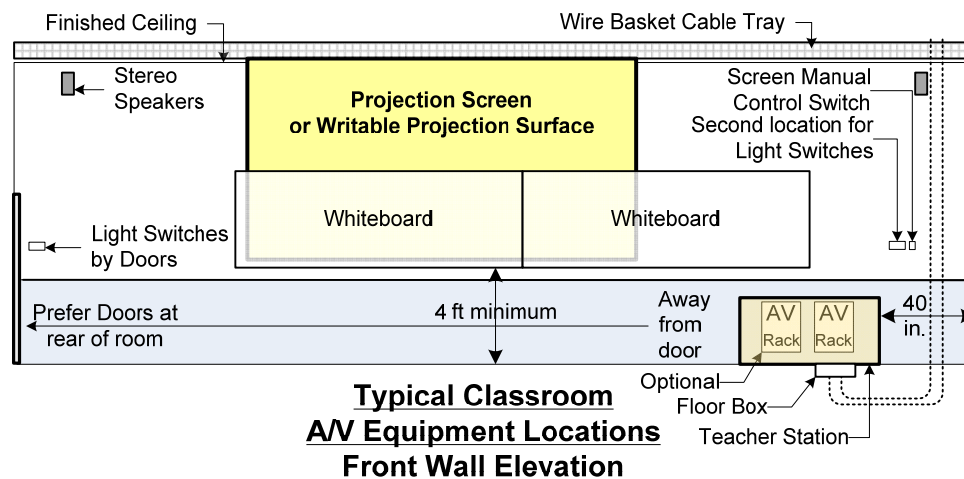
## 5.1 Classrooms and Instructional Spaces

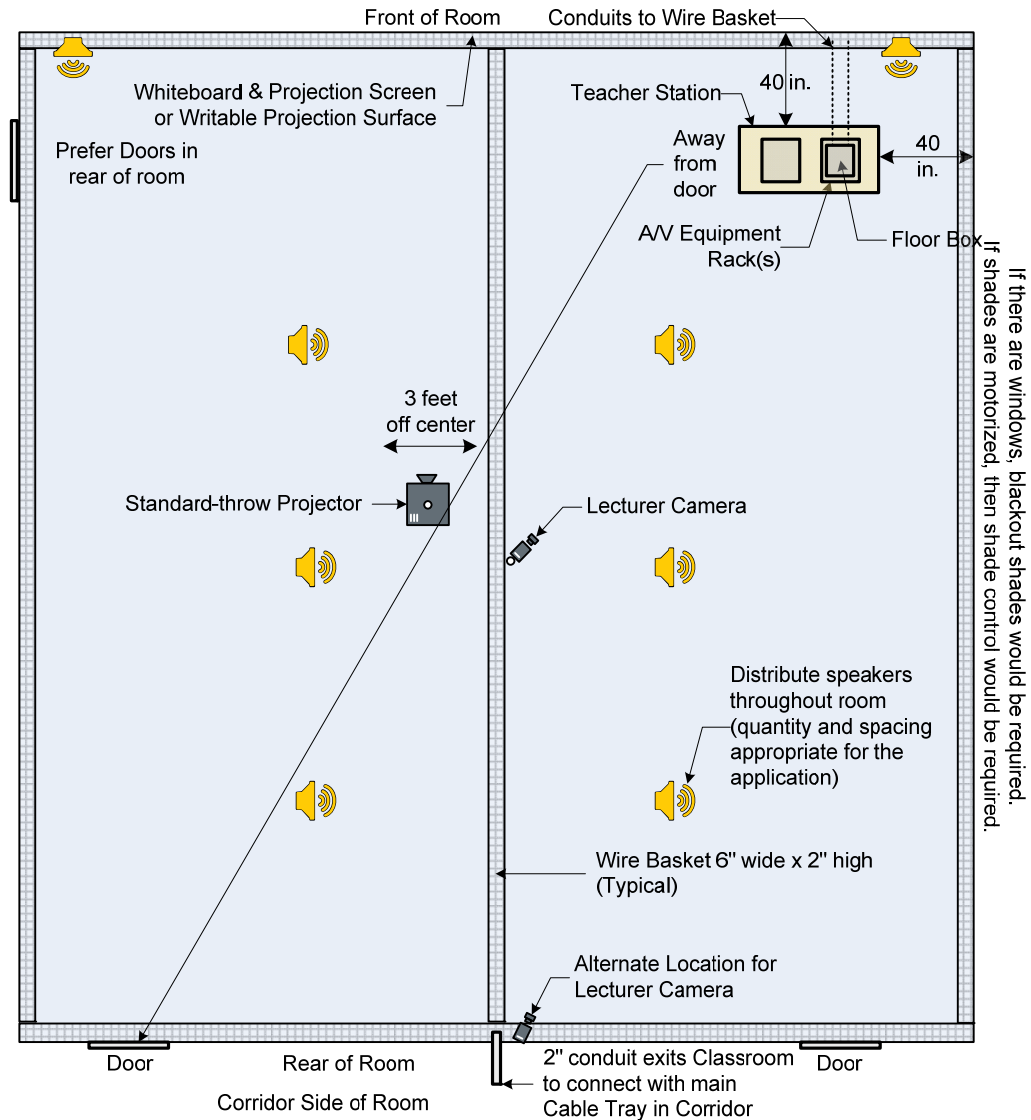
### 5.1.1 CLASSROOMS AND LABS

A Classroom has presentation audio/visual, audio amplification, lecture capture, and web conferencing features.

#### 5.1.1.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of a typical Classroom.





**Typical Classroom  
A/V Equipment Locations  
Plan View**

## 5.1.1.2 ARCHITECTURAL REQUIREMENTS

### 5.1.1.2.1 CLASSROOM LOCATION

Noise-producing equipment, such as elevators and HVAC equipment, shall be separated from teaching spaces. While soundproofing can treat some problems, it has its limits and can be expensive.

### 5.1.1.2.2 ROOM SHAPE

Classrooms should preferably be deeper (front to back) than they are wide. Window walls should be perpendicular to the presentation wall.

#### 5.1.1.2.3 ACOUSTICS

- A. A noise coefficient of NC 35 and a reverberation time of 0.6 seconds are the highest allowable per the recommendations of ANSI S12.60-2002.
- B. The Designer and the Architect shall discuss with the Owner whether there is any possibility that a classroom might be upgraded in the future to serve as Distance Education Classroom. If this possibility exists, the acoustics for the classroom shall be designed to meet the Distance Education Classroom requirements from day one.
- C. Ideally, walls shall be at least 6" thick. They shall employ sound-dampening material and construction methods to suppress sound transfer between application spaces.
- D. Acoustic treatment shall be employed on walls, floors, and ceilings to reduce reverberant conditions. This treatment shall have an NRC of 80-85, which is typical of fabric over 1" fiberglass. Extraneous sounds must be prevented from entering the classroom. In some cases, this might require dense materials in ceilings and walls. Carpeting is highly desirable to improve acoustics and visual imagery.

#### 5.1.1.2.4 COLORS

The Designer and the Architect shall discuss with the Owner whether there is any possibility that a Classroom might be upgraded in the future to serve as a Distance Education Classroom.

- If this possibility exists, the color treatments in the classroom shall be designed to meet the Distance Education Classroom requirements from day one.

#### 5.1.1.2.5 WINDOWS

If there are windows in the room, automatic blackout shades to control light spill shall be considered.

#### 5.1.1.2.6 FURNITURE

When selecting student tables, consider whether power outlets, data outlets or microphones will be required. If so, it is recommended that tables be manufactured with integrated cable raceways. Table top surface, style, and color shall match room décor and custom A/V cabinetry.

The Designer shall work with the UVU Furniture Purchasing Agent to specify the table colors and table top surface materials.

### 5.1.1.3 ELECTRICAL REQUIREMENTS

#### 5.1.1.3.1 POWER REQUIREMENTS

The electrical power circuits supplying the Projector, Video Panels, Teacher Station, Floor Box, and Equipment Rack shall be dedicated for technology applications, be from the same breaker panel, and use the same phase in the panel.

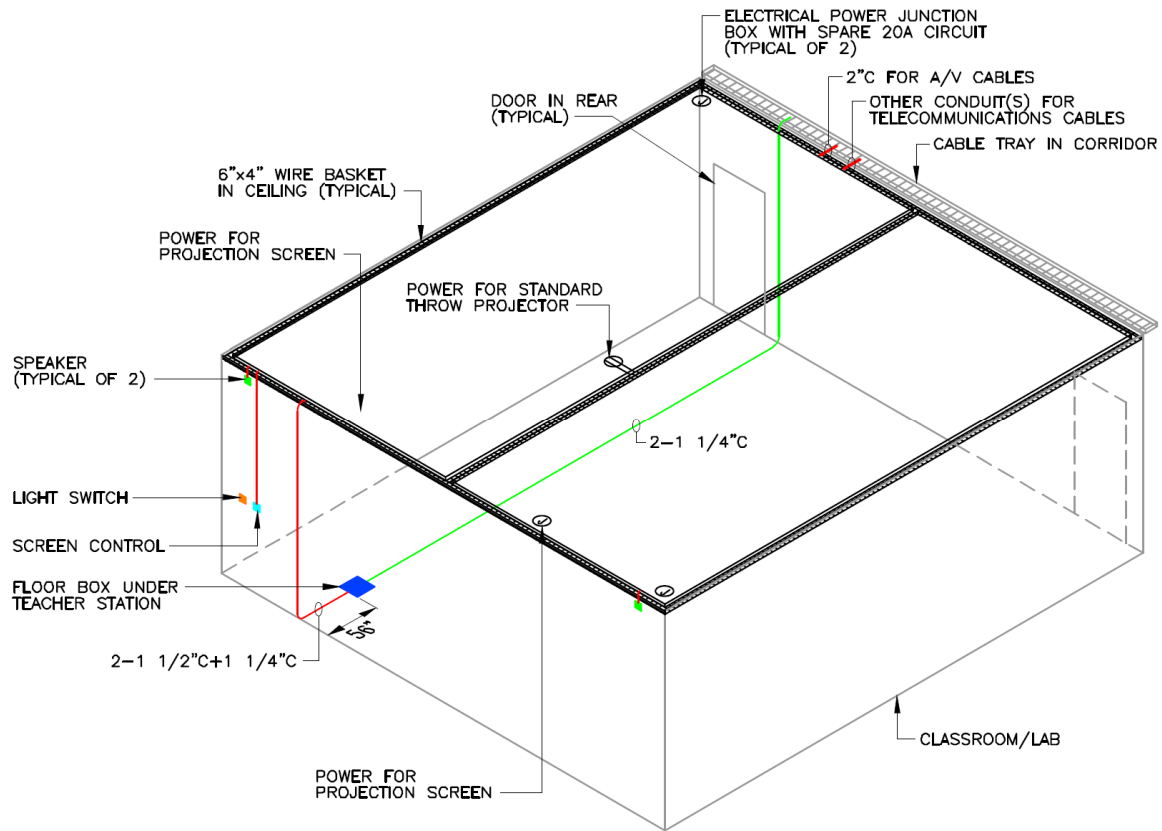
The Equipment Racks in the Teacher Station can share a single dedicated 20A circuit.

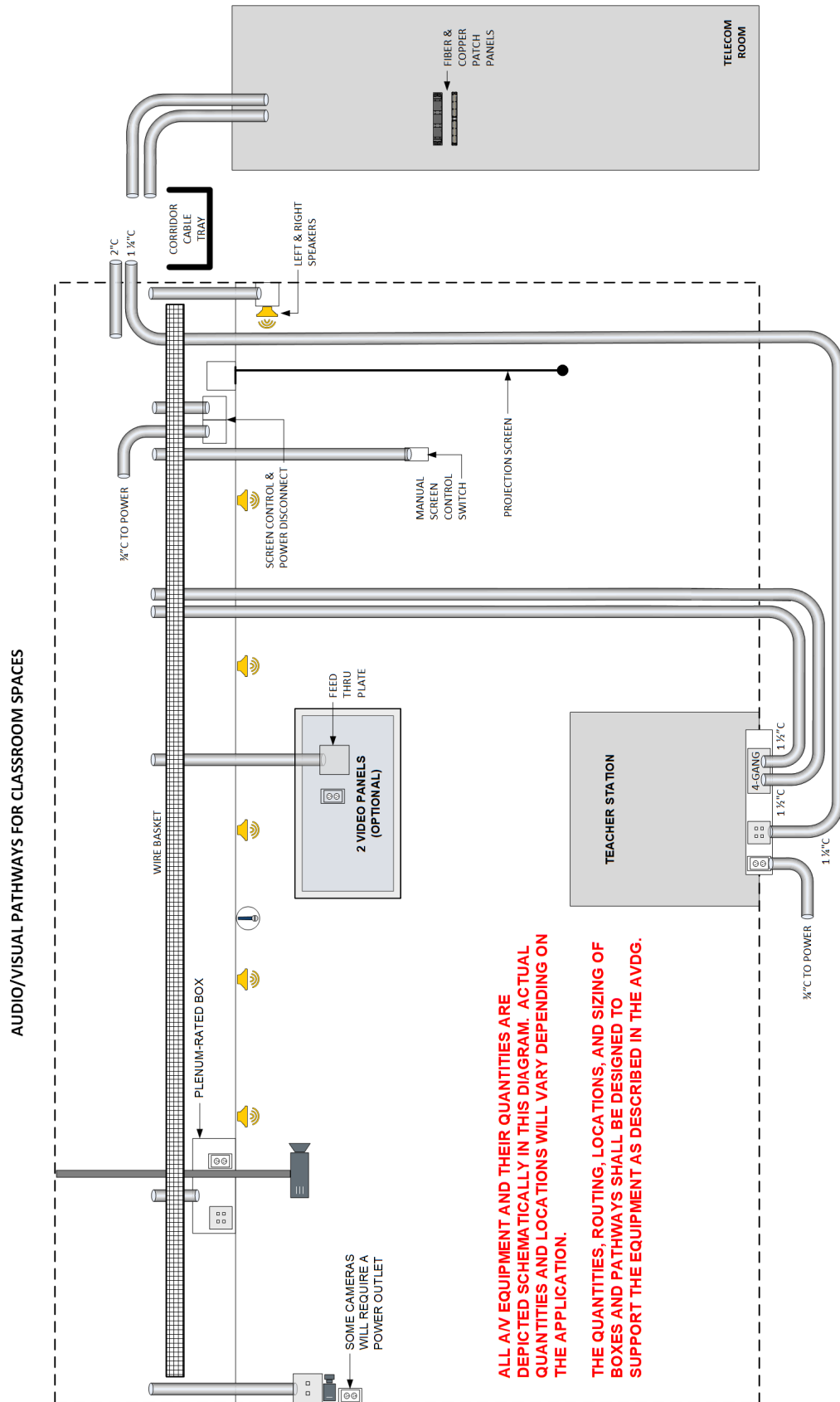
Throughout the room, the A/V equipment that will require power includes:

- Video Projector – typically located in a plenum-rated device box mounted in the tile bridge directly above the projector (concealed in the accessible ceiling). This outlet shall be a dedicated circuit serving the projector only.
- A/V Rack – quad outlet per rack, mounted in a floor box or in base of the Teacher Station (inside) oriented facing to the side (not face-up). This outlet shall be a dedicated circuit serving the Teacher Station only.
- Projection Screen – when the screen's motor operates, it can interfere with other electronic equipment. Therefore, power for projection screens shall be circuited separately from the projector, the Teacher Station, and other A/V equipment.

#### 5.1.1.3.2 LOW-VOLTAGE PATHWAYS AND BOXES

- A. A/V conduits shall be sized 1 ¼" minimum, and shall be larger as required for each application.
- B. Provide an A/V Floor Box below the Teacher Station as shown in the plan diagram above.
  - Provide two 1 ½" conduits for A/V purposes only from the A/V Floor Box up to the wire basket in the ceiling.
  - Provide a separate 1 ¼" conduit routed from the A/V Floor Box under the Teacher Station to the main distribution cable tray (typically in the corridor) for telecommunications cabling.
- C. For wall-mounted A/V devices (such as speakers and cameras) provide conduits (1" trade size) from the wire basket in the ceiling down to in-wall, 2 1/8" deep device boxes, with a single-gang mud ring serving each wall-mounted audio/visual device. Provide feedthrough faceplates sized to allow cables with connectors to pass through. Provide blank faceplates for future devices. Conduits, device boxes, and faceplates shall comply with UVU telecommunications guidelines. Faceplates shall match (color, material, style) the other faceplates used in the project.
  - Be aware that some PTZ cameras mount directly to a 2-gang mud ring.
- D. Provide wire basket cable trays in accessible ceiling to accomplish the functions depicted in the plan diagram above. Cable tray practices shall comply with UVU telecommunications guidelines.
- E. The two diagrams below depict the pathways and boxes required for a Classroom A/V application:





### 5.1.1.3.3 TELECOMMUNICATIONS CABLING REQUIREMENTS

- A. The Designer shall work with the telecommunications designer and the AVPM to verify that the appropriate numbers of cables and colored jacks are included in the telecommunications drawings to support A/V applications, in addition to other needs. See the TDDG for further information.
- B. Provide the following telecommunications cabling:

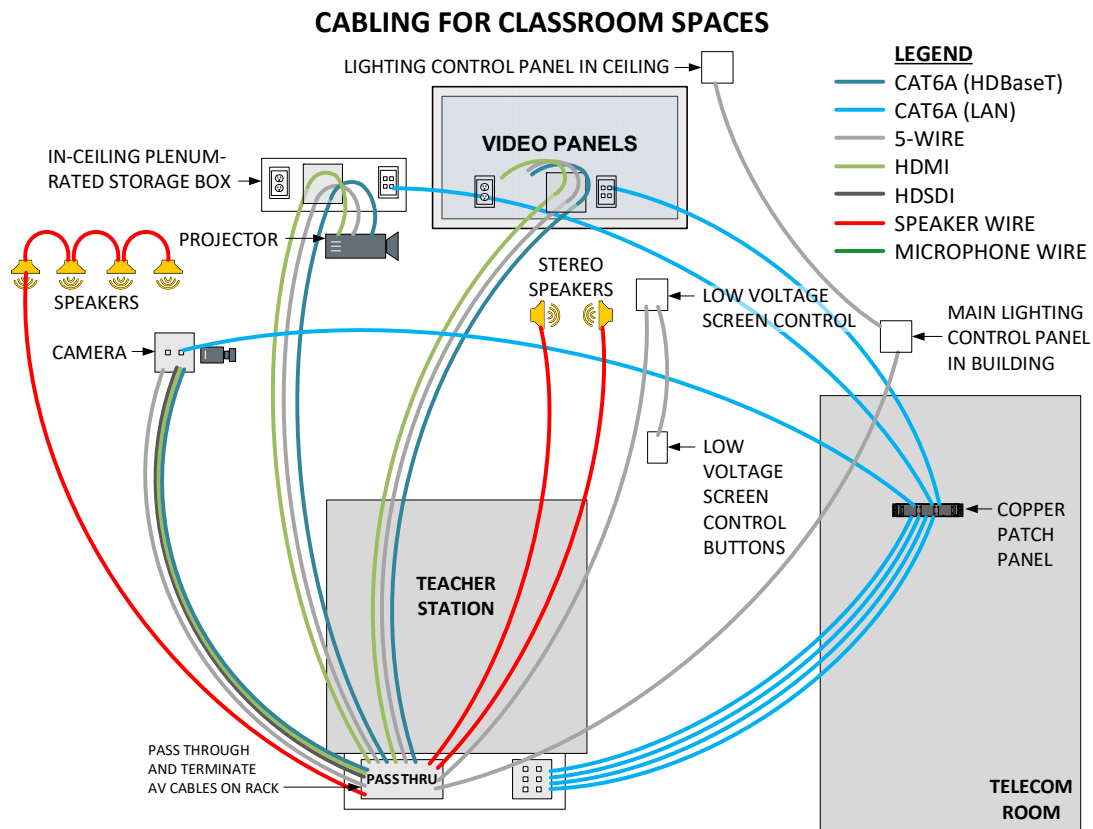
Application	Endpoint/Termination	Cable	Endpoint	Termination
Crestron control system	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Owner-provided computer located in the A/V Rack	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Video Switcher located in the A/V Rack	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Data network connection for laptop	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Each Projector (LAN)	Telecom Room	Category 6A	Outlet above projector in plenum box	RJ45 Jack
Each Video Panel (LAN)	Telecom Room	Category 6A	Outlet behind video panel	RJ45 Jack
Each Camera (LAN)	Telecom Room	Category 6A	Outlet behind camera	RJ45 Jack
Each Camera (HDBaseT)	Pass-through floor box under Teacher Station	Category 6A	Pass-through outlet behind camera	Connectors on both ends (no jacks)
HDBaseT to each video projector and video panel	Pass-through floor box under Teacher Station	Category 6A	Pass-through outlet above projector or behind video panel	Connectors on both ends (no jacks)

The cable quantities will vary depending on the number of audio/visual devices in the A/V Equipment Rack and located throughout the room.

Multiple outlets may be required inside the Teacher Station to terminate all cables.



The following diagram depicts the telecommunications cabling required for a Classroom audio/visual application:



ALL A/V EQUIPMENT AND THEIR QUANTITIES ARE DEPICTED SCHEMATICALLY IN THIS DIAGRAM. ACTUAL QUANTITIES AND LOCATIONS WILL VARY DEPENDING ON THE APPLICATION.

THE QUANTITIES, ROUTING, AND TERMINATION OF CABLING SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

OTHER A/V WIRING AND CABLING MAY ALSO REQUIRED FOR SPECIAL APPLICATIONS NOT DEPICTED HERE.

#### 5.1.1.3.4 LIGHTING REQUIREMENTS

Pendant light fixtures shall be coordinated so that they do not obstruct the projector light path to the display wall. Standard-throw projectors are typically hung between 8 and 14 inches below the finished ceiling to center of lens, and set back from the front of the room a distance of twice the screen width minus 2 feet. Refer to the projection throw chart specific to the projector model and lens being used. Projectors shall be located in the middle of the acceptable throw range defined by the manufacturer.

Front-of-room lighting must be controllable separately from the rest of the room to eliminate spill on the screen that would degrade image quality.

Light fixtures that are wired to be “always on” shall not be placed near projection screens or video panels.

#### **5.1.1.4 HVAC REQUIREMENTS**

In order to meet the above Noise Coefficient, the HVAC must be low velocity with sound absorption material in the ducts.

HVAC designers shall anticipate that A/V equipment will produce a heat gain of approximately 1500 watts in the classroom.

Since students will occupy these rooms for up to three hours at a time at intense levels of concentration, there must be temperature control, humidity control, and complete changes of air on a cycle consistent with that type of activity.

#### **5.1.1.5 A/V EQUIPMENT AND FURNISHINGS**

##### **5.1.1.5.1 TEACHER STATION**

Teacher Station furniture shall be located in the front of the classroom, to the side of the display area of the front wall, away from the door. The Teacher Station shall be visible from every seat in the space but shall not obstruct the line of sight to the projection screen from any seat in the space. Teacher Stations shall be anchored to the floor.

The Designer shall inquire with the AVPM to select which of the three standard styles of Teacher Station Furniture shall be used in each application space:

- Desk style form-factor (both a left and right version)
- Stand-up work surface style form factor (not movable) with dual racks
- Lectern with interior equipment rack

See Teacher Station drawings in Appendix 8.1.

##### **5.1.1.5.2 A/V EQUIPMENT RACK**

An A/V Equipment Rack assembly (or two racks) shall be located inside the teacher station. The cabling shall enter the rack at the bottom rear and be properly routed and Velcroed to the cable lacing system. All cables should be groomed such that cables can be easily traced and removed. The A/V Equipment Rack shall contain the following equipment:

- Crestron controller system, which shall be connected to the University data network.
- Blu-ray player, if required.
- Owner-provided computer. The Designer shall inquire with the UVU AVPM whether the computer will be rack-mountable or whether the Designer shall include a 3U shelf to support the computer.
- Wireless microphone receiver
- Video Switcher/Scaler

- Audio Switcher/DSP
- Amplifier
- Ventilation fans may be required. Coordinate with the AVPM.
- In Teacher Stations, power conditioning devices shall be provided to protect the equipment in the A/V Racks. For racks with 8x8 matrices and larger, provide an uninterruptible power supply (UPS).

An example A/V Equipment Rack elevation detail is shown in Appendix 7.2 Rack Elevation Diagrams.

#### **5.1.1.5.3 FLOOR BOX**

Typically, a floor box beneath the Teacher Station is desirable. When a floor box is not feasible, UVU prefers that low-voltage conduits serving the technology applications in the Teacher Station simply stub up approximately 1" above the floor and enter the Teacher Station through cutouts in the floor of the Teacher Station. If a permanent teacher station or podium is secured above, then no A/V cabling shall terminate in it. Rather, the floor box shall serve as a pass-through point. All data and connections shall be terminated in the floor box.

#### **5.1.1.5.4 VIDEO PROJECTOR**

Discuss with the UVU AVPM which type of projector should be used for a given project. Standard-throw projectors are typically preferred. However, where a standard-throw projector cannot be used, consider using a ceiling-mounted long-throw projector.

AC power will be required for the projector.

#### **5.1.1.5.5 PROJECTION SCREEN**

Where a projectable surface is used, do not use a projection screen.

Otherwise, projection screens shall be mounted in a central location in the front of the room. Screen shall be mounted a maximum of 4 inches away from the wall and, when extended, shall clear the chalk tray of any black or white board mounted behind it. The bottom of the fully extended screen shall be a minimum of 36 inches above the finished floor.

A low-voltage manual screen control switch is required. A power cutoff switch above the ceiling is also desired so that technicians can disconnect the screen from power for servicing activities.

The Designer shall consult with the UVU AVPM regarding the desired screen sizes in each application.

#### **5.1.1.5.6 SPEAKERS**

The classroom audio system shall be designed with separate speaker systems to provide a clearly intelligible stereo (for content) and monaural (for speech) audio signal at every location within the classroom. Audio enhancement shall provide a level of not less than 55 dB SPL at 48 inches above finished floor in the classroom seating area. Audio levels front to back/side to side shall not vary by more than 2dB at any point within the seating area.

#### 5.1.1.5.7 ASSISTIVE LISTENING

Every classroom requires assistive listening features.

#### 5.1.1.5.8 ROOM CONTROL

The Crestron room control system shall provide control of the video display devices, projection screen, content source selection (audio and video), window dressing, and lighting.

The Designer shall discuss with the AVPM which room-specific features shall be programmed into the control system.

##### 5.1.1.5.8.1 Room Control Programming

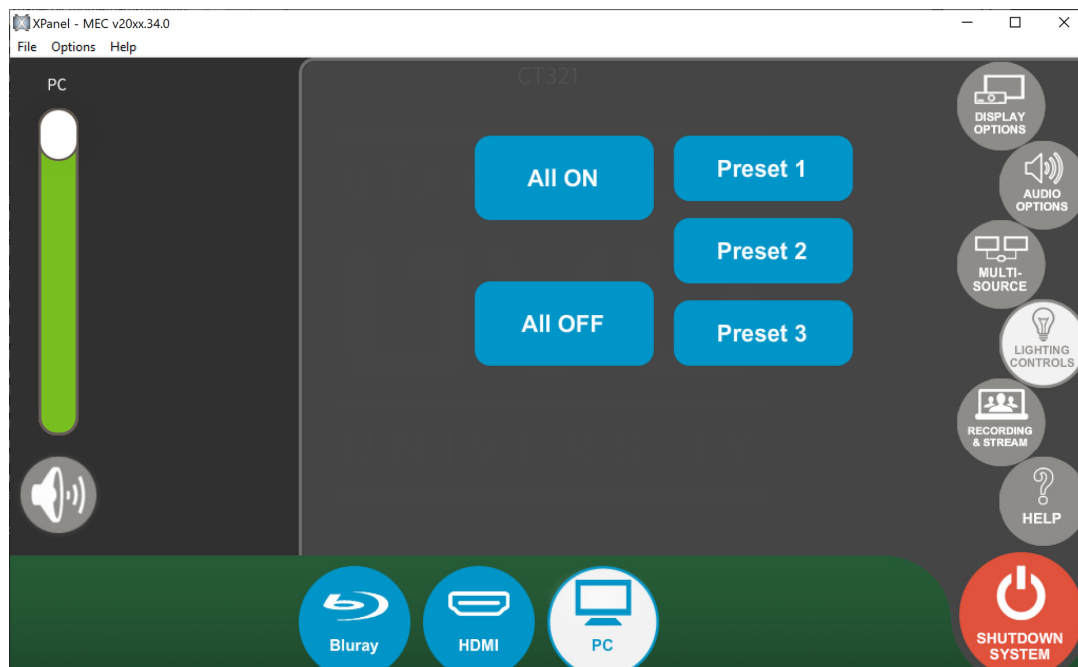
All programming for the Crestron Processor and all touch panels shall be coordinated with the UVU AVPM. Every touch panel and PC software interface in use has the same page layout and button nomenclature throughout the campus and all additions must follow suit.

##### 5.1.1.5.8.2 Projector Control

Power on/off and input selections on the projector are selected by the Crestron system. The Crestron system shall also provide for the automated lowering and raising of the projection screen with the projector on/off control.

##### 5.1.1.5.8.3 Lighting

The Crestron control system shall be programmed to provide lighting control, automated with the use of the video projector. The lighting system shall also be given a separate control page for overriding the automated control as needed. The following graphic is an existing example in use at UVU:



#### 5.1.1.5.8.4 Codec

The Designer shall discuss with the AVPM if a codec will be required.

#### 5.1.1.5.8.5 Audio and Video Routing and Switching

Audio and video routing shall be done with the Crestron control system.

The room control system performs source selections via peripheral equipment to provide sources to the video projector.

#### 5.1.1.5.8.6 Content Switcher

When UVU uses a content switcher, the switcher is used for all video source selections including computer, laptop, Blu-ray player, and document camera.

#### 5.1.1.5.8.7 Touch Panel

A Crestron touch panel shall be used for the control interface.

### 5.1.2 HORSESHOE CLASSROOMS

The seating in a Horseshoe Classroom shall be tiered and arranged in a U shape.

In addition to the features described above for all classrooms, Horseshoe Classrooms require three video output devices arranged as described in the two options below:

- |  |   |   |
|--|---|---|
| • A video projector aimed at the <b>left wall</b> behind student seating | • A video projector aimed at the front wall behind the instructor | • A video projector aimed at the <b>right wall</b> behind student seating |
|--|---|---|

OR

- |  |   |   |
|--|---|---|
| • A ceiling-mounted video panel, centered in the room, angled downward facing the <b>left wall</b> | • A video projector aimed at the front wall behind the instructor | • A ceiling-mounted video panel, centered in the room, angled downward facing the <b>right wall</b> |
|--|---|---|

### 5.1.3 DISTANCE EDUCATION CLASSROOMS

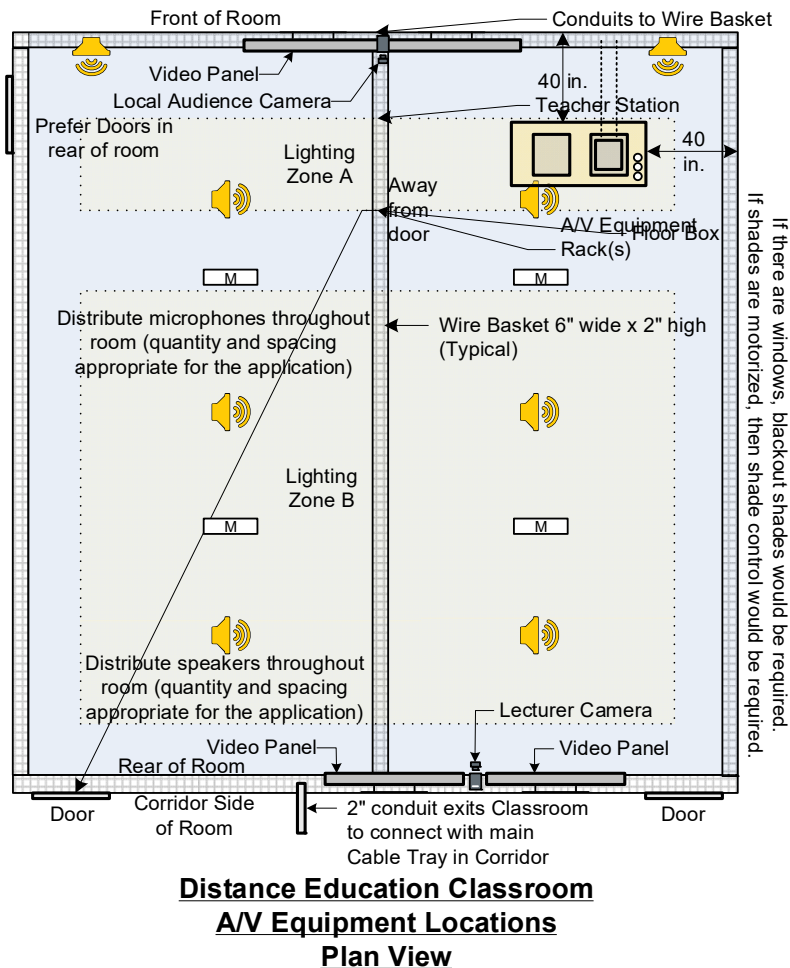
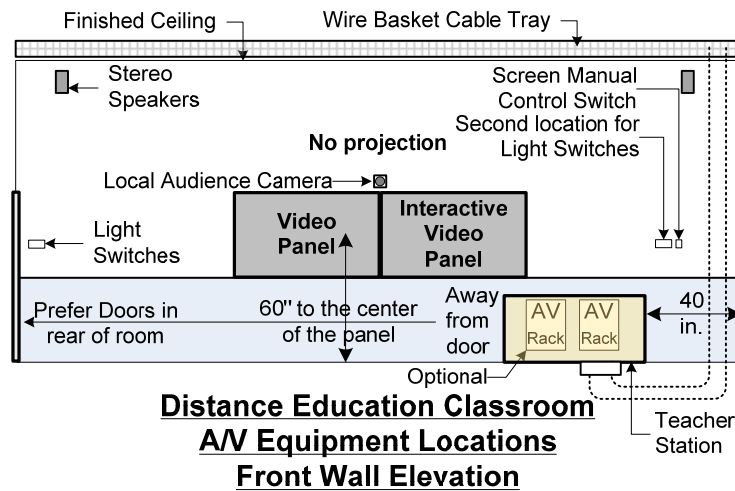
A Distance Education Classroom has the same audio/visual features as a Classroom plus the following additional features:

- Multiple video cameras
- Multiple video panels
- Microphones (wireless lapel or beam-forming ceiling microphones directed at students and instructor)
- Video conference endpoint

Distance Education Classrooms tend to be smaller than standard classrooms.

### 5.1.3.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of Distance Education Classroom:



### 5.1.4 COLLABORATION CLASSROOMS

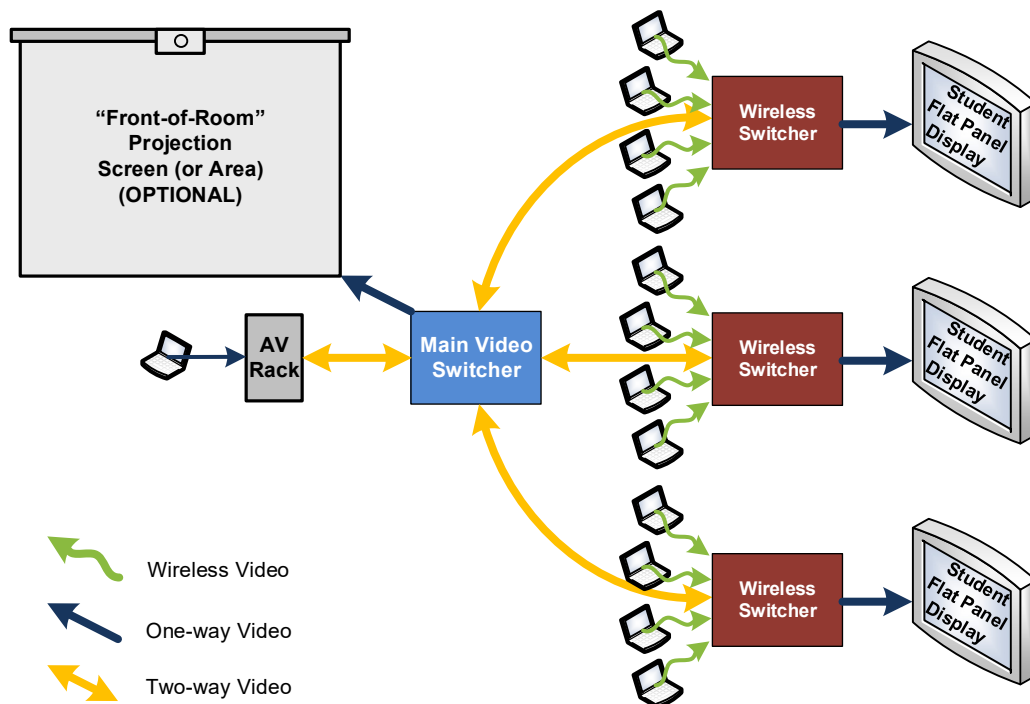
Collaboration Classrooms are sometimes referred to as “Flipped” classrooms. In addition to the audio/visual features of all classrooms, they contain additional video panels and/or projectors to display student computer images.

In Collaboration Classrooms, the instructor spends most of his or her time in the class period moving from table to table to support student groups as they collaboratively apply what they studied outside of class to solve the challenges given them in class. Collaboration Classrooms are not well-suited to video conferencing applications.

In Collaboration Classrooms, students sit in groups of up to 9 around each table. The tables are equipped with technology to support computers that are used by students during the class period. The wall near each table may have a video panel or a projection surface where the students can view it and can interact collectively.

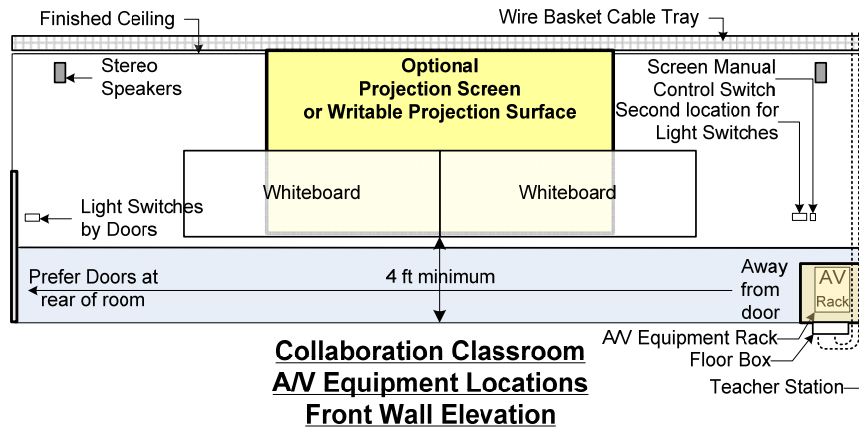
Collaboration Classrooms also have a “front-of-room” projection wall where the instructor might present a limited amount of material; however, Collaboration Classrooms are not intended as lecture spaces. The front-of-room designation is a loosely used term, because the room is not intended to operate primarily in this mode but will instead function most of each class period in a student-table-centric mode. The front-of-room projection shall also be able to display the monitor of any of the student tables should the instructor wish to feature a particular group for the entire class.

Depending on the intended use of a Collaboration Classroom space, it may not have a Teacher Station. In such cases, the A/V Equipment Rack will need to be mounted inside the Teacher Station.

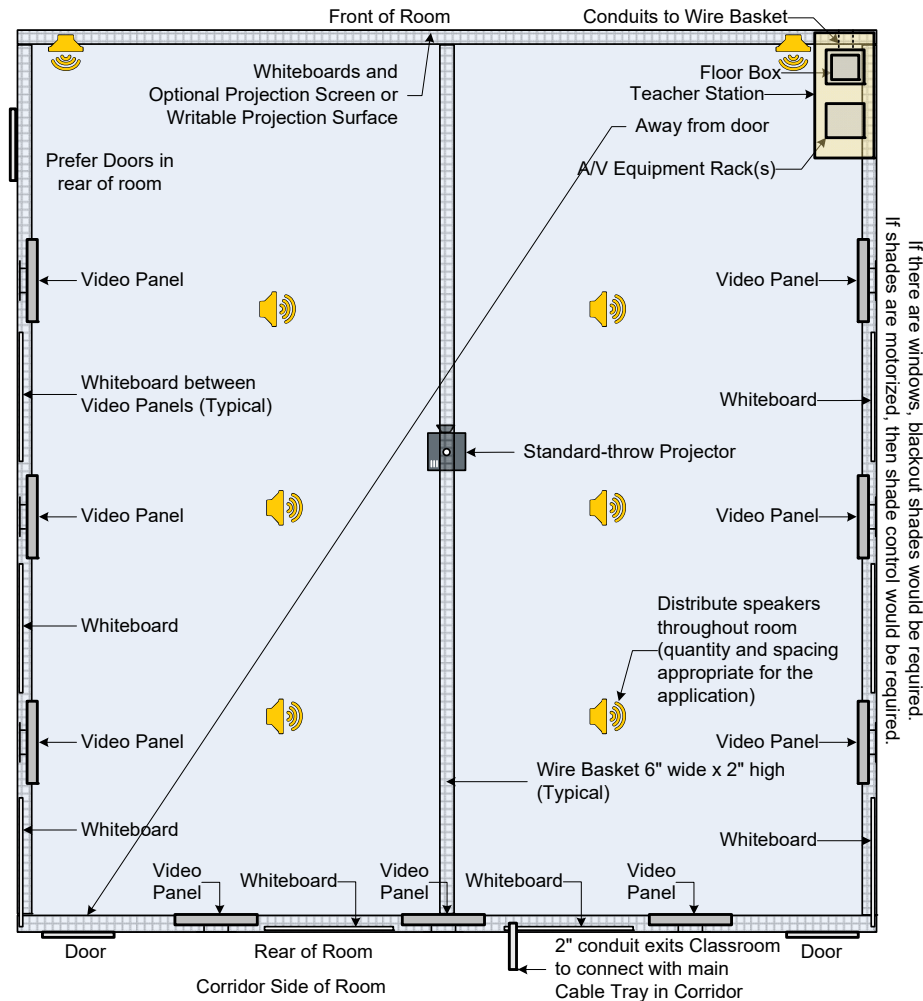


#### 5.1.4.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of a typical Collaboration Classroom.







**Collaboration Classroom  
A/V Equipment Locations  
Plan View**

#### 5.1.4.1.1 A/V EQUIPMENT AND FURNISHINGS

In addition to all of the features of a Classroom, Collaboration Classrooms will also require video switching (equipment or software) and video panels as shown in the diagrams above and discussed below.

The Designer shall discuss the furniture layout and style with the AVPM. The Designer shall discuss the finish and desktop laminates with the Facilities Services Interior Designer.

##### 5.1.4.1.1.1 Video Panels

Near each student group table, video panels shall be wall-mounted using a secure, articulating wall mount. Security devices shall be installed to protect against theft. Video panels shall be mounted no higher than is required to see the bottom of the image from any seat in the room.

Some Collaboration Classrooms may be better served with projectors and projection screens. Typically, this decision shall be made during the Schematic Design or Design Development Phase, in conjunction with the UVU user group/building committee. The Designer shall also discuss this option with the UVU AVPM.

#### 5.1.4.1.1.2 Video Switching

Video switching equipment will be required for the front-of-room system operated by the instructor to select audio/visual content to be projected and distributed. Options will include the screen image from the instructor's computer or the screen image from a student computer anywhere in the room.

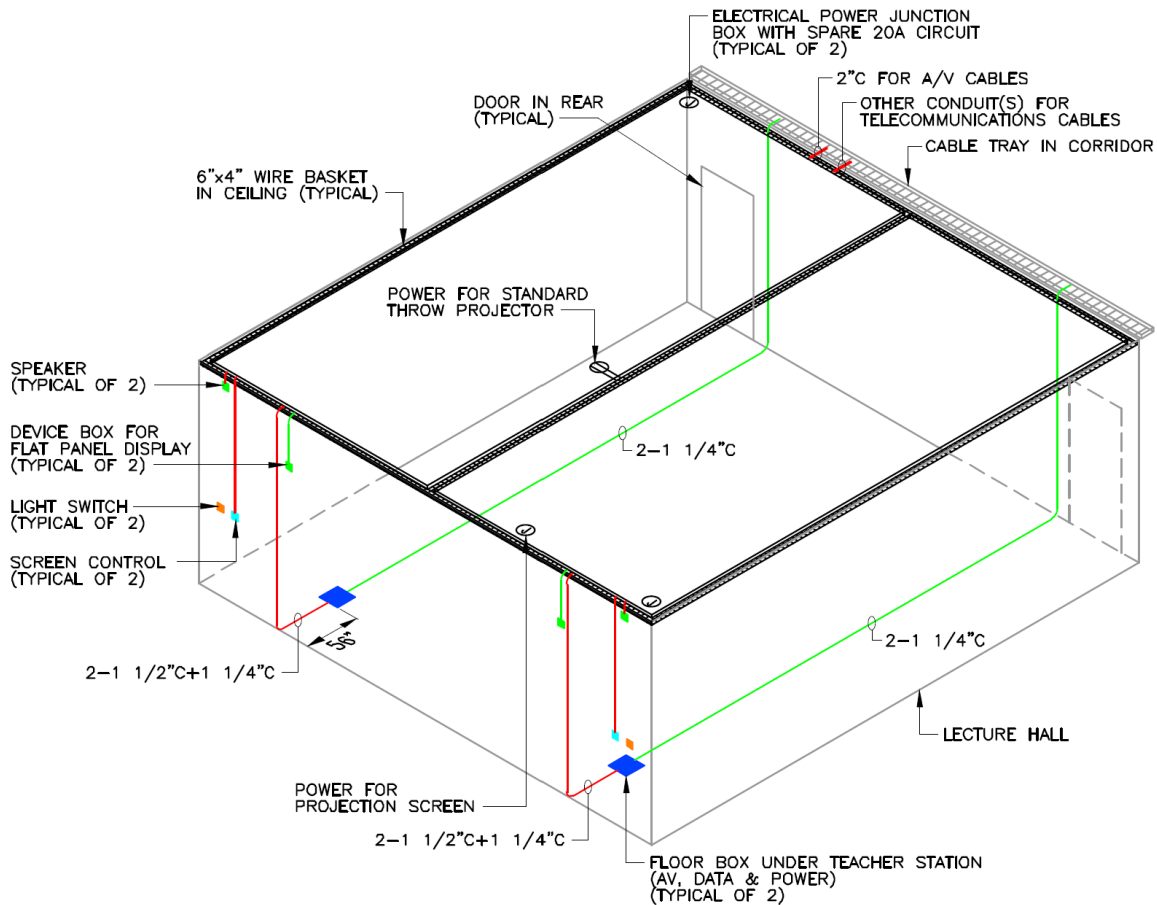
UVU uses the wireless switcher device (not hard-wired video) to integrate student video into the audio-visual system.

At each table, the students will need to be able to choose which of their computers to show on the wall-mounted video panel or projection screen. Also, students should be able to choose to show the front-of-room projection on their wall-mounted video panel.

### 5.1.5 LECTURE HALLS

Lecture Halls are similar to classrooms with the following significant differences:

- There are two stations at the front of the room for the teacher station furniture.
  - There is typically tiered seating.
- A. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Lecture Halls, as depicted below:



## 5.2 Dance Studios

Dance studios are used for academic instruction and artistic practice and shall include a typical classroom setup with the following additional features:

The following features are typically needed:

- Audio/visual equipment rack (housed inside a credenza)
- CD player
- Large venue speakers and subwoofers
- Acoustic wall treatment
- Audio inputs for personal music players, including both Apple and Android devices

## 5.3 Exercise Spaces

Exercise spaces often have stationary exercise equipment such as treadmills, bicycles, stair climbers, etc. The following features are typically needed:

- Multiple video displays showing multiple simultaneous television programs.
- Students can use an application on their personal smartphones to stream the audio broadcasts for each video panel, allowing patrons to tune into the audio for the video program they would like to watch.
- Informational digital signage.

## 5.4 Auditoriums

### 5.4.1 A/V EQUIPMENT AND FURNISHINGS

An Auditorium has the same audio/visual features as a Lecture Hall. However, since an Auditorium is much larger than a Lecture Hall and seats more people, it is usually necessary to adjust the following features:

- Add a raised platform at the front of the room.
- Add a third teacher station position in the center of the raised platform.
- Add a digital signal processor.
- Increase the number of speakers throughout the room.
- Provide audio amplifiers with sufficient power to support the larger number of speakers required.
- Provide acoustic wall treatment as required.
- Video display:
  - For past projects, UVU has provide a rear projection solution with space behind the projection surface and has incorporated the A/V Equipment Room into that space.
  - UVU will probably use direct-view LED walls for new Auditoriums in the future. See Section 5.10.3 Video Walls for more information.

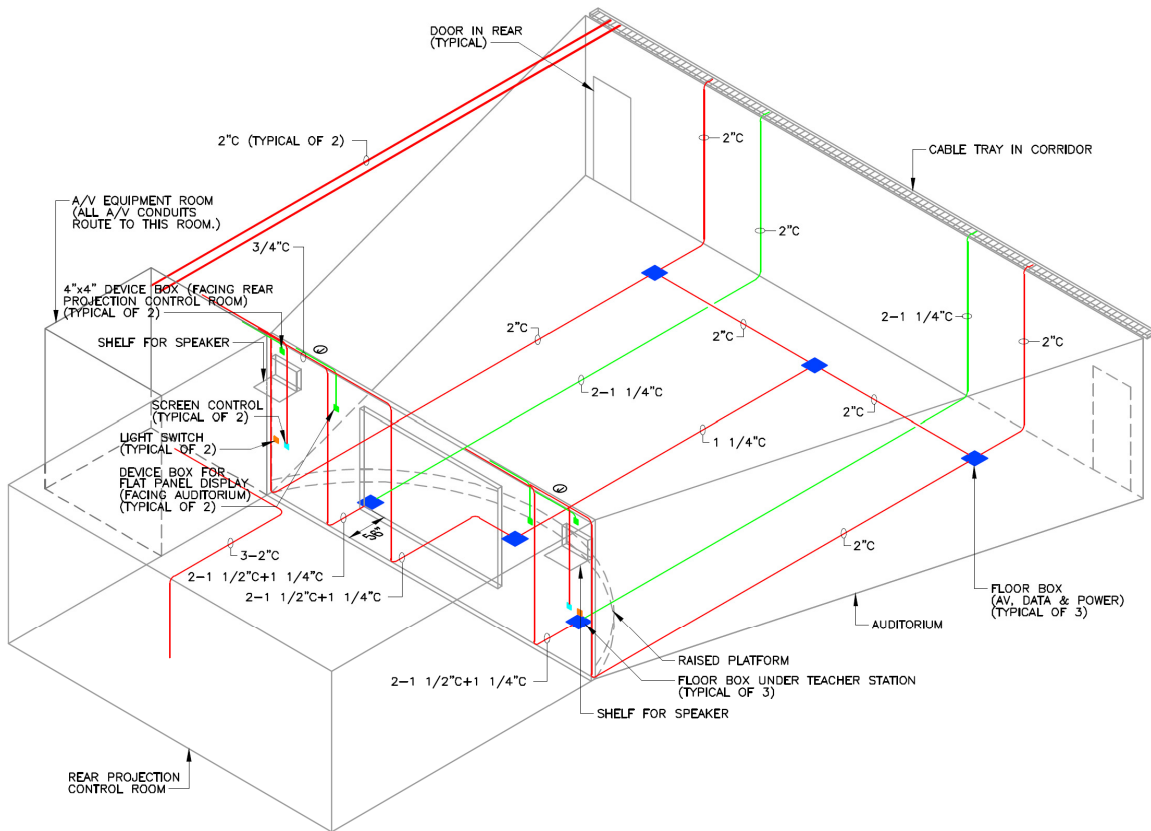
### 5.4.2 ELECTRICAL POWER IN AUDITORIUMS

It is critical that all audio/visual equipment located in and serving an Auditorium be powered on the same phase of the electrical power distribution system, preferably through technology-dedicated electrical circuits, all on the same phase of the electrical power distribution system. This includes the equipment in the A/V Equipment Room, the equipment in the Teacher Station rack, video projectors or direct-view LED video walls.

It is permissible for both an A/V Equipment Room and a Telecommunications Room to share the same technical power panel.

### 5.4.3 LOW VOLTAGE PATHWAYS AND BOXES IN AUDITORIUMS

- A. Where a rear-projection solution is chosen for a project, Auditoriums will require a rear projection room that also serves as an A/V Equipment Room.
- B. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Auditoriums, as depicted below:



#### 5.4.4 A/V EQUIPMENT ROOM

An A/V Equipment Room may be required to host the audio/visual equipment used for Auditoriums and other large spaces. Some labs and larger classrooms may also require an A/V Equipment Room.

The Designer shall inquire whether there are opportunities to combine an A/V Equipment Room with a Telecommunications Room.

##### 5.4.4.1 SIZING

A/V Equipment Rooms in new construction and full remodel projects shall be sized such that ADA-required space is available after equipment racks have been installed.

- Rooms shall be 9 feet by 10 feet (minimum dimensions), with the door on the 9-foot side.

##### 5.4.4.2 ARCHITECTURAL PROVISIONING

- The Designer shall be responsible to inform the Architect about the architectural provisioning requirements for A/V Equipment Rooms, and to do this early in the Design Development phase of the project.
- The Designer shall be responsible to review project documents and determine

that the architectural requirements for the A/V Equipment Rooms are met as described in this document. For projects where an architect is involved, the Designer shall coordinate directly with the architect, and verify that the architect's design documentation meets these requirements. For projects without an architect, the Designer shall alert UVU where additional architectural adjustments are needed to meet the requirements.

- C. Doors shall open out (180-degree swing) from A/V Equipment Room spaces wherever possible, and shall be a minimum of 36" wide and 80" high, fitted with a lock. Coordinate lock and key requirements with UVU. Doors shall be located in hallways or other common areas.
- The Designer shall inquire whether access control electronics are required for a given A/V Equipment Room.
  - A/V Equipment Room doors shall never be located in another building occupant's designated space.
  - If Code or circumstances do not allow an outward swing, the room size shall be increased to accommodate an inward door swing.
- D. Minimum clearance height within an A/V Equipment Room shall be 8 feet. False ceilings (t-bar ceilings, ceiling grids, etc.) shall not be installed in A/V Equipment Rooms. The floor, walls, and ceiling shall be sealed to reduce dust.
- E. Finishes shall be light in color to enhance room lighting. Flooring materials shall be light-colored and slip-resistant – carpet is not required for A/V Equipment Rooms. Interior floor finish and floor covering materials shall also meet the requirements in the International Building Code.
- F. The walls in A/V Equipment Rooms shall be covered either with plywood that has been treated with fire-retardant chemicals by a pressure impregnation process, or plywood that has been painted with a UL-listed, non-toxic fire-retardant intumescent coating having a Class A surface flame spread rating. The plywood shall be painted with primer and two coats of white paint.
- If an approved fire retardant intumescent coating is used, a small plaque shall be attached to the backboard near the door, listing the fire spread rating of the backboard, the manufacturer, and the product number of the fire-retardant intumescent coating. This information may be helpful for future maintenance activities.

Plywood backboards shall extend from 6" above the floor up to a height of 8'6" above the finished floor.

#### **5.4.4.3 ENVIRONMENTAL PROVISIONING**

- A. The Designer shall be responsible to inform the Mechanical Engineer of the environmental provisioning requirements for A/V Equipment Rooms, and to do this early in the Design Development phase of the project.

- B. The Designer shall be responsible to determine that the mechanical HVAC requirements for the A/V Equipment Rooms are met as described in this document. For projects where a Mechanical Engineer is involved, the Designer shall coordinate directly with the engineer, and verify that the engineer's design documentation meets these requirements. For projects without the involvement of a Mechanical Engineer, the Designer shall alert UVU where adjustments to the mechanical infrastructure are needed to meet the requirements.
- C. The Designer shall coordinate with the Mechanical Engineer to ensure that the HVAC requirements for the A/V Equipment Rooms are met and also that HVAC ductwork and motors do not conflict with cable tray or conduit routing.
- D. A/V Equipment Rooms shall be environmentally provisioned as follows:
  - 1. A fundamental design assumption is that all A/V Equipment Rooms will contain active electronic equipment (Owner-provided), even if the current design does not call for such devices. A/V equipment requires an air conditioning system capable of operating on a 24/7/365 basis. If the building system cannot assure continuous cooling operation, a stand-alone unit shall be provided for the A/V Equipment Room.

In addition, a positive pressure differential with respect to surrounding areas is required to help keep dust and other particles out of the room.

- Where practical, the use of outside air for cooling is encouraged. Dehumidification and filtration may be required for systems using outdoor air.
  - Where practical, UVU encourages the use of heat reclamation features.
  - Environmental management and monitoring systems shall be designed for A/V Equipment Rooms.
  - Typically, the building's central air conditioning system should cool the A/V Equipment Rooms during summer months. During the months when the central air conditioning system is not running, a stand-alone air conditioning system shall be used to cool the A/V Equipment Rooms.
    - This unit and any roof penetrations shall be located away from (not directly above) electronics of any kind, to avoid damage from condensate drip and roof leaks.
  - Split systems are preferred, with the equipment located outside the A/V Equipment Rooms wherever possible. The temperature controls shall be located inside the A/V Equipment Rooms.
  - It is never acceptable to rely solely upon exhaust fans to cool an A/V Equipment Room.
  - UVU currently has no preference for any particular manufacturer of air conditioning equipment, so long as it is quality equipment that is suitable for the application.
- 2. The Designer shall request power consumption data for the audio/visual equipment in the project, and shall work with the mechanical systems designer to ensure that the designed cooling capacity is sufficient to handle the A/V heat load.

3. Minimum clearance height in A/V Equipment Rooms shall be eight feet without obstructions (light fixtures, ducting, etc.).
4. The Designer shall carefully coordinate the location of fire suppression sprinklers and piping in A/V Equipment Room spaces.
  - If fire suppression sprinklers are required in A/V Equipment Rooms, they shall be dual-action dry-pipe sprinkler systems.
  - Sprinkler guards must be provided where sprinklers are installed less than 8 feet above the floor.
  - Sprinkler heads and piping shall be mounted and routed above walking space – not above equipment racks or the equipment they will contain.

#### 5.4.4.4 PROHIBITED SYSTEMS

Similar to the requirements for telecommunications rooms, the following shall not be located in or adjacent to A/V Equipment Rooms:

- Areas subject to water or steam infiltration, particularly basements. Floor drains (with trap primers) are required if there is any risk of water entry.
- Areas exposed to excessive heat or direct sunlight.
- Areas exposed to corrosive atmospheric or environmental conditions.
- Potential sources of electromagnetic interference (EMI) or radio frequency interference (RFI) such as large electric motors, power transformers, arc-welding equipment, or high-power radio transmitting antennas.

A/V Equipment Rooms shall not be located in a shared space with electrical equipment other than the electrical panels serving the A/V equipment.

Water piping shall not be routed across the ceiling or through the walls of A/V Equipment Rooms.

## 5.5 Multipurpose Rooms

Multipurpose Rooms are mini-event spaces used to stage a variety of events, including:

- Conferences
- Lectures
- Meetings
- Seminars
- Luncheons
- Panel discussions

Multipurpose Rooms feature dividable spaces without fixed seating, for flexible sizing and arrangement of the space. A movable podium is typically located at the front of the room.

A credenza shall be provided on one wall to host the A/V equipment required to support all of the subdividable spaces within the Multipurpose Room.

Ceiling-mounted standard-throw projectors are provided on mounts that can pivot to point at different walls.



Auxiliary inputs and outputs shall be provided on walls and at the credenza to support event-specific A/V requirements.

Multiple floor boxes are required, typically one per subdividable space. All A/V cabling in floor boxes shall route to patch panels in a credenza cabinet.

Sensors shall be provided to detect the status of the divider walls. Speakers shall be zoned so that the A/V switcher can sub feed each room separately if divided, or all rooms if combined.

## 5.6 Conference Spaces

### 5.6.1 GROUP STUDY ROOMS

Group Study Rooms are small conference rooms with space for approximately 4 to 8 people, and have a wall-mounted video panel with integrated speakers for presentation purposes only. Video conferencing features are not provided in Group Study Rooms.

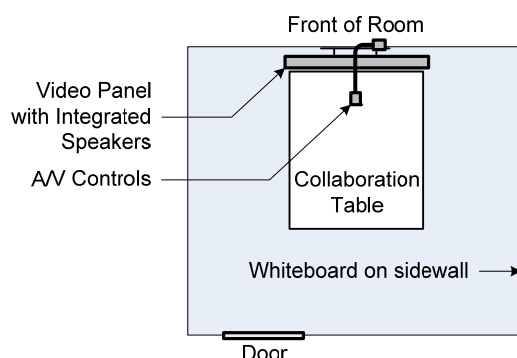
Provide a conduit and box to support an A/V control pad, and a second box and faceplate to host an auxiliary input plate. The Designer shall select a location that coordinates with furniture locations in this space. These features will enable users to connect their own mobile devices without requiring access to the HDMI ports on the rear of the video panel, and also to control the video panel without using the buttons on the panel.

UVU currently uses the Crestron MPC Series Button Panels for this purpose. The control pad shall provide the following functions:

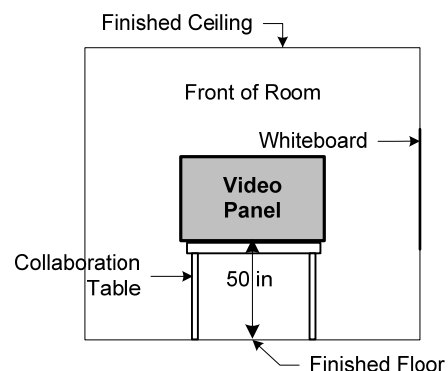
- Video Panel On/Off
- Volume Up/Down
- Input Select

#### 5.6.1.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and wall elevations of Group Study Rooms:



**Group Study Room**  
**AV Equipment Locations**  
**Plan View**



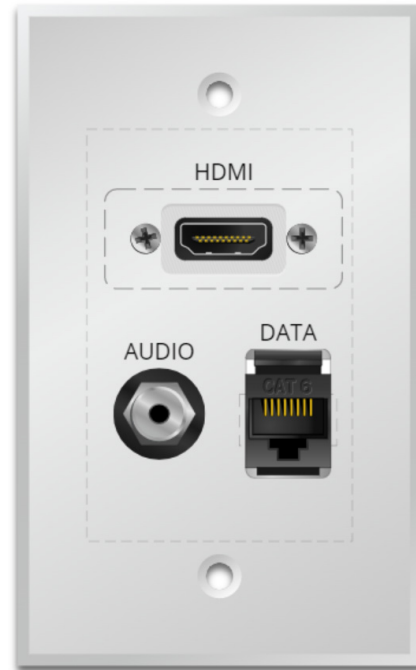
**Group Study Room**  
**AV Equipment Locations**  
**Wall Elevation**

### 5.6.1.2 A/V INTERFACE

A connection point for A/V cabling shall be provided on the wall adjacent to the video panel or in the tabletop near the video panel.

The diagram at right is an example of the connections that should be included in this connection point:

- HDMI input jack
- 3.5mm stereo audio jack
- A network jack



### 5.6.2 CONFERENCE ROOMS

Conference Rooms have both presentation and video conferencing features. A/V cabinets are located inside credenzas.

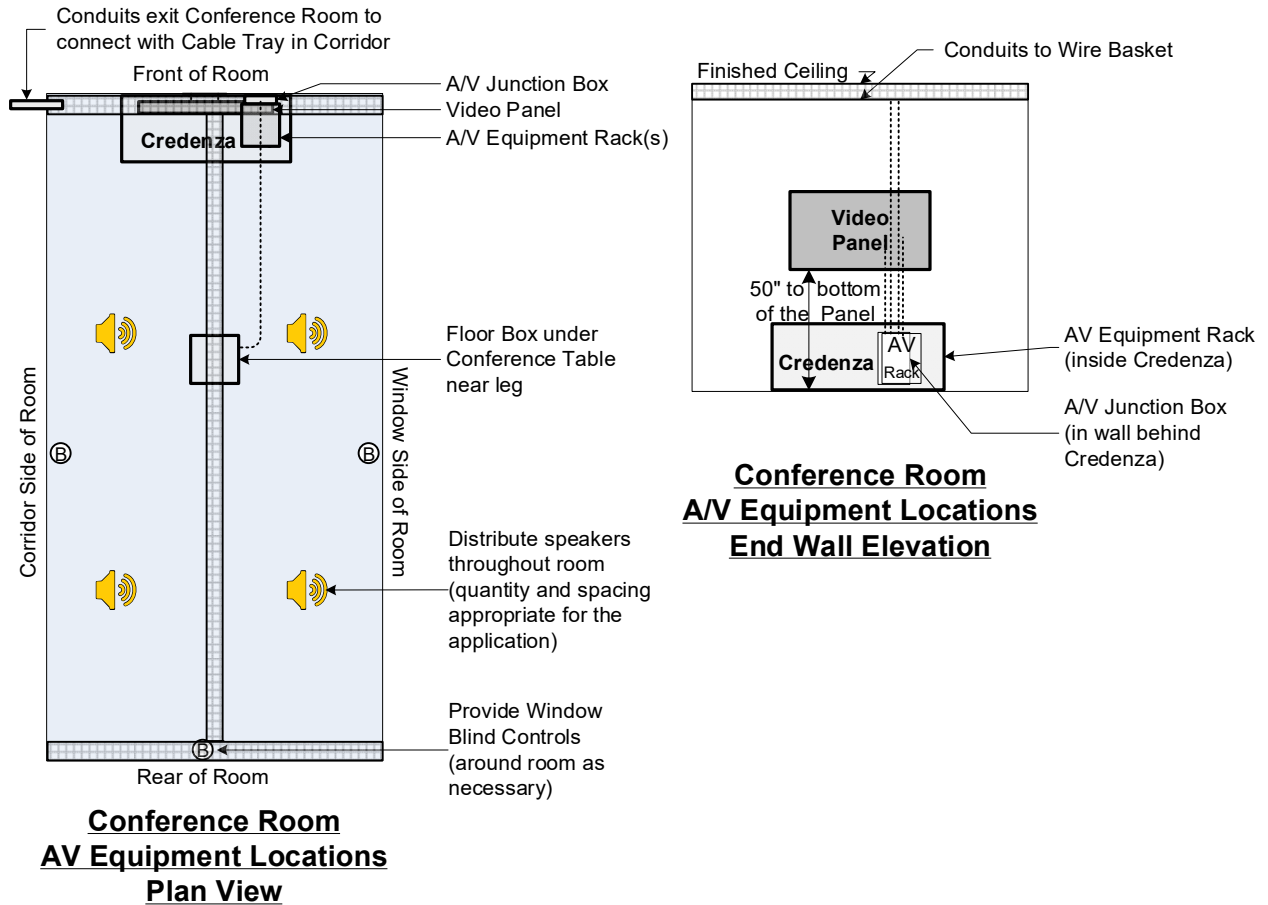
Conference Rooms shall use the same audio/visual systems as a Classroom, except that there will not be a Teacher Station. This is the UVU standard conference facility, especially for non-instructional use. It can also serve as a small classroom for some very specialized purposes, such as graduate seminars.

Conference Rooms shall use video panels (typically not video projection).

All Conference Rooms shall be designed to include conduits and boxes sufficient to support a future upgrade into a video conference room.

#### 5.6.2.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of Conference Rooms.



### 5.6.2.1.1 ARCHITECTURAL REQUIREMENTS

#### 5.6.2.1.1.1 Acoustics

A noise coefficient of NC 35 is the highest allowable. Figures between NC 25 and 30 are desirable with a reverberation time of less than 0.6 sec.

Acoustic treatment should be employed on walls, floors, and ceilings to reduce reverberant conditions. This treatment should have an NRC of 80-85, which is typical of fabric over 1" fiberglass. Extraneous sounds shall be prevented from entering the classroom. In some cases this might require dense materials in ceilings and walls. Carpeting is highly desirable to improve acoustics and help improve visual imagery.

#### 5.6.2.1.1.2 Windows

If there are windows in the room, they shall have automatic blackout shades to control light spill, as well as curtains to help with sound control.

#### 5.6.2.1.1.3 Walls

Walls shall be at least 6" deep. They shall employ sound-dampening material and construction methods to suppress sound transfer between application spaces.

Whiteboards are required.

#### 5.6.2.1.1.4 Colors

Neutral colors without patterns are better for wall areas that will be visible in the background of video conferencing images. The Architect shall carefully select wall treatments that will be compatible with video conferencing.

#### 5.6.2.1.1.5 Furniture

Each Conference Room requires a credenza (located along the presentation wall, biased to one side) to host the A/V Equipment Rack. The credenza is defined in Section 3.2.3 above.

A conference table with tabletop boxes shall be provided to fit the room.

In each cable box, provide the following:

- Two electrical power receptacles
- Two data jacks

In one recessed A/V tabletop box at the presentation end of the room, provide the following cables:

- One HDMI jack
- 3.5mm stereo audio jack

### 5.6.2.1.2 ELECTRICAL REQUIREMENTS

#### 5.6.2.1.2.1 Power Requirements

Wherever possible, the electrical power circuits supplying the Projector, Video Panels, A/V Floor Box, and Equipment Rack (inside Casework) must be from the same breaker panel, and use the same phase in the panel.

Conduits for electrical power shall be  $\frac{3}{4}$ " trade size minimum.

Throughout the room, the A/V equipment that will require power includes:

- Conference Table (tabletop boxes) – quad outlet, mounted inside the table leg (preferred), or in a floor box.
- Video Panel(s) – wall-mounted power outlets typically concealed behind each video panel.
- Video Projector – wall-mounted power outlet typically located above the ceiling to support a short-throw projector.
- Projection Screen – If a projectable surface is not used, a motorized projection screen will be needed, requiring a hard-wired power circuit.

#### 5.6.2.1.2.2 Lighting Requirements

Pendant light fixtures shall be coordinated so that they do not obstruct the projector light path to the display wall. The projector shall typically be hung between 6 and 12 inches below the finished ceiling and approximately twice the screen width back from the front of the room, minus 2 feet.

Front-of-room lighting must be controllable separately from the rest of the room, to eliminate spill on the screen causing a reduction of image contrast.

Fixtures located overhead shall produce 75-80 foot-candles. This light may be fluorescent. Specialized video conferencing lighting shall be considered.

#### **5.6.2.1.3 HVAC**

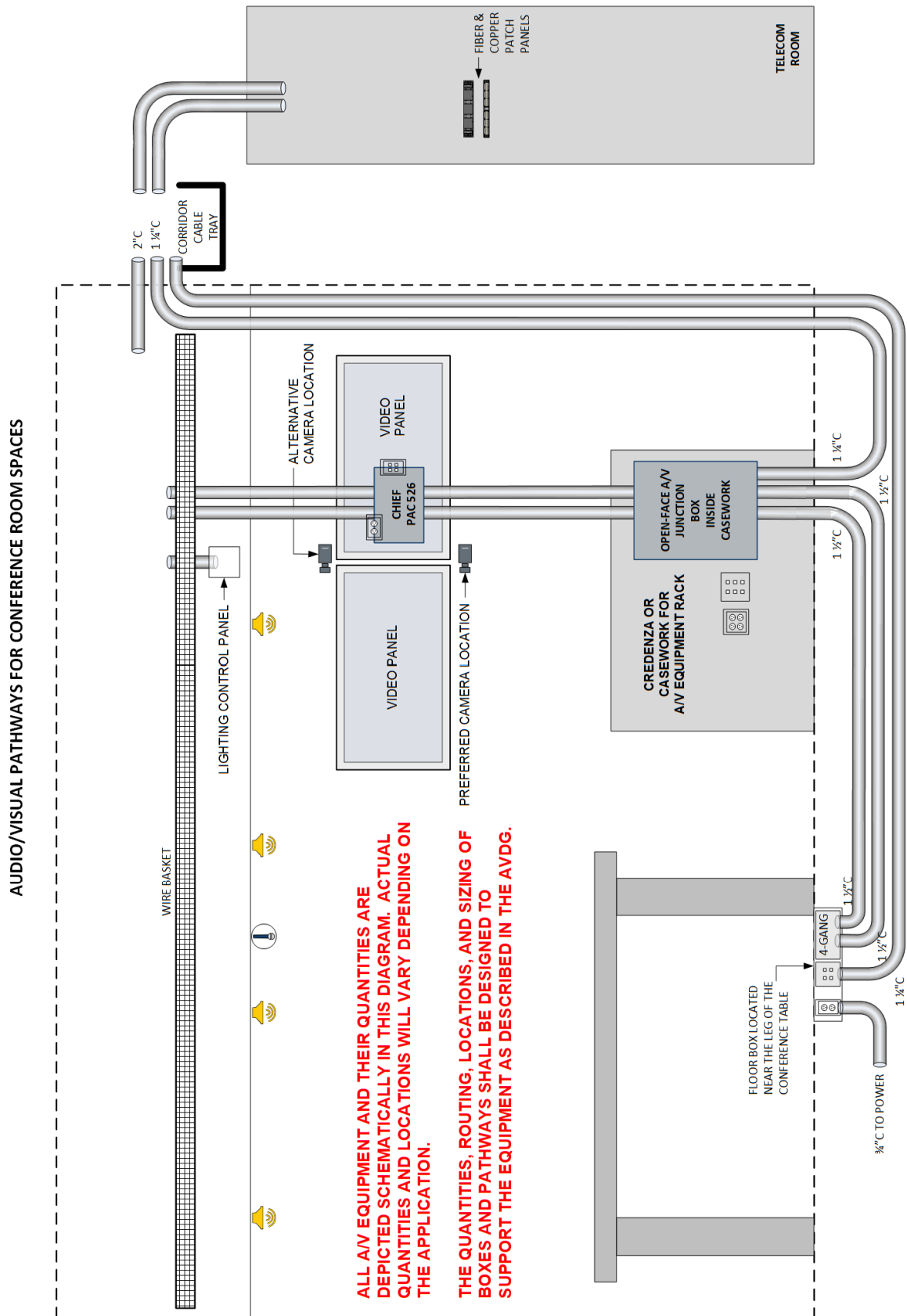
In order to meet the above Noise Coefficient, the HVAC, must be low-velocity with sound absorption material in the ducts.

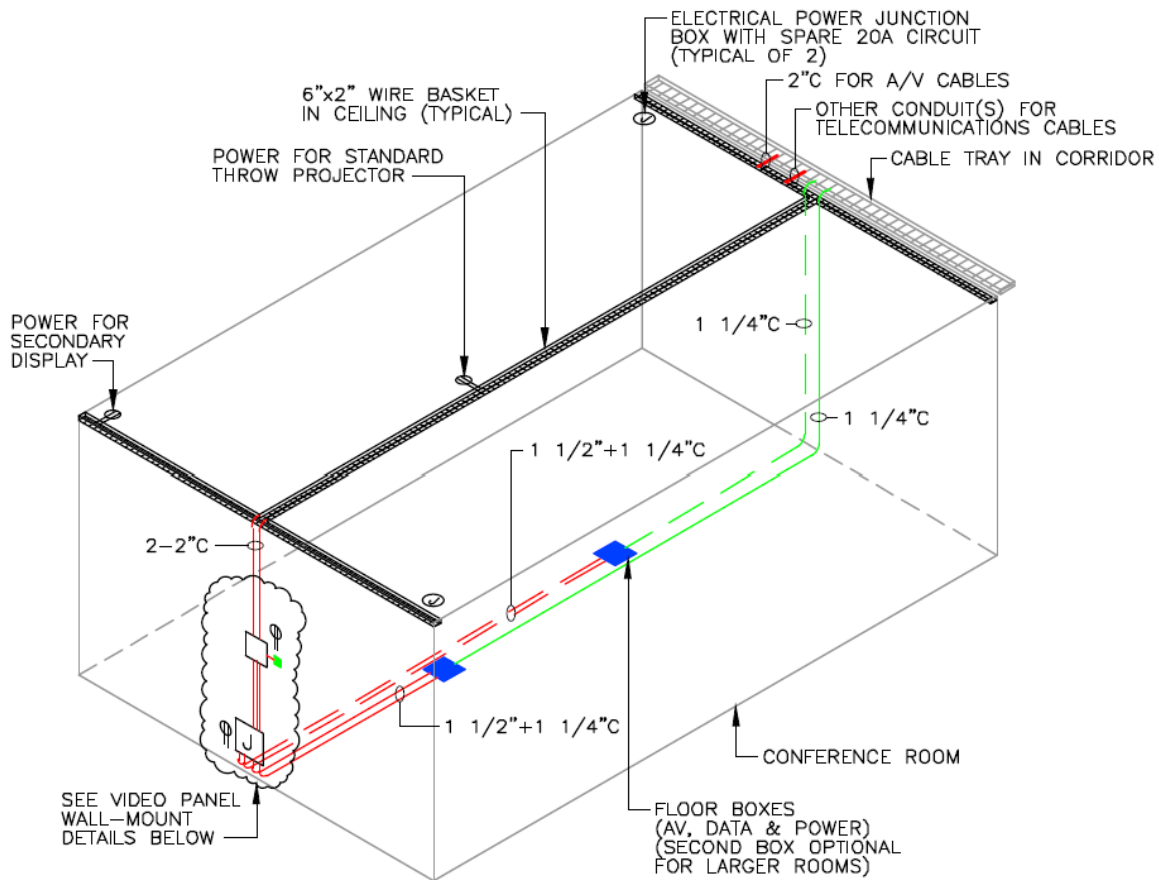
In Conference Rooms, HVAC designers shall anticipate a heat gain from A/V equipment of approximately 700 watts.

#### **5.6.2.1.4 LOW-VOLTAGE PATHWAYS AND BOXES**

The wall elevation and plan diagrams above depict the arrangement of audio/visual features in conference room spaces. The schematic below also depicts conduits and boxes required for all conference rooms, regardless of whether the room will initially include video conferencing features. Conduits and boxes shall be designed to support video conferencing for future use, if not from original occupancy.

- A. All Conference Rooms shall have pathways for video conferencing, even if video conferencing features are not initially installed.
- B. Typically, it is desirable to locate a wireless access point in or near each Conference Room.
- C. Do not place doors on the video panel display/presentation wall.
- D. Conference Rooms vary in size depending on the intended usage. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Conference Rooms. Examples of “large” (seats for more than 10 persons) and “small” (seats for 10 persons and less) Conference Rooms are depicted below:



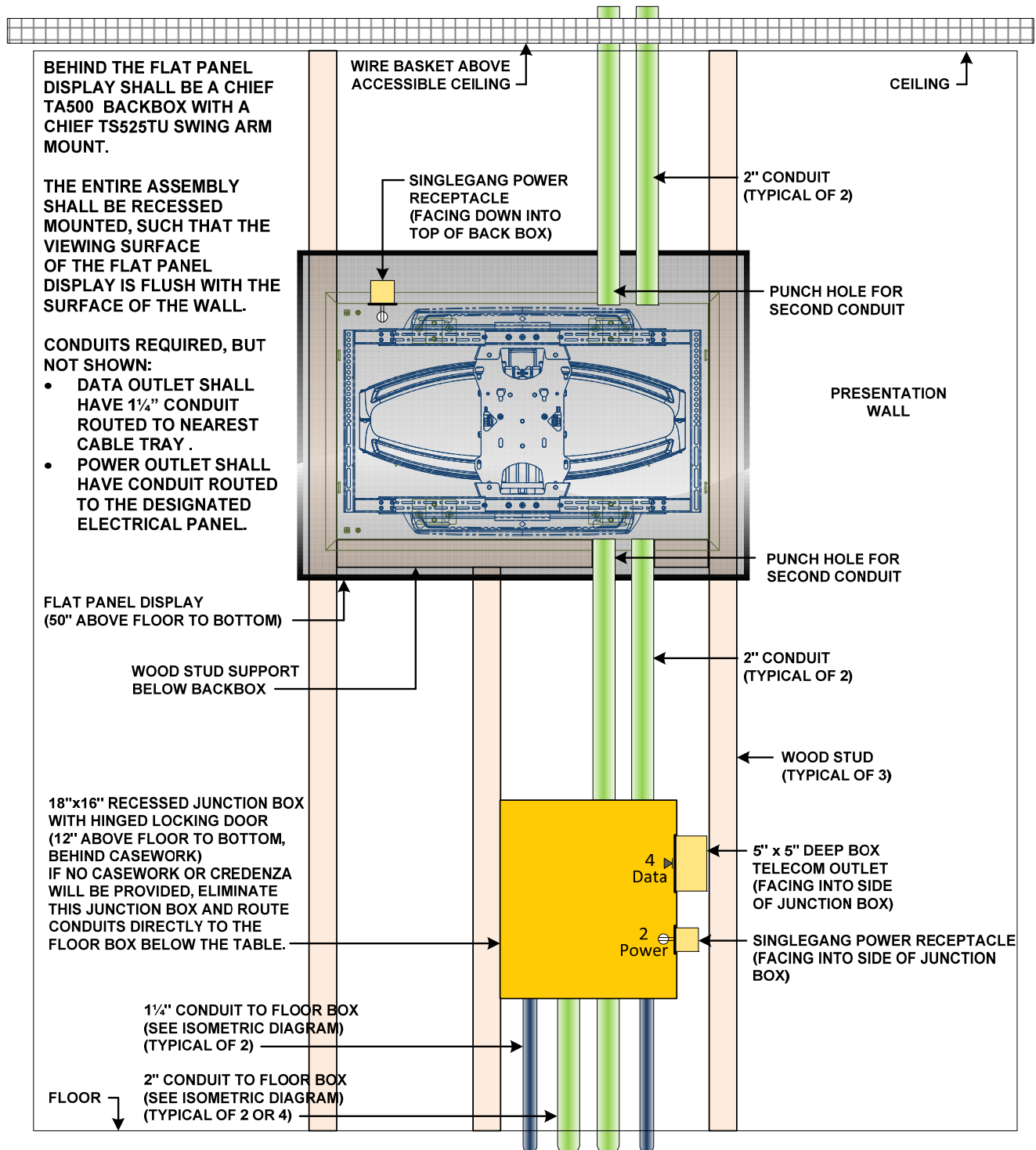


#### 5.6.2.1.4.1 Presentation Wall Box and Conduit Details

There are four options (two depicted below and two more in the Appendix) for video panel display mounting, with its associated pathways and boxes.

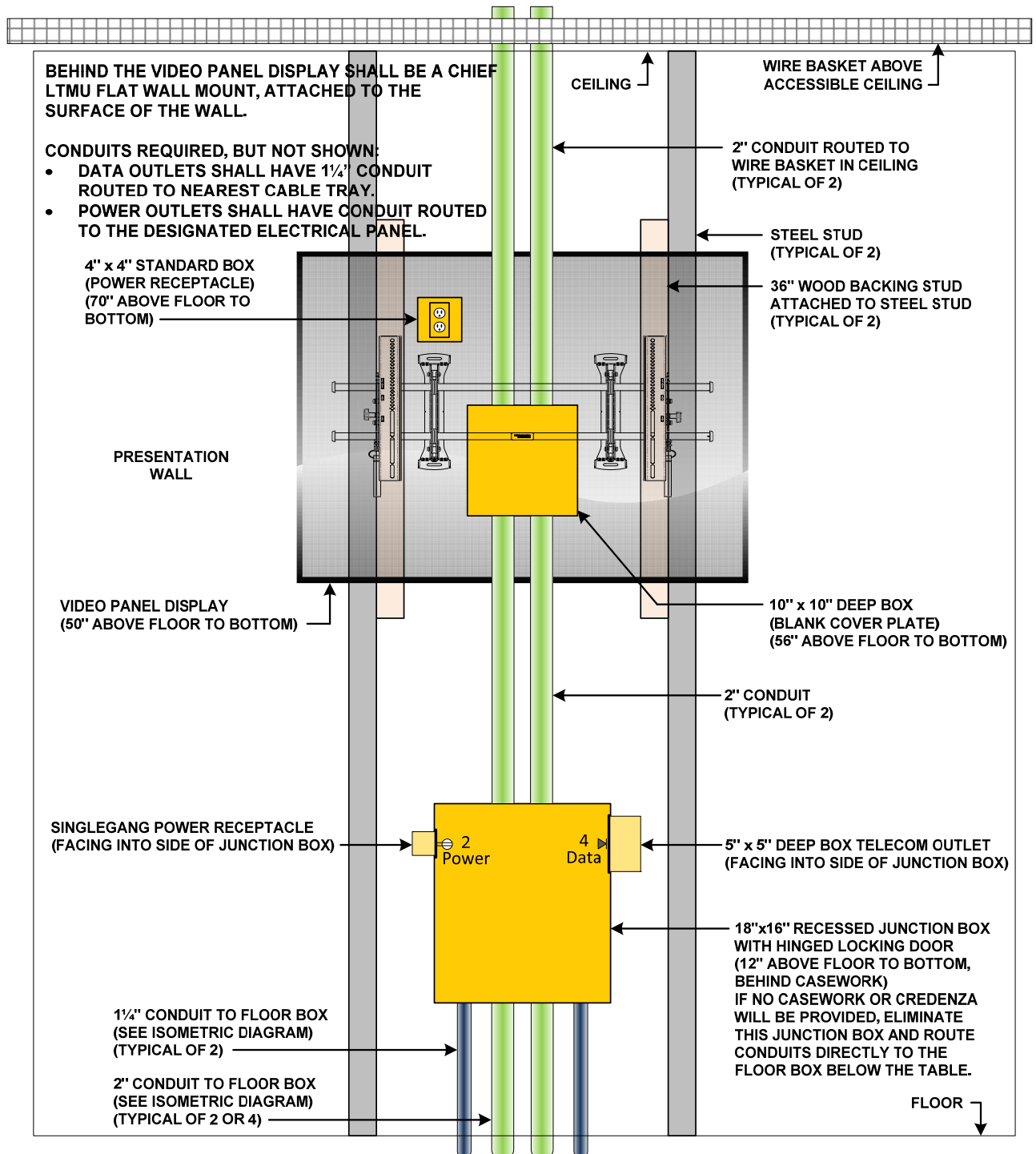
- The solution for a given project may include features from more than one of the options.
- The Designer shall work with the A/V designer and refer to the AVDG to provide the UVU-desired solution for each Conference Room application.

## Swing Arm-mount Option – Conference Room Flat Panel Display Mounting (This is the standard solution.)





**Flat Wall-mount Option – Conference Room Video Panel Display Mounting**  
(This solution requires AVPM approval for rooms that might have double panels.)



- E. Conference tables shall have floor boxes installed beneath them and a tabletop box, with patch cords routed up from the floor box to a tabletop connection point providing access to power outlets, data outlets, and audio/visual inputs.
- The Designer shall work with the A/V designer and refer to the AVDG to provide the correct quantities, types, and colors of cables for each application.
  - See the AVDG for guidelines about the sizing and quantity of floor boxes and tabletop boxes required for each conference table application.
  - Conference rooms (those with tables seating 10 or less) may only need one floor box.

#### 5.6.2.1.4.2 Wire Basket Cable Trays

Optional: provide wire basket cable trays in accessible ceiling to accomplish the functions depicted in the diagram above. Cable tray practices shall comply with UVU telecommunications guidelines (see TDDG).

#### 5.6.2.1.4.3 Conduits, Device Boxes, and Faceplates

Provide conduits (minimum 1" trade size) from the A/V Junction Box to in-wall, 2 1/8" deep device boxes, with a single-gang mud ring serving each wall-mounted audio/visual device. Provide faceplates with circular holes in the plates that are large enough for connectorized cables to pass through. Provide blank faceplates for future devices. Conduits, device boxes, and faceplates shall comply with UVU telecommunications guidelines. Faceplates shall match (color, material, style) the other faceplates used in the project.

- Be aware that some PTZ cameras mount directly to a 2-gang mud ring.

#### 5.6.2.1.4.4 A/V Junction Box

Provide an A/V Junction Box recessed in the wall above the ceiling as shown in the diagram above.

Provide three 1 1/2" conduits to the equipment rack credenza.

Provide separate conduits routed to the main distribution cable tray for telecommunications cabling. Do not route this cabling exposed through the A/V wire basket, as this may require the data cabling to be plenum-rated.

#### 5.6.2.1.4.5 A/V Floor Box

Some applications may require an A/V Floor Box beneath conference tables or other furniture. UVU requires that all floor boxes be used for cable pass-through only.

### 5.6.2.1.5 TELECOMMUNICATIONS CABLING REQUIREMENTS

- A. The Designer shall work with the telecommunications designer and the AVPM to verify that the appropriate numbers of cables and colored jacks are included in the telecommunications drawings to support A/V applications, in addition to other needs. See the TDDG for further information.

B. Provide the following telecommunications cabling:

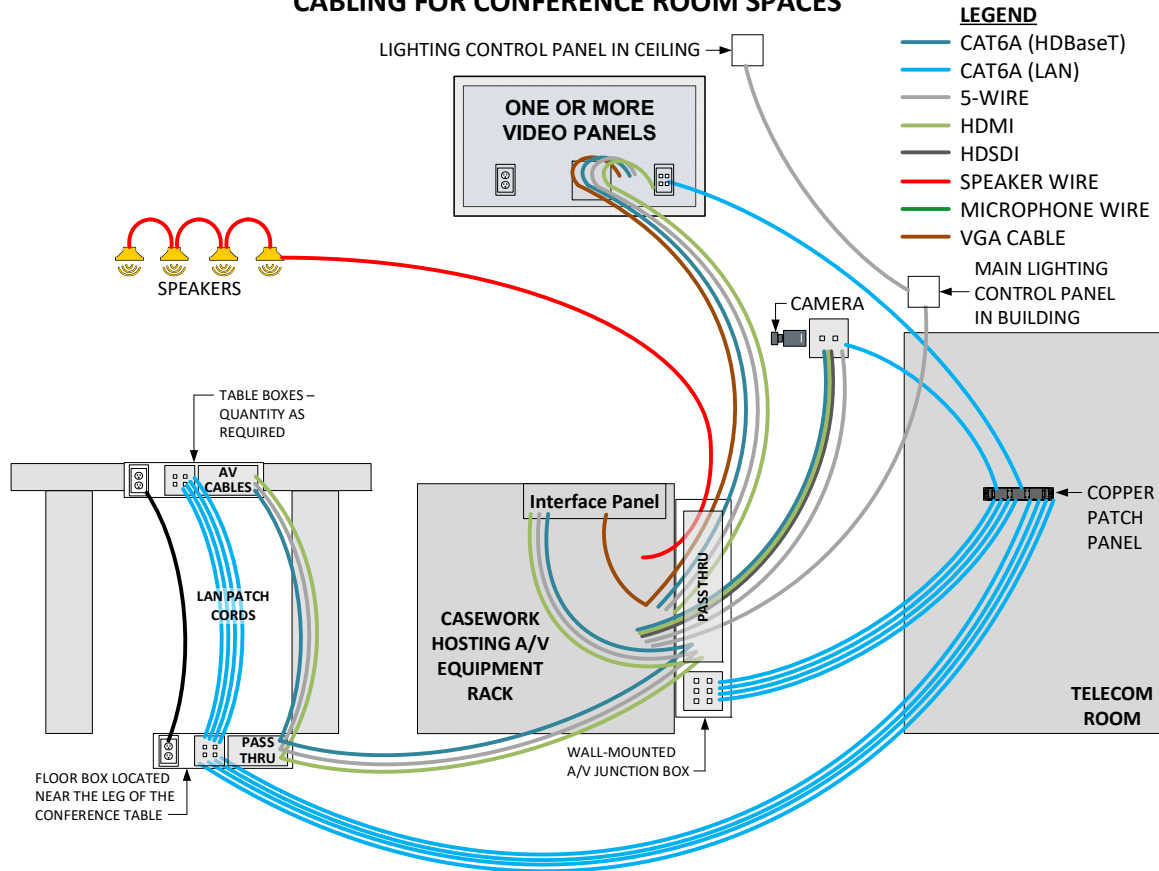
Application	Endpoint/Termination	Cable	Endpoint	Termination
Crestron control system	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Owner-provided computer located in the A/V Rack	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Video Switcher located in the A/V Rack	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Teleconferencing DSP	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Each Video Panel (LAN)	Telecom Room	Category 6A	Outlet behind video panel	RJ45 Jack
Each Camera (LAN)	Telecom Room	Category 6A	Outlet behind camera	RJ45 Jack
Each Camera (HDBaseT)	Pass-through J-Box behind Casework	Category 6A	Pass-through outlet behind camera	Connectors on both ends (no jacks)
HDBaseT to each video panel	Pass-through J-Box behind Casework	Category 6A	Pass-through outlet behind video panel	Connectors on both ends (no jacks)

The cable quantities will vary depending on the number of A/V Equipment Rack and located throughout the room.

Multiple outlets may be required inside the room.

The following diagram depicts the telecommunications room audio/visual application:

## CABLING FOR CONFERENCE ROOM SPACES



ALL A/V EQUIPMENT AND THEIR QUANTITIES ARE DEPICTED SCHEMATICALLY IN THIS DIAGRAM. ACTUAL QUANTITIES AND LOCATIONS WILL VARY DEPENDING ON THE APPLICATION.

THE QUANTITIES, ROUTING, AND TERMINATION OF CABLING SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

OTHER A/V WIRING AND CABLING MAY ALSO REQUIRED FOR SPECIAL APPLICATIONS NOT DEPICTED HERE.

### 5.6.2.1.6 A/V EQUIPMENT AND FURNISHINGS

#### 5.6.2.1.6.1 Equipment Racks

Inside the casework, a rack will host the codec, room audio system, and possibly a Blu-ray player.

#### 5.6.2.1.6.2 Video Panels

Video panels shall be wall-mounted using a secure, articulating wall mount. Security devices shall be installed to protect against theft. The main panel shall be sized appropriately for the room.

Video panels shall be mounted with the bottom edge at approximately 50 inches above finished floor or higher as needed, in order to see the bottom of the image from any seat in the room.

#### 5.6.2.1.6.3 Projection Screen and Projector

Conference Rooms typically use video panels. However, if an application requires video projection, the following requirements apply:

- The projection screen shall be appropriately sized for the room.
- The bottom of the fully extended screen shall not be less than 36 inches above the finished floor.
- Use a standard-throw or ultra short-throw projector. The Designer shall discuss this option with the AVPM.

#### 5.6.2.1.6.4 Speakers

Ceiling-mounted speakers of the same style as the classroom speakers shall be used.

#### 5.6.2.1.6.5 Wireless Support for BYOD Personal Devices

The Designer shall inquire with the AVPM whether wireless support for BYOD personal devices is required in a conference room. This equipment shall be mounted in the equipment rack.

#### 5.6.2.1.6.6 Microphones

Desktop microphones are preferred for Conference Rooms. Ceiling-mounted digital microphones might be used in some applications, and if so, they shall be hung centered above the conference table. Provide the appropriate quantity of microphones for the room size, spaced appropriately in the room.

#### 5.6.2.1.6.7 Audio Recording

UVU requires a rack-mounted digital hardware solution for recording audio in Conference Rooms.

It is required to use room microphones for recording audio.

#### 5.6.2.1.6.8 Video Conferencing

Where conference rooms require video conferencing, Microsoft Teams will be provided by UVU. A UVU computer will be mounted into the A/V equipment rack.

##### 5.6.2.1.6.8.1 Cameras

The Designer shall include a USB camera in the design.

A shelf-mounted or wall-mounted camera is required at the presentation wall end of the table. If video panels are used, the camera shall be mounted immediately between the video panels approximately 60 inches above finished floor. If a projection screen is used, the camera shall be mounted adjacent to the projection screen approximately 60 inches above the finished floor.

### **5.6.3 BOARDROOMS**

Boardrooms are shaped similarly to oversized Conference Rooms. The audio/visual features of Conference Rooms apply to Boardrooms.

#### **5.6.3.1.1 ARCHITECTURAL REQUIREMENTS**

##### **5.6.3.1.1.1 Audio/Visual Equipment Room**

A small room adjacent to the Boardroom is required to house one or more equipment racks for the large volume of A/V equipment required to support a Boardroom. See Section 5.4.4 above for information about A/V Equipment Rooms.

##### **5.6.3.1.1.2 Windows**

If there are windows in the room, they shall have automatic, controlled blackout shades to control light. Blinds are also required on interior windows for privacy.

##### **5.6.3.1.1.3 Credenza**

A credenza is required (located along the presentation wall, biased to one side) to host the A/V Equipment Rack. The credenza is defined in Section 3.2.3 above.

##### **5.6.3.1.1.4 Conference Table**

A large custom conference table is required, as defined in Section 3.2.4 above.

Multiple flip-top cable boxes in the table top shall be provided to fit the room. Also, system control touch panels or button panels shall be installed in one or more of the flip-top cable boxes.

#### **5.6.3.1.2 ELECTRICAL REQUIREMENTS**

In addition to the power requirements for standard conference rooms, the following Boardroom-specific power requirements shall also be addressed.

##### **5.6.3.1.2.1 Power Requirements**

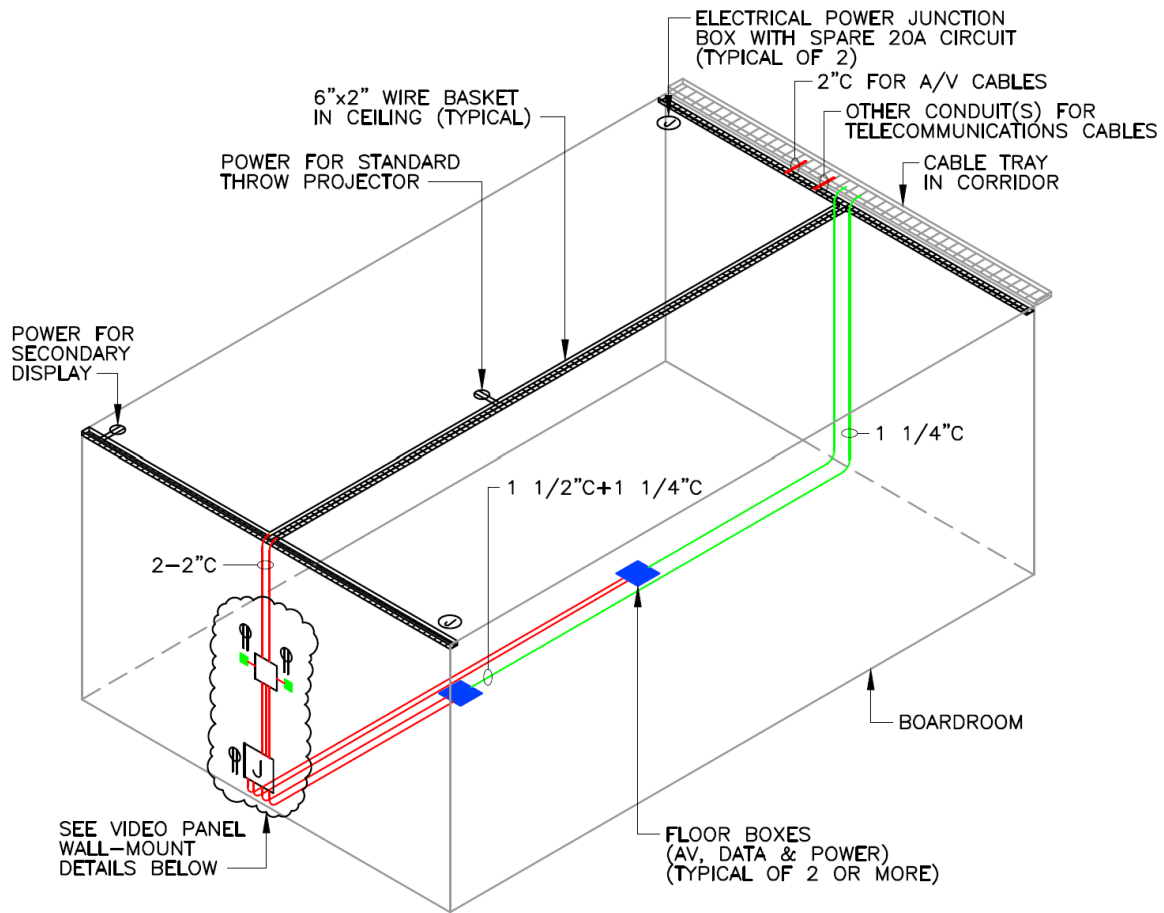
More power outlets are required in a Boardroom table than would typically be provided for a normal conference room table. In addition to power receptacles in the flip-top cable boxes, a duplex receptacle shall be provided for each pair of seats.

##### **5.6.3.1.2.2 Lighting Requirements**

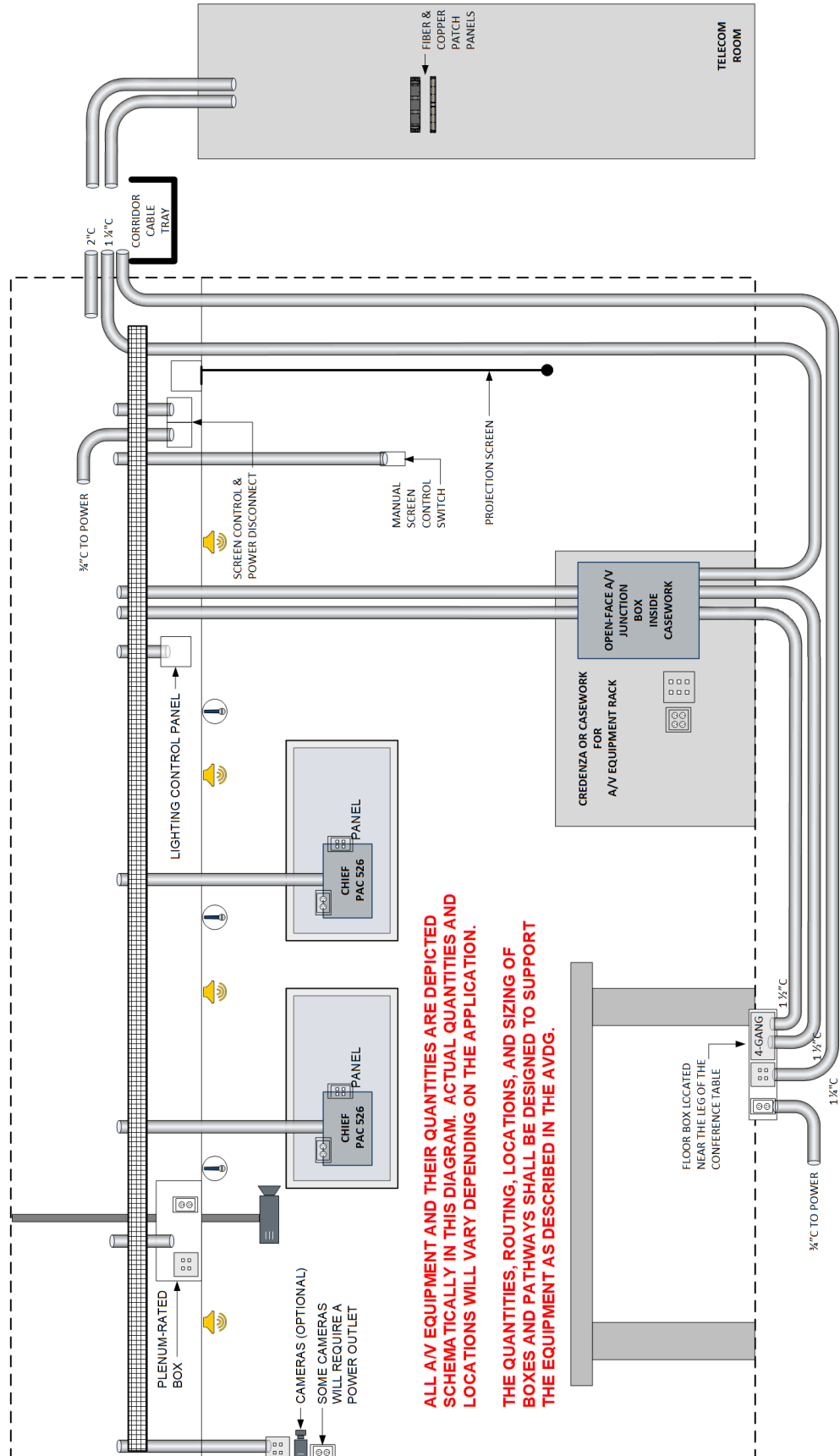
Boardrooms might require more flexible lighting, such as more zones and controllable, dimmable fixtures.

##### **5.6.3.1.3 LOW-VOLTAGE PATHWAYS AND BOXES**

The wall elevation and plan diagrams for conference rooms (above) also depict the arrangement of audio/visual features in Boardroom spaces. The diagrams below depict conduits and boxes required for all Boardrooms. Conduits and boxes shall be designed to support video conferencing for future use, if not from original occupancy.



AUDIO/VISUAL PATHWAYS FOR BOARDROOM SPACES





#### 5.6.3.1.3.1 Presentation Wall Box and Conduit Details

The Designer shall work with the A/V designer and refer to the AVDG to provide the UVU-desired solution for each Boardroom application.

#### 5.6.3.1.3.2 Wire Basket Cable Trays

Wire basket cable trays are required to accomplish the functions depicted in the diagram above. Cable tray practices shall comply with UVU telecommunications guidelines (see TDDG).

#### 5.6.3.1.4 A/V EQUIPMENT AND FURNISHINGS

A/V equipment and furnishings shall be similar to standard conference rooms, with the following differences:

##### 5.6.3.1.4.1 Projection Screen and Projector

Boardrooms may require the use of a projector and projection screen.

- The projection screen shall be appropriately sized for the room.
- The bottom of the fully extended screen shall not be less than 36 inches above the finished floor.
- Use a standard-throw or ultra short-throw projector. The Designer shall discuss this option with the AVPM.

##### 5.6.3.1.4.2 Video Panels

Video panels are also frequently used. One or more video panels shall be wall-mounted using a secure, articulating wall mount. Security devices shall be installed to protect against theft. Video panels shall be sized appropriately for the room.

Video panels shall be mounted with the bottom edge at approximately 50 inches above finished floor or higher as needed, in order to see the bottom of the image from any seat in the room.

##### 5.6.3.1.4.3 Audio Features

The following audio features and systems are always required in Boardrooms:

- Wireless support for BYOD personal devices
- Assistive Listening equipment
- Audio Recording, with ceiling-hung microphones and a digital signal processor
- Teleconferencing
- An amplifier for public address audio

##### 5.6.3.1.4.4 Video Conferencing

Video conferencing is used in Boardrooms. One or more higher-quality cameras (possibly with custom lensing) are required.

## 5.7 Theaters

Theaters are more complex than most other audio/visual applications and require experienced professional audio engineering, coordinated through the AVPM.

For projects that include theater spaces, the Designer shall work directly with the AVPM to design theater features.

### 5.7.1 ARCHITECTURAL FEATURES

Theaters require architectural attention to include a large number of key features:

- Orchestra pit with a trench system for microphone cables.
- Cable management around the inside curve of the orchestra pit.
- Cable management around the outside curve of the stage.
- Cable management resting on the floor along the back wall of the stage, typically wire basket cable tray that is 8" wide x 4" high and painted black.
- Overhead catwalks (above the audience and stage) are typically required to access electrically-operated battens for supporting lighting, props, speakers, and other theatrical devices.
- Fly systems (electric and passive) above the stage, and sometimes over the stage apron and audience.
- Rear crossover space for performers to travel between the sides of the stage while hidden from audience view.
- Green Rooms
- Ensemble Dressing Rooms
- Star Dressing Rooms
- Wardrobe and prop staging spaces
- Quick Change Rooms (located in both wings)
- Scene shop (wood shop, paint shop, etc.)
- Costume Sewing
- Set Storage
- Loading dock
- Lift Storage
- Stage Manager's Office
- Visiting Director's Office
- Trap Room under the stage, with a door to the orchestra pit.
- Overhead rigging, designed for a specific weight rating.
- Lighting Dimmer Room

- A/V Equipment Room to host amplifier racks, Dante network headend, some patching of wired microphones, and HDBaseT patch panels.
- Paint all stage, ceiling and performance spaces visible to the audience flat black. Gloss or satin paint is prohibited.

### 5.7.2 SOUND BOOTH

A Sound Booth is required to provide a front-of-house mixing position, along with an adjacent Lighting Booth.

A small A/V Equipment Rack is required in the booth to host an equipment patch panel.

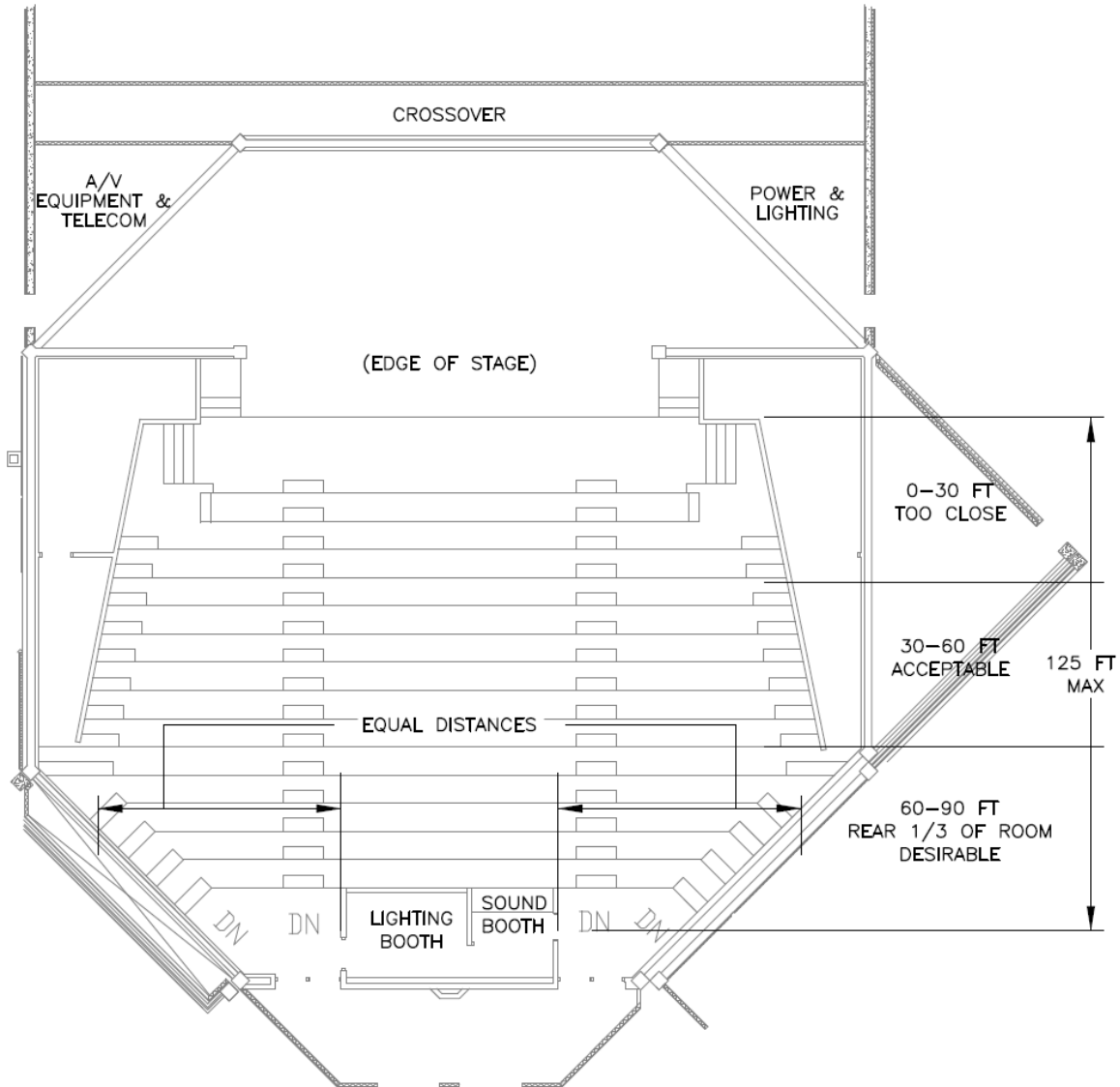
Sound booths shall be sized to host control board equipment and multiple people (audio engineer and a few students). While theaters are used for performances, they also serve pedagogical functions where students observe or perform theater operational functions.

A Sound Booth shall be provided that is open-air (not an enclosed space) and is located as follows:

- At eye level with the performers on the stage.
- Located no further than 125 feet from edge of the stage, approximately half to two-thirds the length of the room. The pair of booths (Sound and Lighting) shall be centered (left/right) in the space.
- Not beneath a balcony overhang. If the theater has a balcony, with the sound booth near the overhang, provide a rear wall and ceiling over the top of the sound and lighting booths to provide protection from dropped (or otherwise) objects and to reduce the visible distractions to audience members above.

For larger theaters, it will probably be necessary to place the Sound Booth within the audience.

- If a sunken sound booth is desired, the height of the parapet wall of the Sound Booth must be higher than the head/hat height of people seated in front of the Sound Booth.
- A rear wall shall be provided.



Sound Booths shall be painted flat black. All hardware in the booth shall also be flat black.

Some acoustic wall treatment may be necessary or desirable in the Sound Booth.

Undesirable sources of noise shall be located away from the Sound Booth. For example, the following shall not be located near, within, or below the Sound Booth:

- HVAC ducts
- Mechanical rooms
- Any noise-producing equipment

It is required that the Sound Booth and its specialized equipment be secured while the theater is not in operation. Given that the Sound Booth operates in the open air, Booth security requires careful architectural attention.

### 5.7.3 LIGHTING BOOTH

A Lighting Booth is required to provide a front-of-house lighting control position, adjacent to the Sound Booth described above.

The Lighting Booth can be enclosed with a single-pane sliding window; however, this is not required. If a window is provided, there shall not be a visible discontinuity in the field of view (such as a window mullion, window frame, or overlapping glass panels).

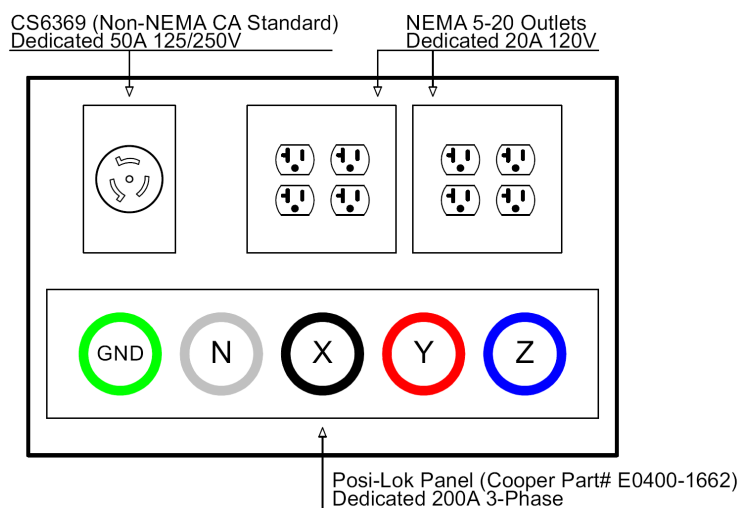
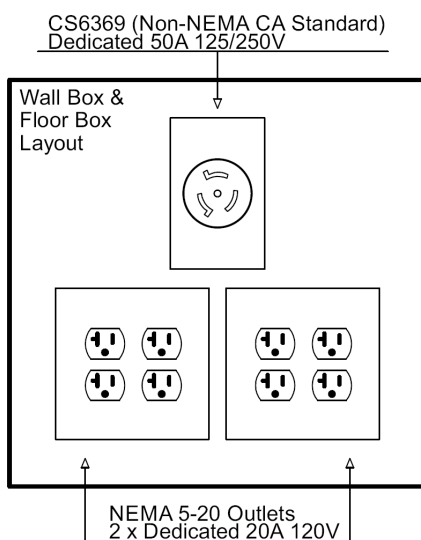
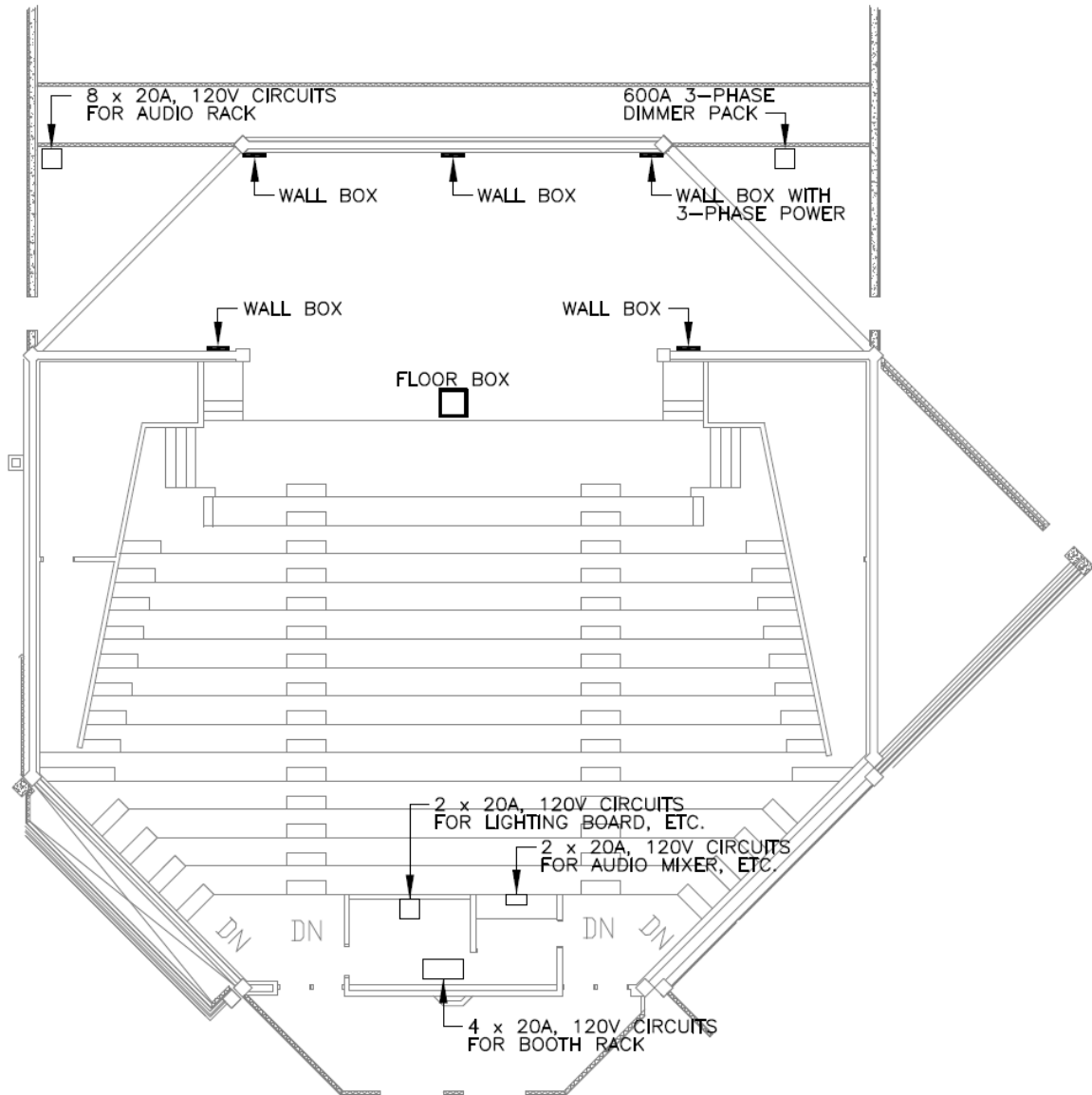
A Lighting Booth shall be sized to host control board equipment and multiple people (lighting director and a few students).

### 5.7.4 THEATER PATHWAYS

- Provide a minimum of one 4" conduit (PVC or EMT) terminated with open bell-end fittings:
  - between the Sound Booth and stage left
  - between the Sound Booth and stage right
  - between the Sound Booth and orchestra pit
- Provide a minimum of four 2" conduits (PVC or EMT) terminated with open bell-end fittings:
  - between the Sound Booth and A/V Equipment Room
- Audio monitor conduits (sized as appropriate, typically 1") route as follows:
  - between the A/V Equipment Room and Green Room
  - between the A/V Equipment Room and Lobby
- Wire basket cable tray, 6"x2", painted black, following the route of the catwalk:
  - 2" conduits between the cable tray and the A/V Equipment Room
  - 2" conduits between the cable tray and the Sound Booth

### 5.7.5 AUDIO/VISUAL POWER

The Designer shall work with the electrical engineer to provide wall boxes for audio/visual power in the locations shown in the diagram below:



Additional auxiliary power outlets shall be provided just outside the stage area for use with mobile production equipment. The outlets shall have cam-lock style fittings suitable for 3-phase 400A service.

In addition to the audio/visual power, the electrical engineer shall design convenience power outlets throughout the Theater as required for other purposes.

### 5.7.6 LIGHTING FIXTURES

The architect and electrical engineer shall design the theater lighting, including:

- House lights
  - Shall be on separate dimmable ETC controllable zones.
- Worklights
  - Can be whatever matches other building spaces.
- Egress Lighting (LED only)
  - step lights
  - aisle lights
  - walkway lights
- Exit signs
  - lower brightness, tritium gas
- Stage Lighting
  - ETC Source Four 750W Ellipsoidal Spotlight
  - ETC ColorSource Par D-series, with DMX connectivity
  - LED preferred
  - Follow-spots with moving/robotic heads

### 5.7.7 AUDIO SYSTEMS

Dante audio communications technology is desirable:

- Provide redundant switches (primary and backup) with 1GB switch ports for each Dante device.
- Provide 2 Cat6A cables for each Dante device (one cable for each switch).

Soundboards shall be Yamaha CL Series.

Yamaha Remote I/O (RIO) racks are required in the following locations:

- One rack in the top-center catwalk – 24U.
- One rack in the orchestra pit – 24U.
- Interface boxes on each of the four corners of the stage.

Provide a minimum of two Speakon NL4FX connectors at every location where there is a microphone input or a Dante Remote IO (RIO)

DMX or other 3-pin cable connections shall be provided around the stage at the RIO locations listed above.

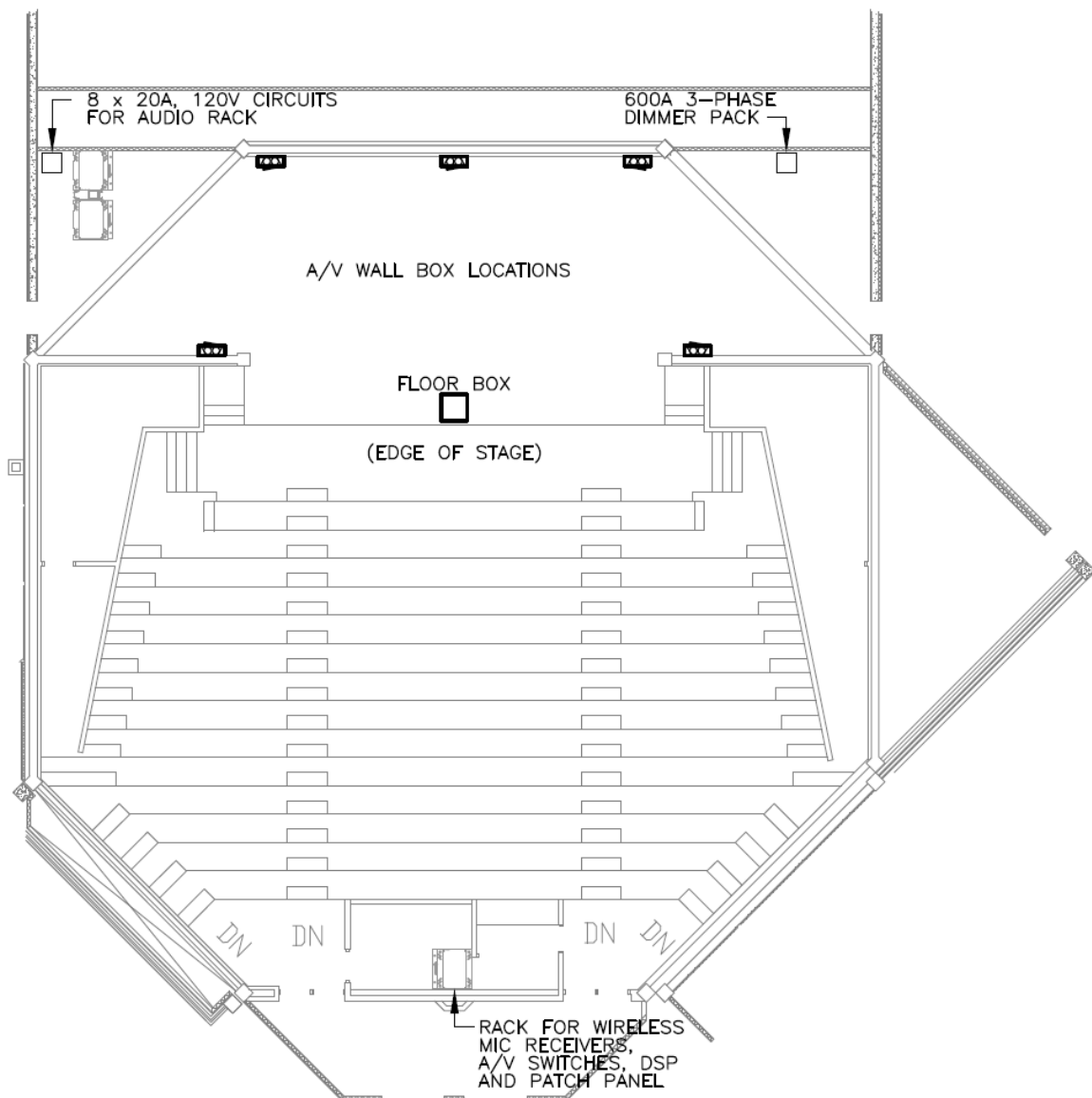
The orchestra pit shall have a floor trench with grommets in the trench cover to route microphone cables to each musician.

Provide an interface panel and provide pre-configured setups for common theater uses, so that non-technical people can deploy the audio/visual features in the room without requiring technical support.

Provide wireless microphone receivers and antennas in the sound booth.

A separate A/V Equipment Room, incorporating a small telecommunications room, is required. Specific requirements include:

- Physically accessible, close proximity to the stage, with a side door.
- Should be near the Green Room if possible.
- Sized similar to a 3-rack IDF (2 racks for A/V, 1 rack for telecom). See the TDDG for further information.
- Provide a 24-port patch panel in the sound booth that is cabled to the nearest telecommunications room (typically the A/V Equipment Room).

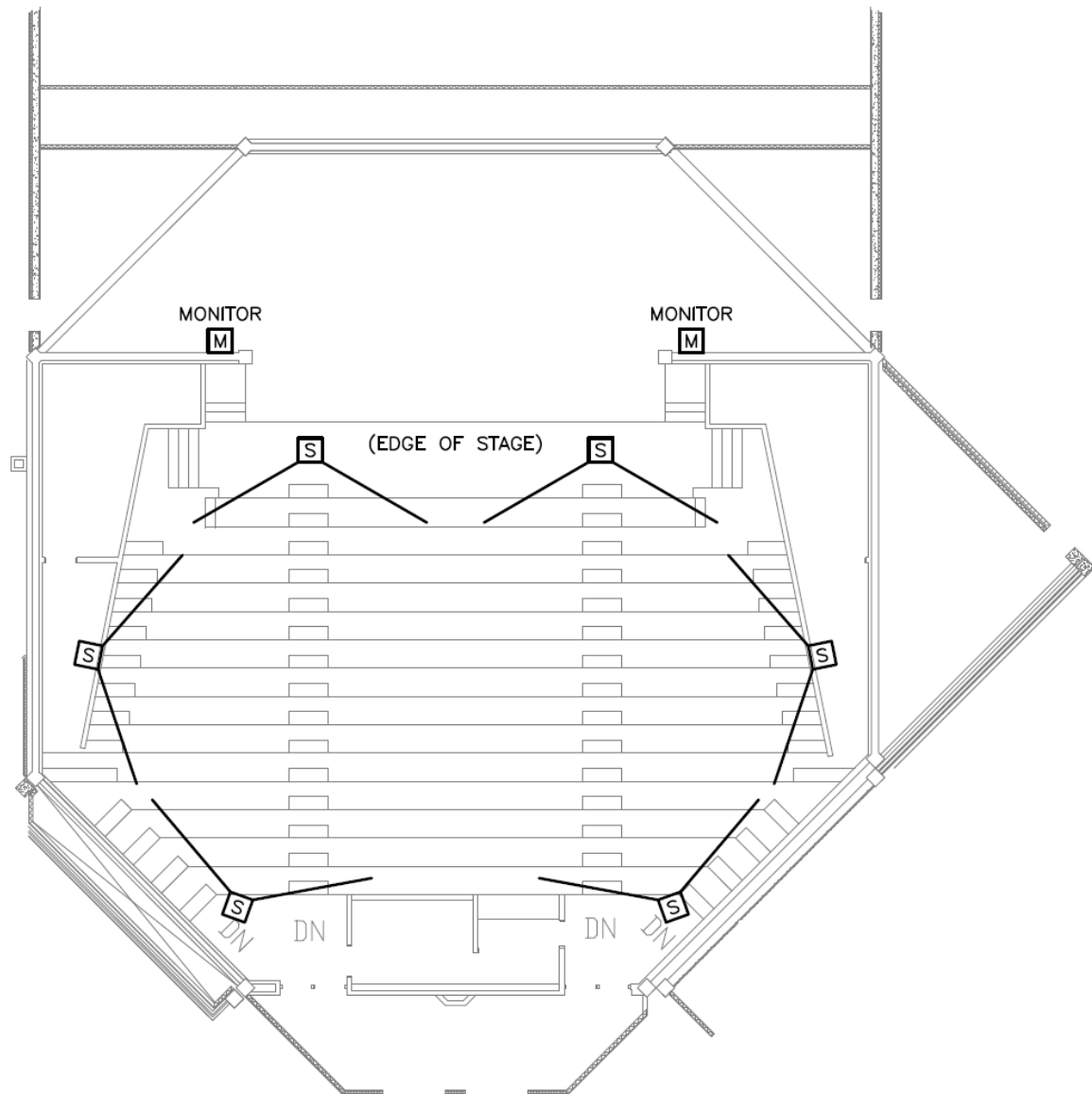




### 5.7.8 SPEAKERS

House speakers shall be provided approximately in the locations shown in the diagram below.

- Horizontal speaker throw shall be 100-120 degrees.
- Vertical speaker throw shall be 10-30 degrees.



For balcony seating, provide fill speakers as required.

Speakers shall be passive (not powered) speakers.

Each speaker shall be power-rated at least 2W per audience seat, typically between 600W and 3000W RMS.

Speakers shall typically be ceiling-hung using aircraft cables. A unistrut mounting structure shall be attached to the overhead structure or to the underside of the catwalk. This solution provides for convenient, finely tunable placement and orientation of each speaker.

Provide a ¾" conduit to each speaker location, with a 4"x4" square device box and a feedthrough faceplate.

Speaker Wiring:

- Speaker wiring shall be 12AWG or larger, and shall be routed to the amplifier rack.

Monitor Speakers shall be provided in the following locations:

- Lighting Booth
- Green Room
- Dressing Rooms
- Ticket Office
- Lobby (including each entrance).
  - In the Ticket Office, independent volume control and three-source switching shall be provided for the Lobby speakers:
    - Program Audio
    - Public Address Announcements
    - Music

### 5.7.9 INTERCOM

Each theater shall be equipped with a 4-channel intercom system.

- Wall-mount speaker stations with push-to-talk shall be provided in locations designated by the AVPM.
- Wired headset stations shall be provided in locations designated by the AVPM.
- Wireless headset intercom shall also be provided with coverage throughout the theater, house, and associated spaces.

UVU uses intercom equipment from the following manufacturers:

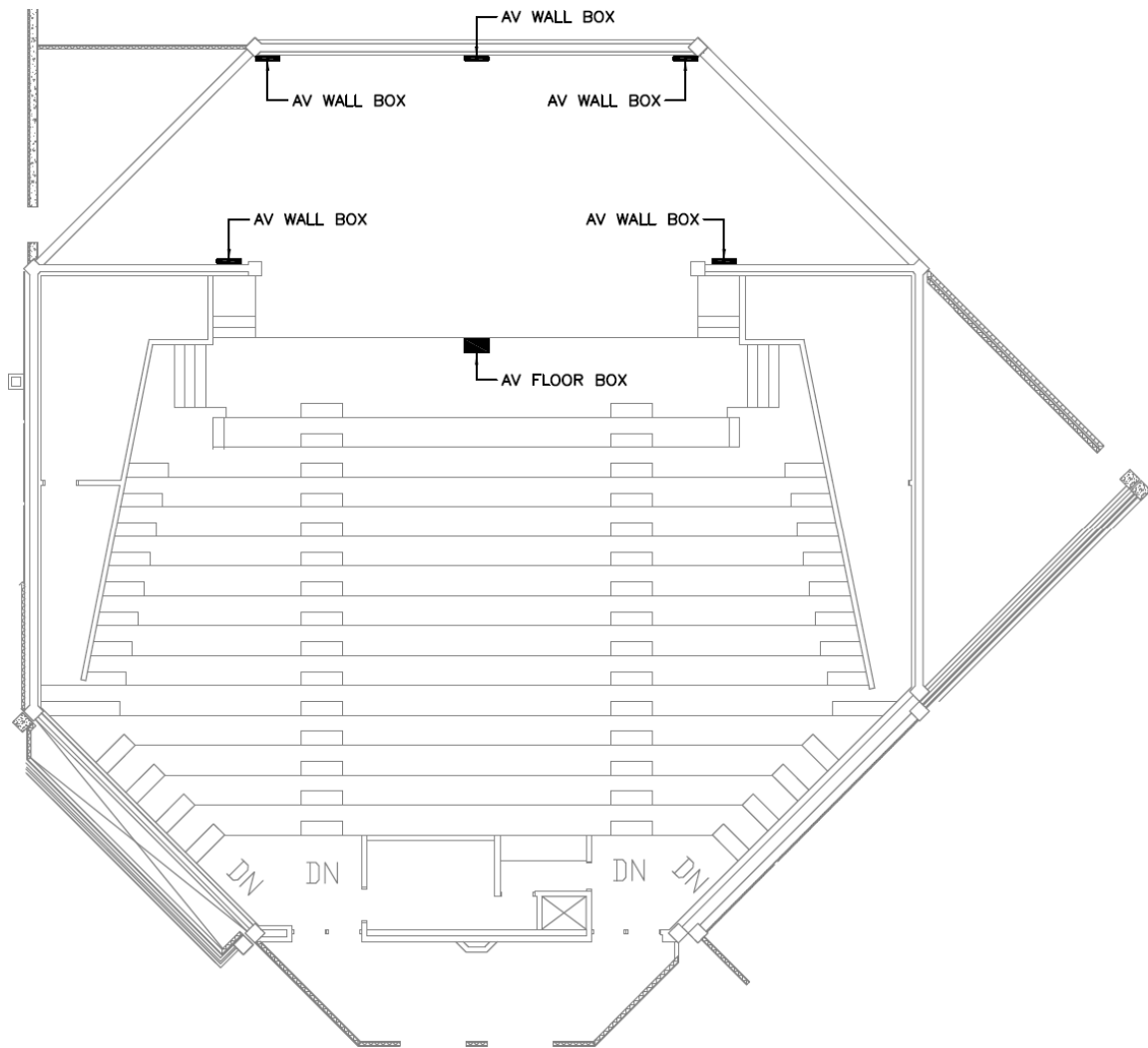
- Clear-Com
- Telex

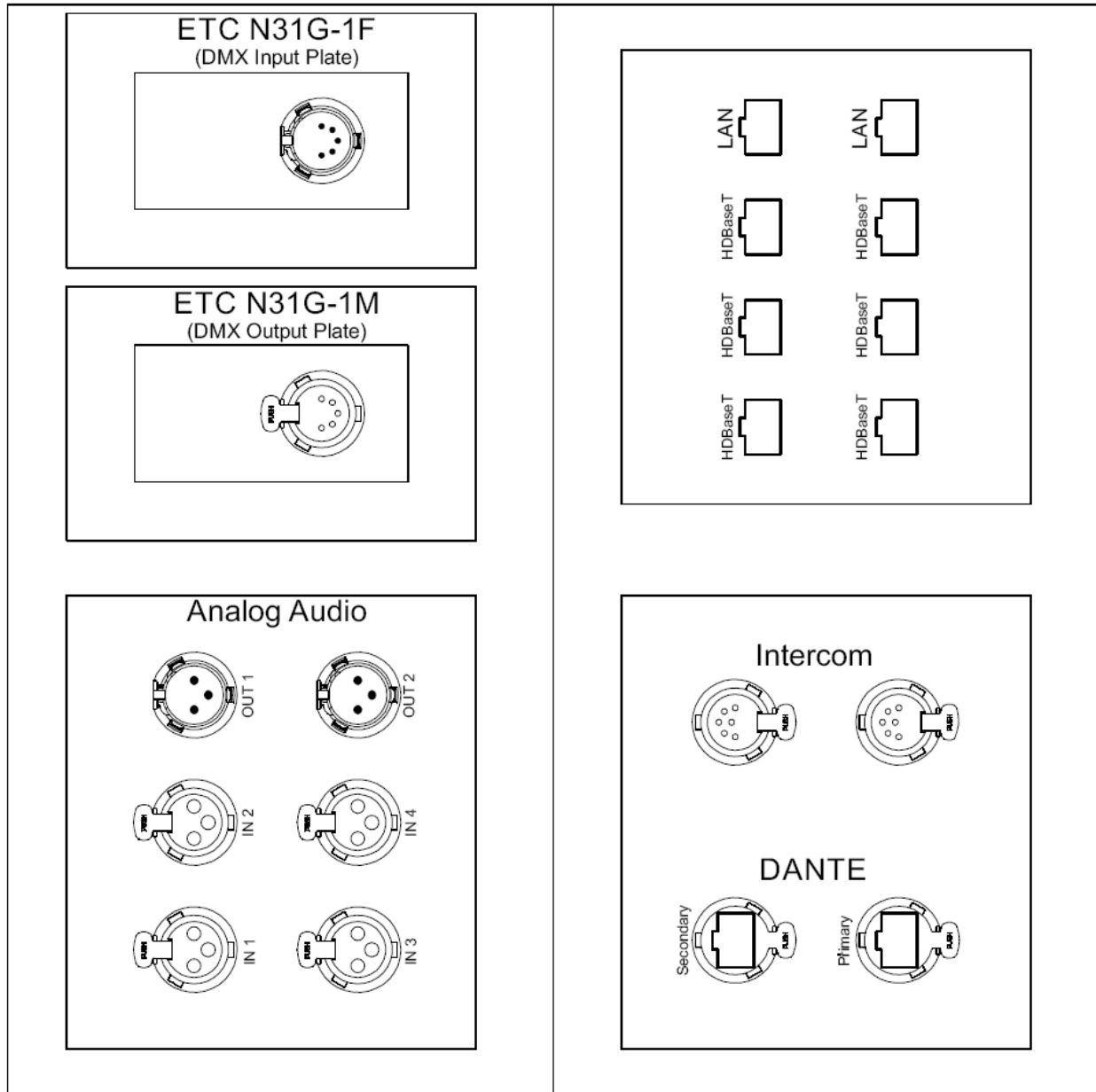
### 5.7.10 AUDIO/VISUAL INTERFACE BOXES

Wall boxes shall be provided in the locations shown in the diagram below, to provide audio/visual inputs and outlets as shown in the wall box detail below the diagram:

Provide Neutrik etherCON Cat6A, XLR form-factor connectors for all Dante and DM connections.

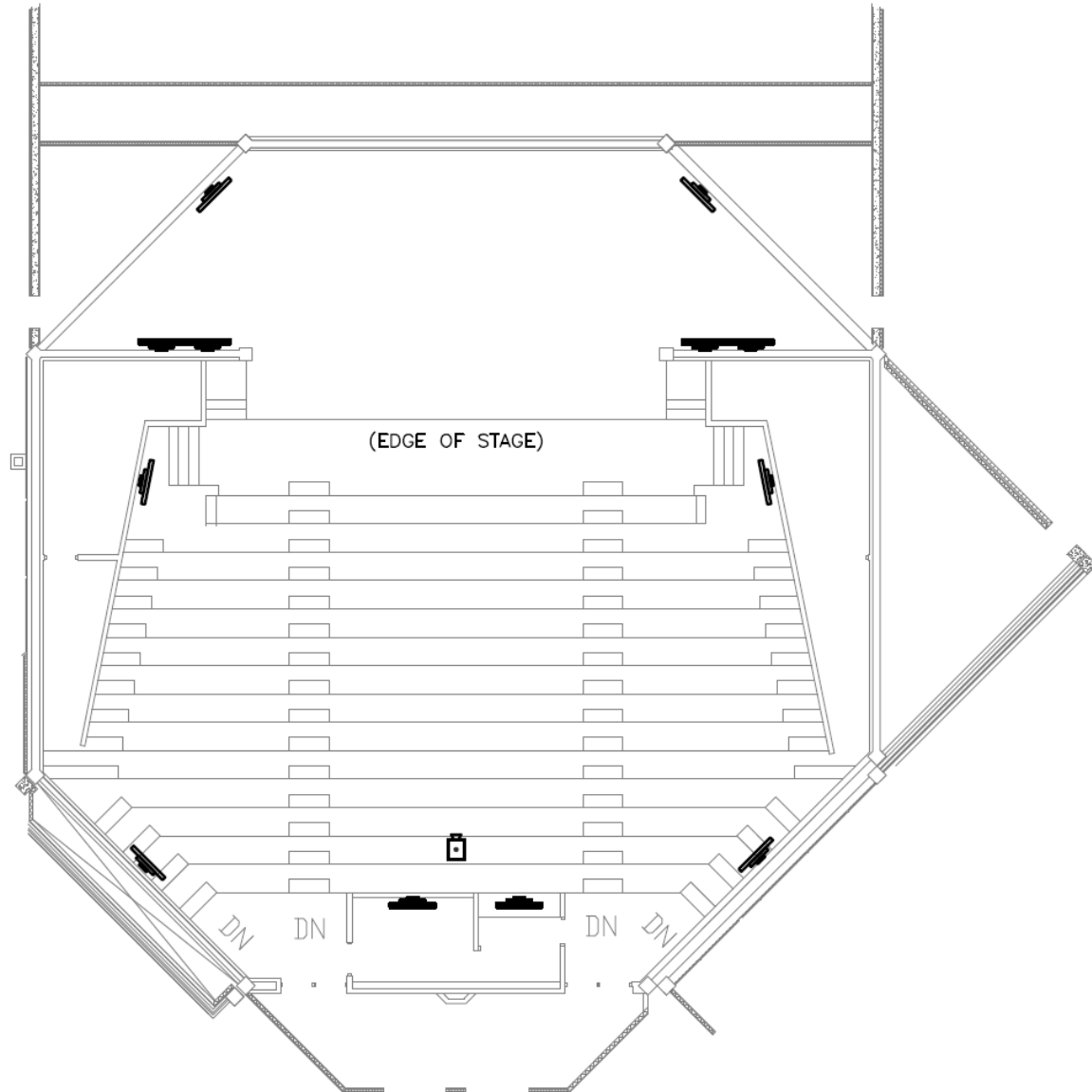
Provide Neutrik custom-colored lettering plates.





### 5.7.11 VIDEO PANELS

Video panels shall be located in approximately twenty locations throughout the theater and its associated spaces. The diagram below depicts most of these locations, with references to the list:



In addition to the locations shown on the diagram above, the following additional locations require video panels:

1. Left side of the Lobby (by the left entrance)
2. Right side of the Lobby (by the right entrance)
3. Backstage Corridor Waiting Area
4. Back side of the proscenium
5. Green Room
6. Men's Dressing Room
7. Women's Dressing Room
8. Ticket Office

Each video panel shall be provided one shielded Category 6A cable and HDBaseT distribution, cabled directly to a patch panel in the Sound Booth.

In addition, another shielded Category 6A cable shall be provided between the Sound Booth and the nearest telecommunications room for auxiliary distribution elsewhere in the building.

### 5.7.12 VIDEO PROJECTORS

A video projector shall be provided, typically located in the rear of the theater, near the Lighting and Sound Booths, as depicted in the diagram above. However, for large theaters, the projector may need to be suspended from the overhead catwalk at a distance within the projection throw range of the projector.

The projector shall be selected based on performance characteristics that meet the requirements of the theater space. The following parameters shall be considered to be a starting point for projector selection.

- 12K Lumens minimum
- 1080p minimum
- 120 nits minimum

Two DM cables are required for each projector, terminated in an outlet adjacent to the projector.

### 5.7.13 STAGE LIGHTING CONTROLS

Stage lighting controls shall be composed of products from Electronic Theater Controls (ETC), [www.etcconnect.com](http://www.etcconnect.com)

- Dimmers
- Consoles
  - The Ion family of control consoles is typically suitable for most UVU theater spaces.
  - The EOS family of control consoles might be needed for a larger theater.

## 5.8 Athletic/Performance Stadiums

Large facilities are constructed for athletic and performance events. These venues are unique, and each requires custom-designed solutions.

The following features are typically needed:

- |                                |                                   |
|--------------------------------|-----------------------------------|
| • Audio/visual control rooms   | • Large audio amplifier systems   |
| • Large video panels           | • Large speaker systems           |
| • Audio/visual equipment racks | • Acoustic treatments             |
| • Digital signage              | • Video panel cluster/scoreboard  |
| • LED banner signage           | • Concert lighting infrastructure |
| • Broadcasting infrastructure  | • Concert power infrastructure    |

## 5.9 Instructional Media Studios

Instructional Media Studios are used by teachers to prepare audio/visual media for instructional purposes, or by students for multimedia assignments. Lectures or demonstrations can be recorded, both audio and video, and streaming media files can be produced in this space.

The Designer shall request case-by-case direction from the AVPM to guide the design process for each Instructional Media Studio.

The space is sized similar to an office, with a credenza/desk serving as an operator workstation and containing an A/V Equipment Rack.

A noise coefficient of NC 35 and a reverberation time of 0.6 seconds are the highest allowable per the recommendations of ANSI S12.60-2002. Provide neutral-colored, fabric-covered acoustic panels.

The video background wall behind a person being recorded shall be painted with a matte blue/gray color. A ceiling-mounted pull-down background screen shall be provided with the following two screen options:

- UVU Logo
- Green screen (for video editing)

The lighting shall be dimmable, warm-colored light (not solely fluorescent).

The following audio/visual features are required:

- Audio/visual equipment rack (housed inside a credenza)
- Computer with two video panels
- Cameras
- Document camera
- Blu-ray player
- Speakers
- Microphones (desktop, wireless or ceiling-hung)
- Acoustic wall treatment
- Specialty lighting

In addition to the Code-required convenience power outlets, additional power outlets shall be provided to serve A/V functions, including special lighting – provide two outlets per wall above the T-bar ceiling.

UVU is exploring the use of a glass writing surface product from Lightboard <http://lightboard.info/> and may wish to use this on future projects.

## 5.10 Video Panel Applications

### 5.10.1 DIGITAL SIGNAGE

Video panels shall be sized for the application. Each panel shall be 46 to 55 inches (diagonally measured), or larger for special applications.

Video panels used for digital signage shall be wall-mounted using a secure wall or ceiling mount. Security devices shall be installed to protect against theft.

Each digital signage application requires a double-gang electrical power outlet, concealed behind the video panel. This power outlet will support at least 2 devices that require 120VAC power.

Each application shall have the following low-voltage jacks terminated in an outlet concealed behind the video panel:

- Two Category 6A cables are required for each Digital Signage video panel, terminated in the nearest telecommunications room.
- See the TDDG for more information.

The design shall require the A/V Contractor to provide a media player, software, and license for each application, and to connect the media player to the existing campus system (SCALA). The Designer shall work with the AVPM to select the appropriate solution on a case-by-case basis, probably deploying one or more of the following options:

- An Open Pluggable Specification (OPS) media player. UVU's preferred video panel from NEC has integrated OPS card slots.
- Thin-client computers. Products from Lenovo and Intel are currently being used.

The Designer shall inquire with the UVU AVPM on a case-by-case basis about the requirements for a project.

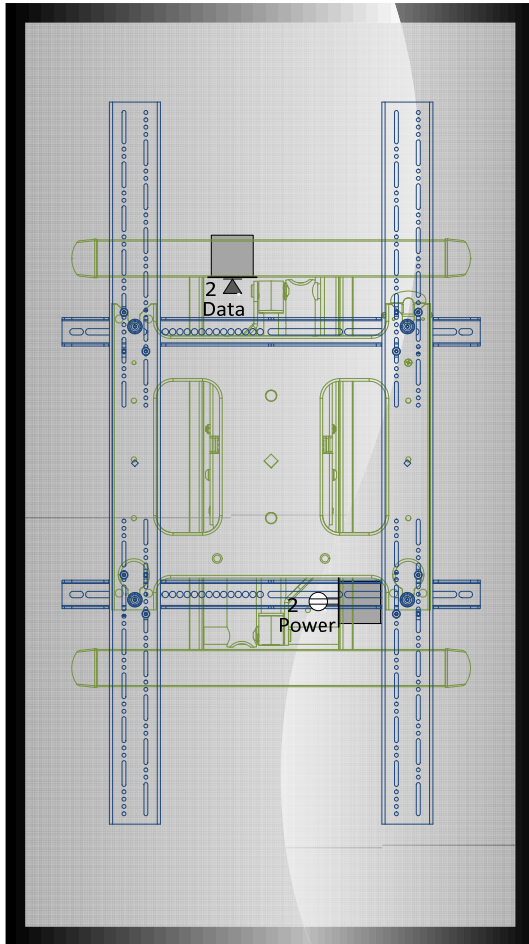
### **5.10.2 DIGITAL SIGNAGE SOFTWARE LICENSING**

Each digital signage application will require digital signage software (DSS) to operate. The Designer shall include in the design documents a requirement that the contractor provide fully licensed software as a part of the deliverables.

#### **5.10.2.1 DIGITAL SIGNAGE – PORTRAIT ORIENTATION**

Portrait-oriented digital signage panels shall be mounted 40" above finished floor to the bottom of the display. The mounting height will vary depending upon the size of the display. The Designer shall coordinate with the AVPM to determine the exact locations and sizes.





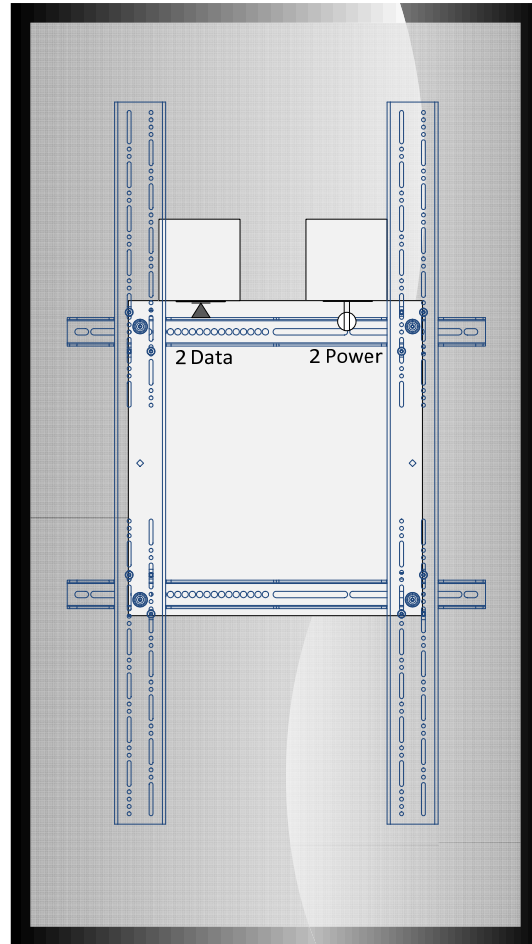
### RECESSED APPLICATIONS

THE ENTIRE ASSEMBLY SHALL BE RECESSED MOUNTED, SUCH THAT THE VIEWING SURFACE OF THE FLAT PANEL DISPLAY IS FLUSH WITH THE SURFACE OF THE WALL.

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PIWRFUB MOUNT WITH A CHIEF PSBU INTERFACE BRACKET.

CONDUITS REQUIRED, BUT NOT SHOWN:

- DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.
- POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.



### SURFACE-MOUNTED APPLICATIONS

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PAC 516 IN-WALL BOX WITH A CHIEF PIWRFUB MOUNT OVER THE TOP.

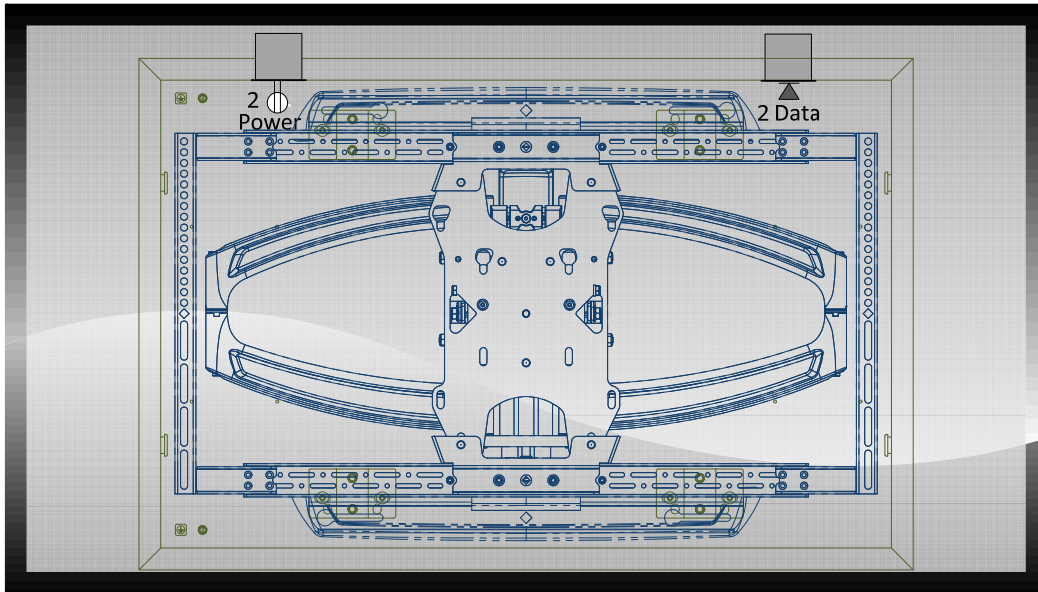
CONDUITS REQUIRED, BUT NOT SHOWN:

- DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.
- POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.

### 5.10.2.2 DIGITAL SIGNAGE – LANDSCAPE ORIENTATION

Landscape-oriented digital signage panels shall be mounted 50" above finished floor to the bottom of the panel. The mounting height will vary depending upon the size of the display. The Designer shall coordinate with the AVPM to determine the exact locations and sizes.

The landscape solution shall also be used for office video panel applications. Use an articulating mount if it is recessed in the wall. Use a surface mount for most other applications.



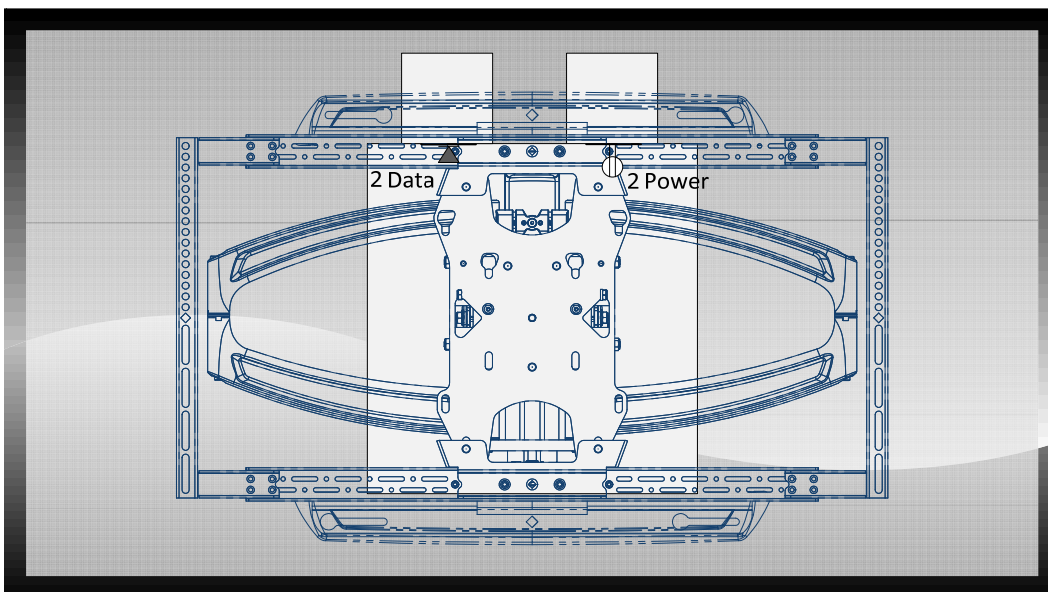
### RECESSED APPLICATIONS

THE ENTIRE ASSEMBLY SHALL BE RECESSED MOUNTED, SUCH THAT THE VIEWING SURFACE OF THE FLAT PANEL DISPLAY IS FLUSH WITH THE SURFACE OF THE WALL.

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF TA500 BACKBOX WITH A CHIEF TS525TU SWING ARM MOUNT.

CONDUITS REQUIRED, BUT NOT SHOWN:

- DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.
- POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.



### SURFACE-MOUNTED APPLICATIONS

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PAC 526 IN-WALL BOX WITH A CHIEF PIWRFUB MOUNT OVER THE TOP.

CONDUITS REQUIRED, BUT NOT SHOWN:

- DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.
- POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.

### 5.10.3 VIDEO WALLS

- A. Video walls require careful attention to the details that are unique to each application space. Therefore, the Designer shall collaborate with the AVPM to define the design parameters for each project.
- UVU uses direct-view LED for video wall applications. The Designer shall inquire with the AVPM about manufacturers and models of solutions that have been successfully used at UVU.
  - The pixel pitch and screen size of a video wall application shall be decided in collaboration with the AVPM. For Auditoriums:
    - The pixel pitch is typically 2.0
    - The display size is typically around 30' wide and 10' high
    - The cost can be in the range of \$50,000.
- B. Video walls designed for UVU facilities shall include components and features meeting the following parameters:
- LED chip manufacturer: Cree, Nichia, or Nationstar (no exceptions)
  - Brightness: 1000cd/m2 (or greater)
  - Refresh Rate: 1920Hz (or greater)
  - Viewing Angle: Horizontal 160°, Vertical 140° (or greater)
  - Color Temperature: Adjustable from 6500K – 9500K (or greater)
  - Greyscale: 16-bit (or greater)
  - Receiving Cards and Video Wall Driver: Novastar
- C. Direct-view LED walls require more electrical power circuits than are typically expected. Depending on the pixel pitch and size of the wall, potentially a dozen 120VAC 20A circuits could be required. The Designer shall coordinate the power requirements with the electrical engineer and verify that the required power circuits are included in the construction scope.
- D. With the power consumption discussed above, there is a corresponding heat output from direct-view LED walls is higher than typically anticipated. The Designer shall coordinate the video wall heat load production with the mechanical engineer and verify that the required mechanical cooling is included in the construction scope.
- E. The Designer shall specify that 10% replacement parts be furnished by the contractor.
- F. The Designer shall work with the Architect to design the appropriate wall structure, wall thickness, and finish materials. Video wall driver equipment must be rack-mounted within approximately 100 feet of the video wall. A nearby AV closet or telecommunications room would be appropriate.

## 5.11 Planetariums/Edge-blended Video

Applications involving multiple projectors to display large images (such as planetariums and large projection walls) can be implemented using edge-blending video solutions.

UVU wishes to consider using software from Worldwide telescope (<http://www.worldwidetelescope.org>) for these applications.

## 5.12 Entertainment Spaces

Spaces for relaxation, social interaction, and entertainment can be created with a variety of applications:

- Sports zones, with multiple video displays
- Video game centers, composed of seating furniture surrounding video displays with gaming equipment
- Informational digital signage

These applications will require some or all of the following:

- Video panels
- Furniture
- Power and data outlets
- Audio speakers
- Video game equipment

A pathway and junction box system shall be designed for these spaces using a hierarchical star topology. Each subspace or pod within the Entertainment Space shall have pathway to an aggregation junction box, and from there, pathway (including cable tray in the corridor) shall be provided to the nearest telecommunications room.

The Designer shall work with the AVPM to address the unique requirements for each Entertainment Space.

## 5.13 Outdoor Plaza/Gathering Spaces

Outdoor public gathering spaces at UVU are used for group events such as presentations, concerts, and fairs. These events sometimes require specialty lighting, as well as public address systems to communicate with larger groups.

Power outlets are required for A/V equipment and computer equipment, and power for lighting shall be circuited separately. Provide power distribution spider boxes as follows:

- Various high amp (50 amp or greater) multi-phase power circuits to distribute power via spider boxes terminated with a CS6369 non-NEMA CA standard connector.
- One 150 amp or greater outlet with cam-lock (3-phase, neutral, ground) for lighting and high-powered audio systems.

A weatherproof connection panel shall be mounted near the power outlets. The panel shall typically host 2 Category 6A cables and 6 strands of singlemode fiber optic cabling.

UVU has a large portable outdoor LED video wall and A/V system composed of a projector, portable projection screen, media center projector cart, speakers and subwoofer. The design of outdoor spaces where this system could be used should provide power and network connectivity for this system.

The Designer shall inquire with the AVPM on a case-by-case basis which of the above features or other unique features will be required for a given application.

## 6 Construction Document Content

This section of the AVDG describes the content requirements that the Designer shall include when creating the Construction Documents. This content is in addition to the content found in some generally accepted document sets.

The services provided by the Designer, and the resulting documents, shall comply with the State of Utah's contract requirements. In addition to these requirements, the Designer shall also meet the requirements in this document, including the Construction Document content requirements in this section.

Construction Documents shall communicate a fully detailed and coordinated design (rather than making adjustments in the field during construction), and are expected to result in reduced construction costs and fewer change orders. The level of detail required to meet this objective may be substantially greater than some audio/visual designers may be accustomed to providing.

The Designer shall include the following content in the Construction Documents:

### 6.1 Plans and Drawings

#### 6.1.1 GENERAL

The audio/visual portion of the Construction Drawing set shall include the following:

- Cover Sheet
- Sheet List
- Site Map
- Symbol Schedule
- List of Abbreviations
- Plan Sheets
- Elevation Diagrams
- Schematic Diagrams
- Construction Details
- Demolition

All plan sheets shall be scaled, shall indicate the scale, and shall show a north arrow. All plan sheets shall show a key plan when the building or site is too big to fit on a single sheet.

Equipment and cable identifiers shall be shown on the drawings and diagrams.

#### 6.1.2 OUTSIDE PLANT SITE PLAN DRAWINGS

Typically, there will not be a large amount of audio/visual content on site plan drawings. However, video distribution cabling (fiber optic) between buildings will sometimes be

designed on a project. In these cases, the telecommunications engineer will design the outside plant ductbanks and cabling, and the Audio/Visual Designer shall work with the telecommunications engineer to make sure that any audio/visual cabling needs are addressed.

Other outside plant audio/visual applications may include:

- Outdoor speakers in Plaza/Gathering areas
- Access to indoor equipment for outdoor events

For projects where there is no telecommunications engineer, but where outside plant cabling is required, the following requirements apply:

- A. Provide drawings showing a scaled telecommunications distribution site plan. These drawings shall show the following:
- Maintenance hole or handhole locations (labeled with their identifiers)
  - Complete ductbank routing, details, and elevations
  - Conduit sizes, quantities, and arrangements
  - Section cuts
  - Existing and new surface conditions
  - Outside plant fiber optic telecommunications cabling, including fiber types and strand counts
  - Locations of buildings, roads, poles, existing underground utilities, and other obstructions
- B. These sheets shall also identify coordination arrangements where conflicts could possibly arise with site work for other disciplines, in particular indicating the separation distances between low-voltage and power or steam. The sequencing of site work shall also be shown, if applicable.

### 6.1.3 INSIDE PLANT PLAN DRAWINGS

- A. Scaled plan drawings shall be provided for each building, showing the audio/visual applications and cabling inside the building. These drawings shall show the following:
- Routing of new pathway to be constructed during the project.
    - The content of the drawings shall be coordinated with other disciplines and shall be representative of the complete pathway route that the Contractor shall use, rather than a schematic depiction.
    - The Designer shall expend considerable coordination effort during the design process. Non-coordinated pathway/raceway is not acceptable to UVU.
  - Approximate locations of junction boxes and conduit bends.
  - Backbone distribution cabling.
- B. Where new cabling will be pulled into existing conduits, the Construction Documents shall show the routes of each *existing* conduit. Where it is not possible to determine the routing of existing conduits, the Designer shall inform the UVU AVPM and seek direction on whether to use the existing conduits or



design new conduits for use on the project. Typically, the Designer is required to identify such conditions during field investigation activities.

#### 6.1.4 DEMOLITION

- A. Any existing equipment and cabling intended to be no longer in use following the new installation shall be removed (salvaged and returned to the Owner undamaged and in working condition) as a part of the project. UVU uses salvaged equipment as spare parts to support the existing equipment in other buildings. The Designer shall inquire with the AVPM for approval of the disposition of salvageable equipment and cabling.
- B. Existing cabling to be demolished shall be shown on the plans and schematic diagrams. Separate demolition plan sheets and schematic diagrams shall be provided for projects with extensive cable demolition.

#### 6.1.5 A/V EQUIPMENT ROOM PLAN DETAILS

- A. Construction documents for UVU projects shall show scaled plan drawing details for the A/V Equipment Room spaces. The details shall show the footprint and location of each of the major components in the room including at least the following:
  - Cable tray entrances
  - Backbone cable routing
  - Grounding busbar
  - Equipment cabinets
  - Desks or workstations
  - Space for other low-voltage systems
  - Ladder racking

#### 6.1.6 ELEVATION DIAGRAMS

- A. The Designer shall provide scaled wall elevation details for each Conference Room, Classroom, and A/V Equipment Room affected by the project.
- B. For remodel projects, the Designer shall produce digital photographs of each wall depicting the existing conditions where future audio/visual equipment will be located. These photos shall be provided with the wall elevation details in the Construction Documents.
- C. The wall elevation details shall show the components that are mounted on the walls in the room including at least the following:
  - Ladder racking
  - Cable slack loops
  - Grounding busbar
  - Existing devices
  - Work area
  - Backbone cable routing
  - Cable management
  - Termination blocks
  - Power receptacles
  - Wall-mounted electronic equipment
  - Entrance conduits
  - Equipment cabinets
  - Other low-voltage systems
  - Space for future equipment
- D. Elevation details shall be provided for each of the A/V equipment cabinets in each Conference Room, Classroom, and A/V Equipment Room. Rack elevation details shall show the cabinets and any components that are mounted on or near the racks including at least the following:



- Patch panels
- UPS equipment
- Existing devices
- Shelves/drawers
- A/V equipment
- Power strips
- Space for future equipment
- Cable management

- E. The details shall depict the audio/visual materials that are listed in the specification.
- F. Where a project involves additions to existing equipment racks/cabinets, the elevation details shall identify the existing equipment and indicate the equipment to be removed, in addition to indicating which items are “new, to be provided under the Contract.” Provide the following elevation details:
- Existing Rack/Cabinet Elevation
  - Revised Rack/Cabinet Elevation

### 6.1.7 SCHEMATIC DIAGRAMS

- A. The Designer shall provide schematic diagrams for the design of each A/V application. The diagrams shall show the equipment identifiers for each device. Where diagrams span multiple pages, reference tags shall be shown for each cable that connects to another page.
- B. An example A/V schematic diagram is shown in Appendix 7.1.

## 6.2 Project Manual

- A. The State of Utah DFCM publishes requirements for the Project Manual.
- B. The Project Manual shall contain a summary of the audio/visual work on the project, a description of the demolition requirements (if applicable), and a discussion of the utility coordination requirements.
- C. In addition to these requirements, the Project Manual shall contain the A/V Systems Cutover Plan.

### 6.2.1 SPECIFICATIONS

#### 6.2.1.1 UVU AUDIO/VISUAL CONSTRUCTION GUIDE SPECIFICATION

- A. The UVU Audio/Visual Construction Guide Specification (AVCGS) is a *guide* specification as opposed to a *master* specification. It does not include an exhaustive listing of all possible products or installation methods that could be employed in an audio/visual project.
- B. The AVCGS is an example of a specification that shall be used for an A/V upgrade project or for a new facility project. It has verbiage that identifies issues that the Designer shall consider throughout the adaptation process. The

Designer shall adapt the sections in the AVCGS to the particular requirements of the given project.

- C. The Designer shall directly edit the AVCGS for use on each project. The Designer shall notify the UVU AVPM where changes or additions to the specifications are desired. Edits to the documents shall be performed with the “Revision Tracking” features activated. At the various project milestones when the documents are submitted to UVU for review, the specifications shall be printed showing the revision markings.
- D. The Designer shall be responsible for adding any necessary content to the specification that is applicable to the project and not already contained in the AVCGS.
- E. Please refer to the more detailed instructions contained in the AVCGS, both in the Preface of that document as well as in the “hidden text” comments contained in the electronic files.

#### 6.2.1.2 COMMON SPECIFICATION SECTIONS

There are several specification sections that are commonly used for audio/visual systems or contain content that supports audio/visual functionality.

The following section is a UVU standard and addresses Teacher Stations. The Architect and Audio/Visual Designer will have involvement in the preparation of this section:

- 06 41 23 – Interior Custom Casework

Sections typically provided by the architect, but requiring Audio/Visual Designer input:

- 09 23 13 – Acoustical Gypsum Plastering
- 09 81 00 – Acoustic Insulation
- 09 83 00 – Acoustic Finishes
- 09 84 00 – Acoustic Room Components

Sections typically provided by the Telecommunications Engineer, possibly requiring Audio/Visual Designer input:

- 27 05 00 – Common Work Results for Communications
- 27 05 26 – Grounding and Bonding for Communications Systems
- 27 05 28.29 – Hangers and Supports for Communications Systems
- 27 05 28.33 – Conduits and Backboxes for Communications Systems
- 27 05 28.36 – Cable Trays for Communications Systems
- 27 11 00 – Communications Equipment Room Fittings
- 27 13 00 – Communications Backbone Cabling
- 27 15 00 – Communications Horizontal Cabling
- 27 16 00 – Communications Connecting Cords, Devices, and Adapters
- 33 81 26 – Communications Underground Ducts, Manholes, and Handholes
- 33 82 00 – Communications Distribution
- 33 82 43 – Grounding and Bonding for Communications Distribution

Sections typically provided by the Audio/Visual Designer:

- 27 41 00 – Audio/Video Systems

### **6.2.2 CUTOVER PLAN**

The Designer shall provide a detailed cutover plan that is coordinated with other disciplines on the project, as well as with UVU data and telephone equipment cutover requirements. Verbiage shall be provided in this section describing the sequence of work tasks to accomplish the cutover. Limitations on the permissible downtime and temporary service arrangements shall be discussed in the cutover plans.

Not all projects will require a cutover plan.

### **6.2.3 FIBER LINK-LOSS BUDGET ANALYSIS**

For projects that include fiber optic cabling as part of the audio/visual system:

- A. The Designer shall provide (in the Construction Documents) a link-loss budget analysis for each fiber optic cable.
- B. The link-loss budget analysis shall be formatted as shown in the Appendix of UVU's Telecommunications Distribution Design Guide. Upon request, UVU will provide an electronic spreadsheet file to be used as a template.

## **6.3 Record Drawings and Documentation**

The State of Utah DFCM publishes requirements for Record Drawings and submittals. The following requirements related to Record Drawings and submittals are **in addition** to those published by the State:

### **6.3.1 RECORD DRAWING CONTENT**

The Record Drawings shall show the identifiers for the audio/visual equipment and cabling as constructed.

### **6.3.2 RECORD DRAWING DELIVERABLES**

Two copies of the following shall be delivered, one to the UVU FSPM, and the other to the AVPM:

- A CDROM containing editable 2D AutoCAD drawings (with all xrefs bound to the drawing) of the audio/visual plans, elevations, and details, in addition to the Revit or BIM model files.
- The A/V subcontractor's redline drawings and updated CAD drawings (reflecting construction adjustments), in both printed and electronic form (on CDROM).
- A CDROM containing the digital photographs taken by the Designer during the project.

# 7 Appendices

## 7.1 Cabling Schematic

The schematic diagram on the following page depicts UVU's standard practices for cabling in typical audio/visual applications. The Designer shall apply these practices for each application, and adjust the cabling as required to achieve the objectives of the application space.



## 7.2 Rack Elevation Diagrams

UVU has developed best practice strategies for arranging the equipment in A/V equipment racks. While each application space and project may require unique solutions, the Designer shall apply the best practice guidelines depicted below and shall prepare rack elevations for each A/V equipment rack in the project.



- A. Power strip with built-in exhaust fan shall be located at the top of the rack – no power switch on the front.
- B. Blank filler panels between all accessible equipment that is visible to the public. If a rack is behind a lockable door (not visible), blank panels are not required.
- C. Whenever there is space available, spread equipment to provide a 1RU space between each piece of active rack-mounted equipment to reduce overheating.
- D. Where an equipment rack has space available in the locked side of a Teacher Station, mount the amplifier in the top of the rack on the locked side so that rising heat doesn't affect other equipment. Otherwise, place the amplifier low in the visible rack behind a security door.
- E. UVU logo and A/V Servicedesk contact info shall be silkscreened on one or more blank filler panels.





- F. On the visible rack, the most frequently used equipment shall be mounted higher in the rack. For example, the Blu-ray player and computer should be near the top. The drawer should be near the bottom.
- G. Provide a drawer (where possible, 4U high) near the bottom of the visible rack to hold the charging equipment for the wireless microphone and other appurtenances.
- H. All shelf-mounted equipment shall be installed with a custom bezel to conceal unfilled space around the devices on the shelf. In addition to aesthetics, the purposes of the bezel are to prevent theft, to prevent the shelf from being used to store non-A/V items, and to stabilize equipment on the shelf.
- I. Accessible to public: source devices, drawer, auxiliary interface panel, exhaust fan, auxiliary power outlet, lecture capture device.
- J. Secured away from public: control system, amplifier, digital signal processor, A/V switchers, transmitter/receivers, wireless microphone receivers, codecs, network switch, distribution amplifiers, mixers, ventilation.

## 8 UVU Appendix

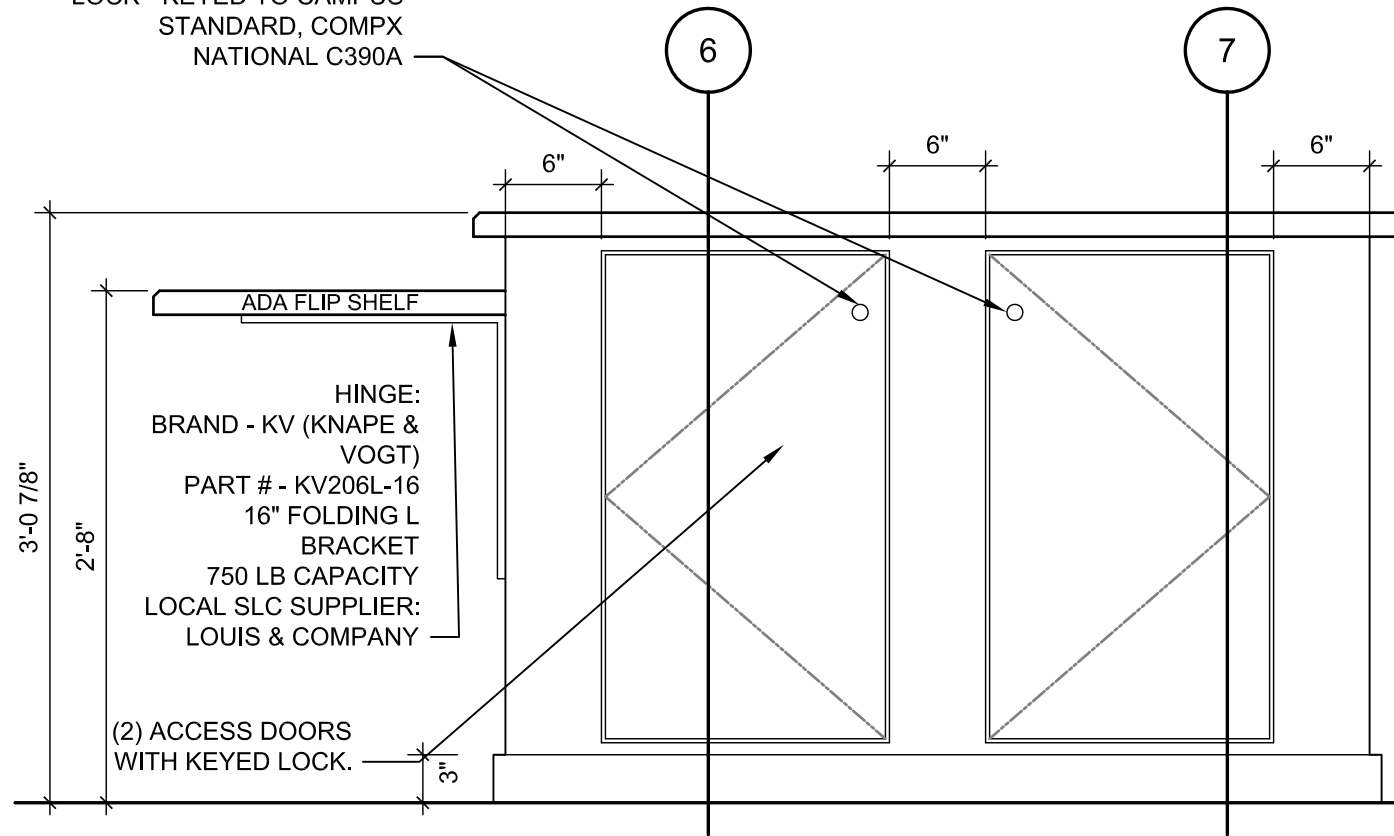
### 8.1 Teacher Station Drawings

The following pages show three different styles of Teacher Stations used at UVU. The Designer shall inquire with the UVU AVPM regarding which style(s) shall be used in each space for each given project:

#### 8.1.1 DESK STYLE FORM-FACTOR (RACK ON RIGHT, KNEE SPACE ON LEFT)

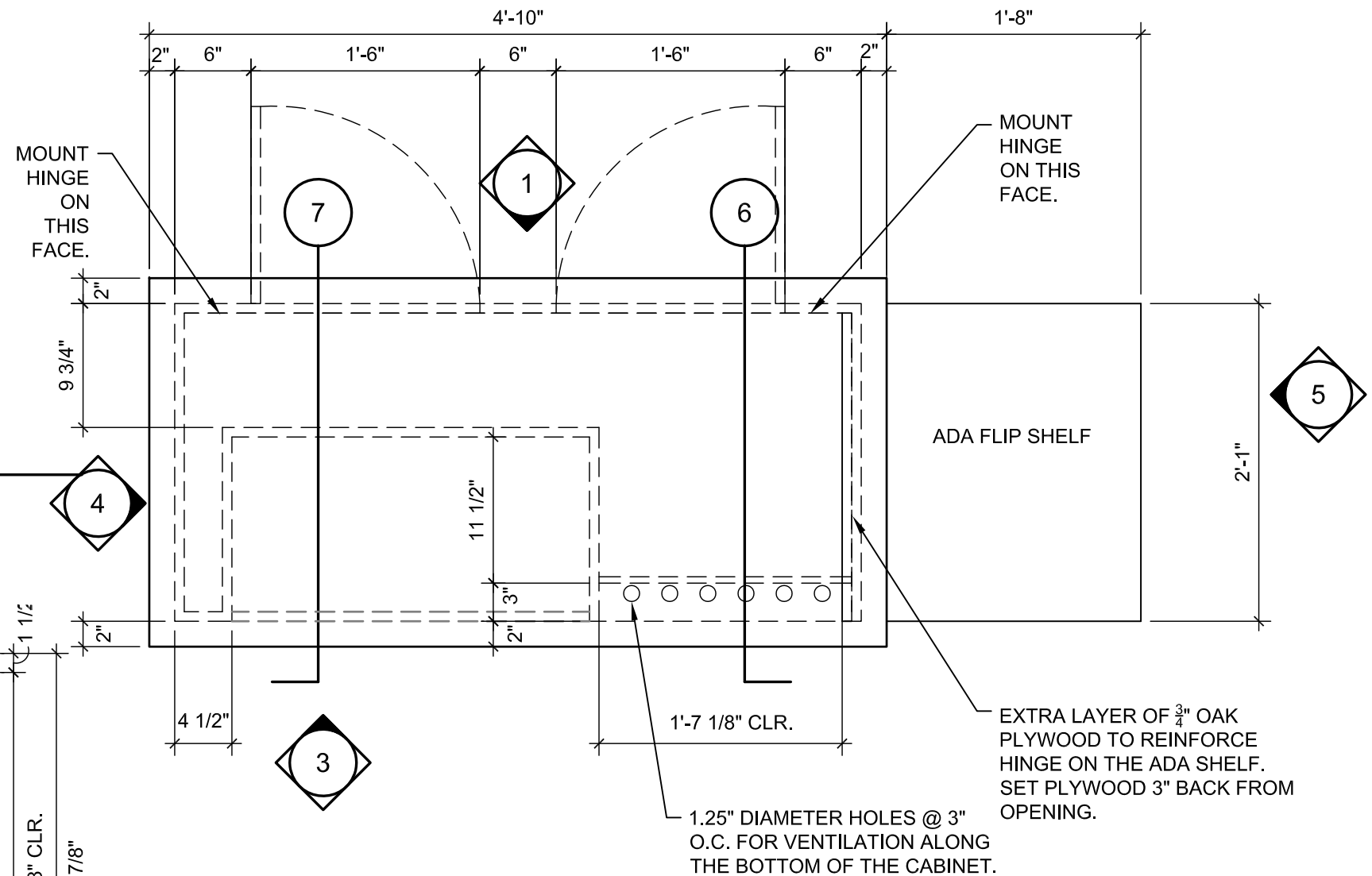


LOCK - KEYED TO CAMPUS  
STANDARD, COMPTON  
NATIONAL C390A



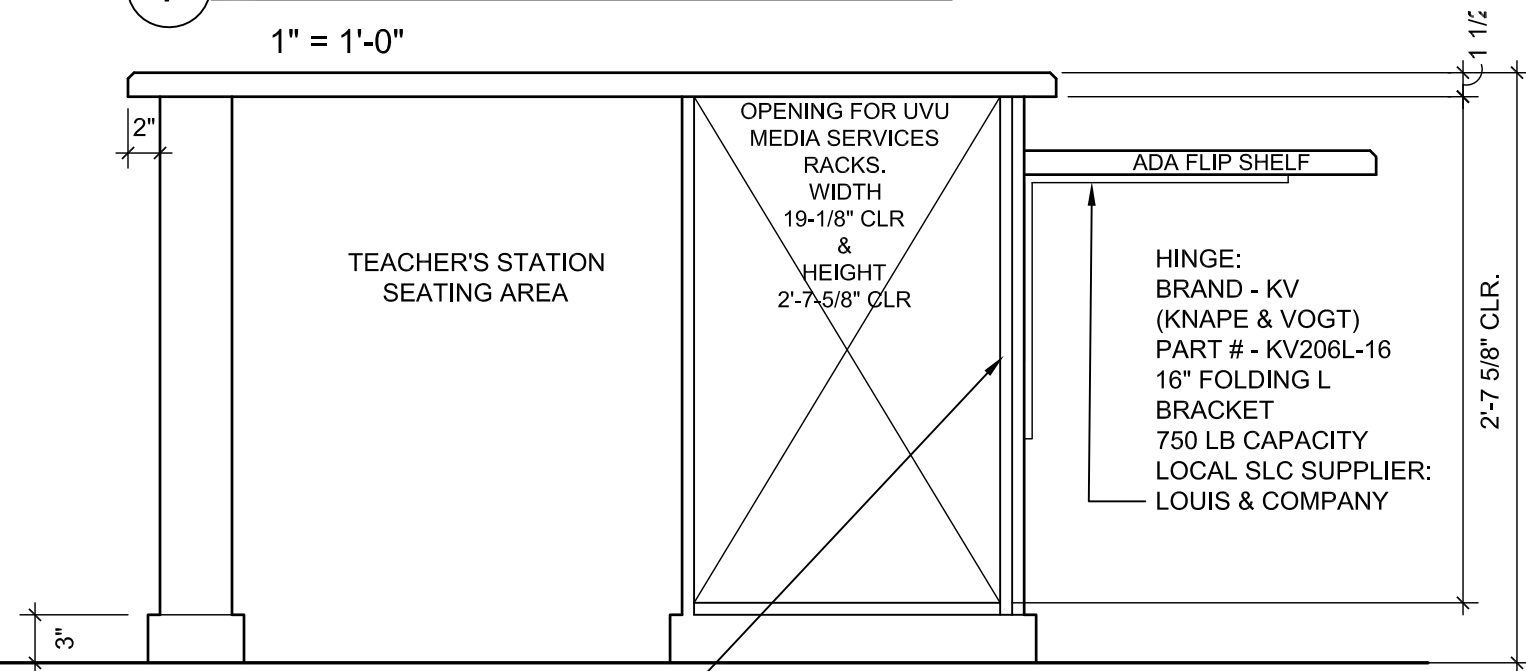
## FRONT ELEVATION

1  
1" = 1'-0"



## FLOOR PLAN

2  
1" = 1'-0"



## BACK ELEVATION

3  
1" = 1'-0"

CLASSROOM TEACHER STATION (REVERSE - OPENING LEFT/EQUIPMENT RIGHT)

FLOOR PLAN & ELEVATIONS

SCALE: 1" = 1'-0"  
DATE: MAY 3, 2016

**FINISHES**

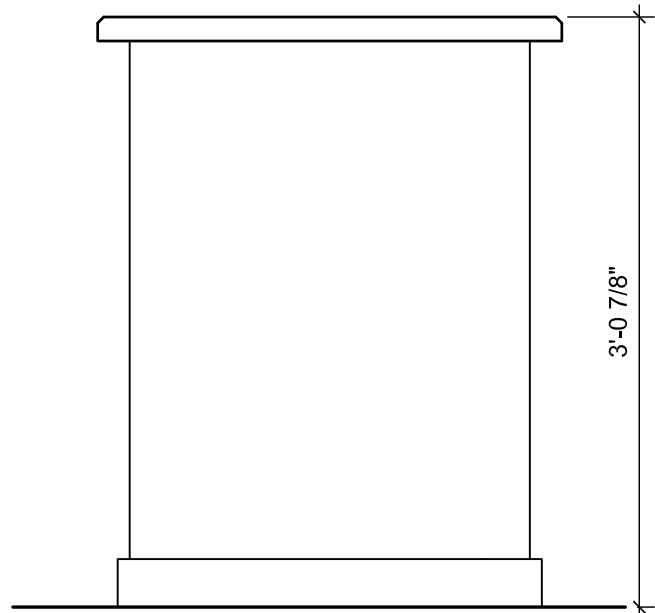
COUNTER:  $\frac{3}{4}$ " WHITE OAK PLYWOOD WITH HDWD OAK BEVELED EDGES, NATURAL FINISH.

TEACHER STATION VERTICAL PANELS:  $\frac{3}{4}$ " WHITE OAK PLYWOOD, NATURAL FINISH.

3" BASE:  $\frac{3}{4}$ " HDWD WHITE OAK, NATURAL FINISH.

**NOTES**

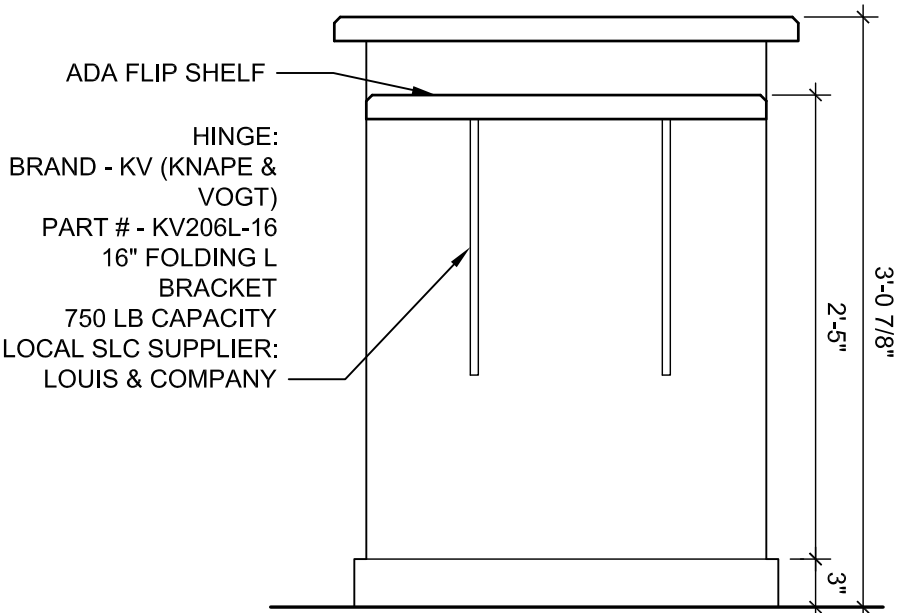
THE DIRECTION OF THE GRAIN TO BE THE SAME ON FRONT, BACK, SIDES & BASE. PROVIDE CUTOUTS IN THE TOP SURFACE AND THE LOCATION & SIZES WILL BE COORDINATED WITH UVU MEDIA SERVICES.



**SIDE ELEVATION**

4

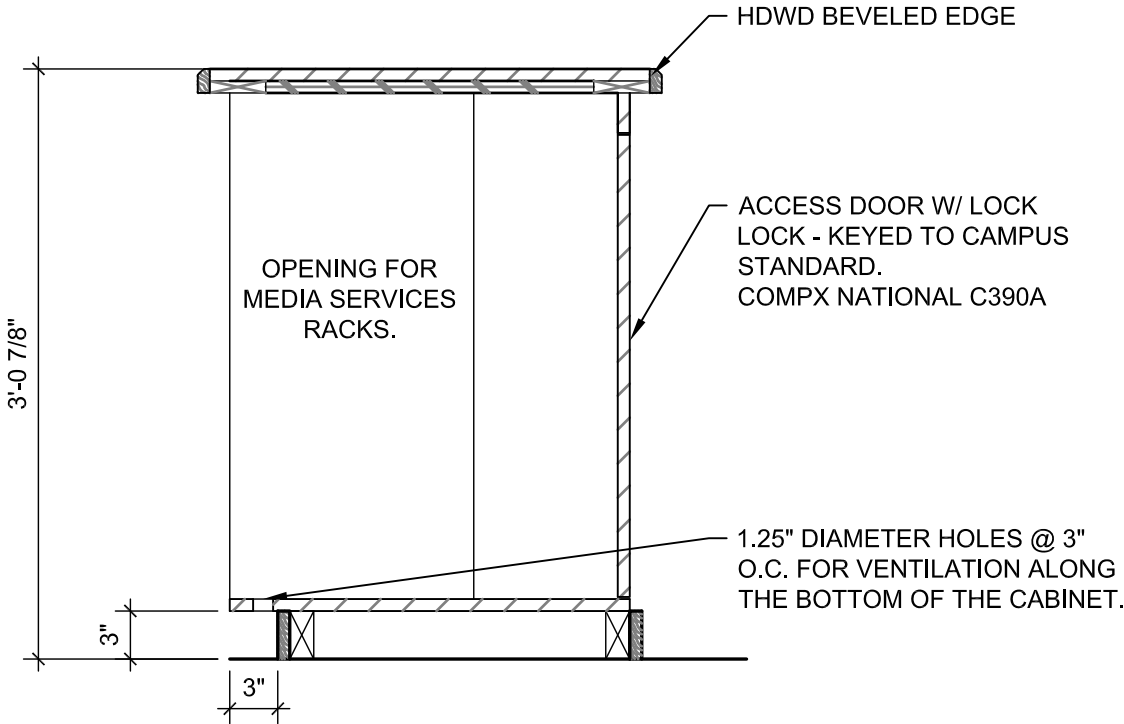
1"=1'-0"



**SIDE ELEVATION**

5

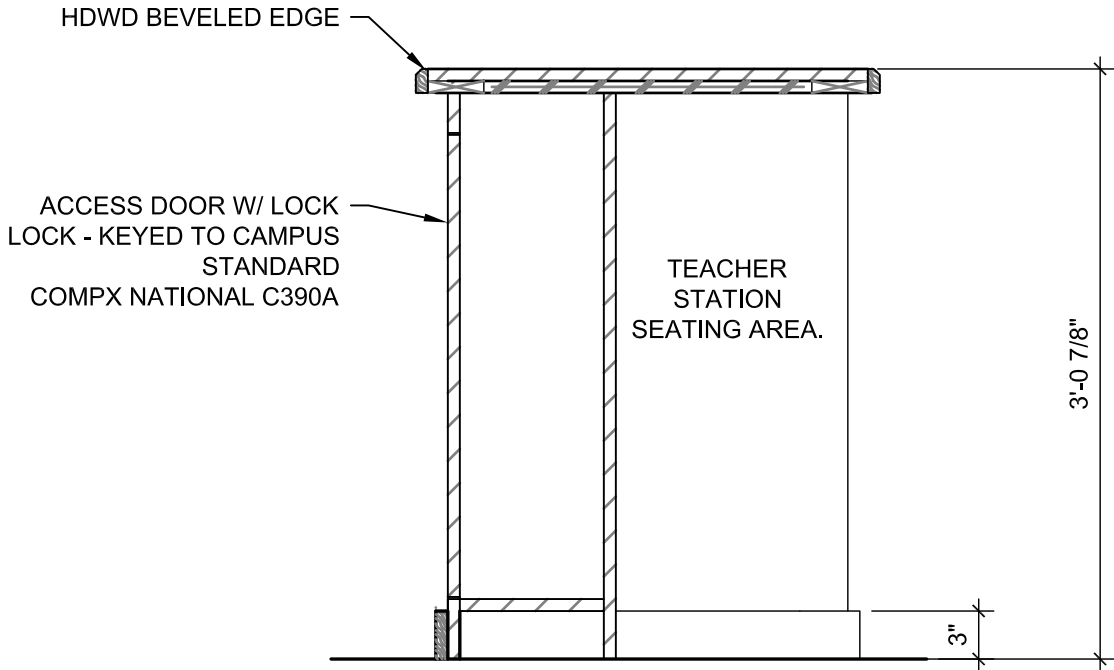
1"=1'-0"



**SECTION**

6

1"=1'-0"

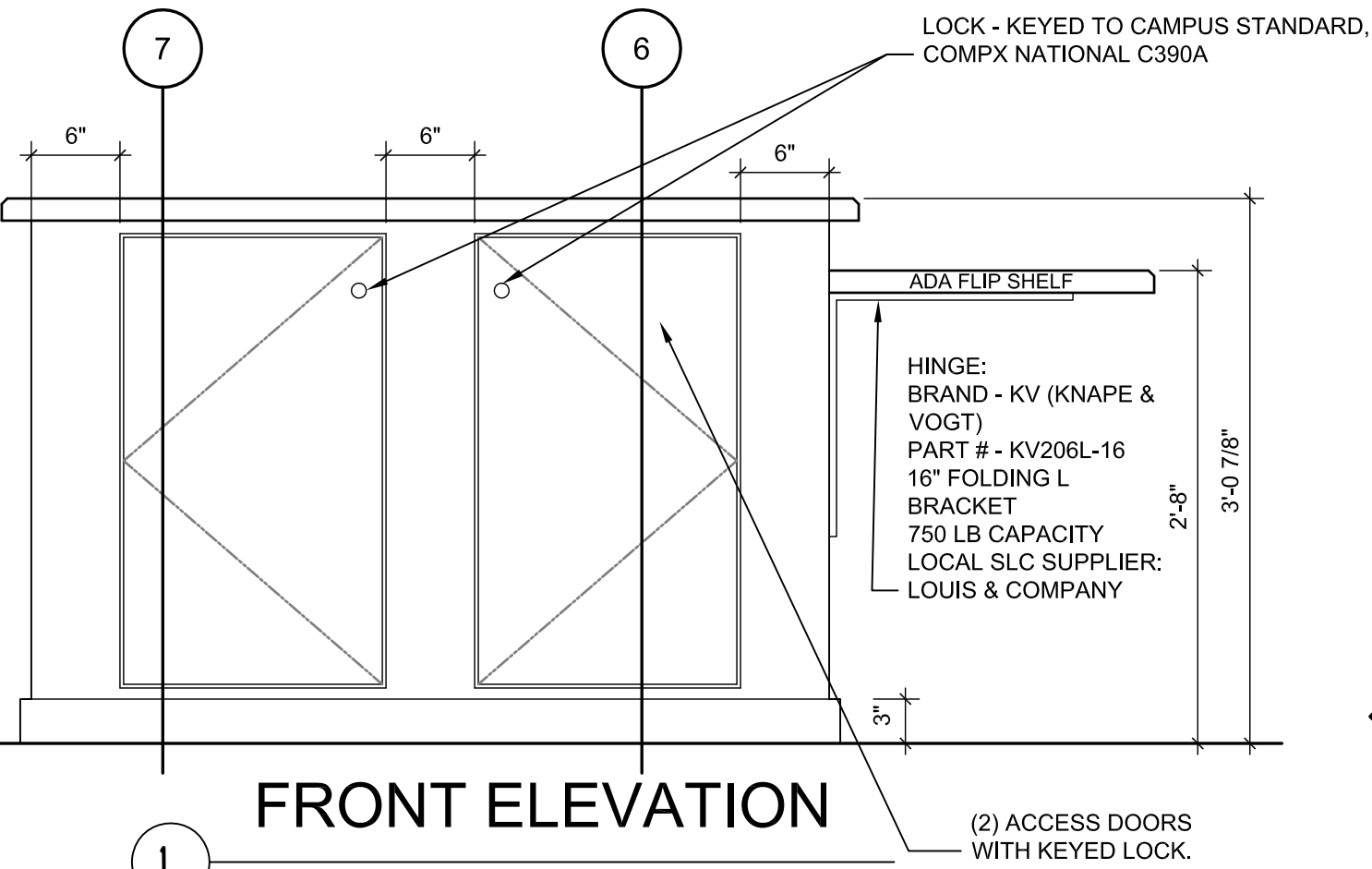


**SECTION**

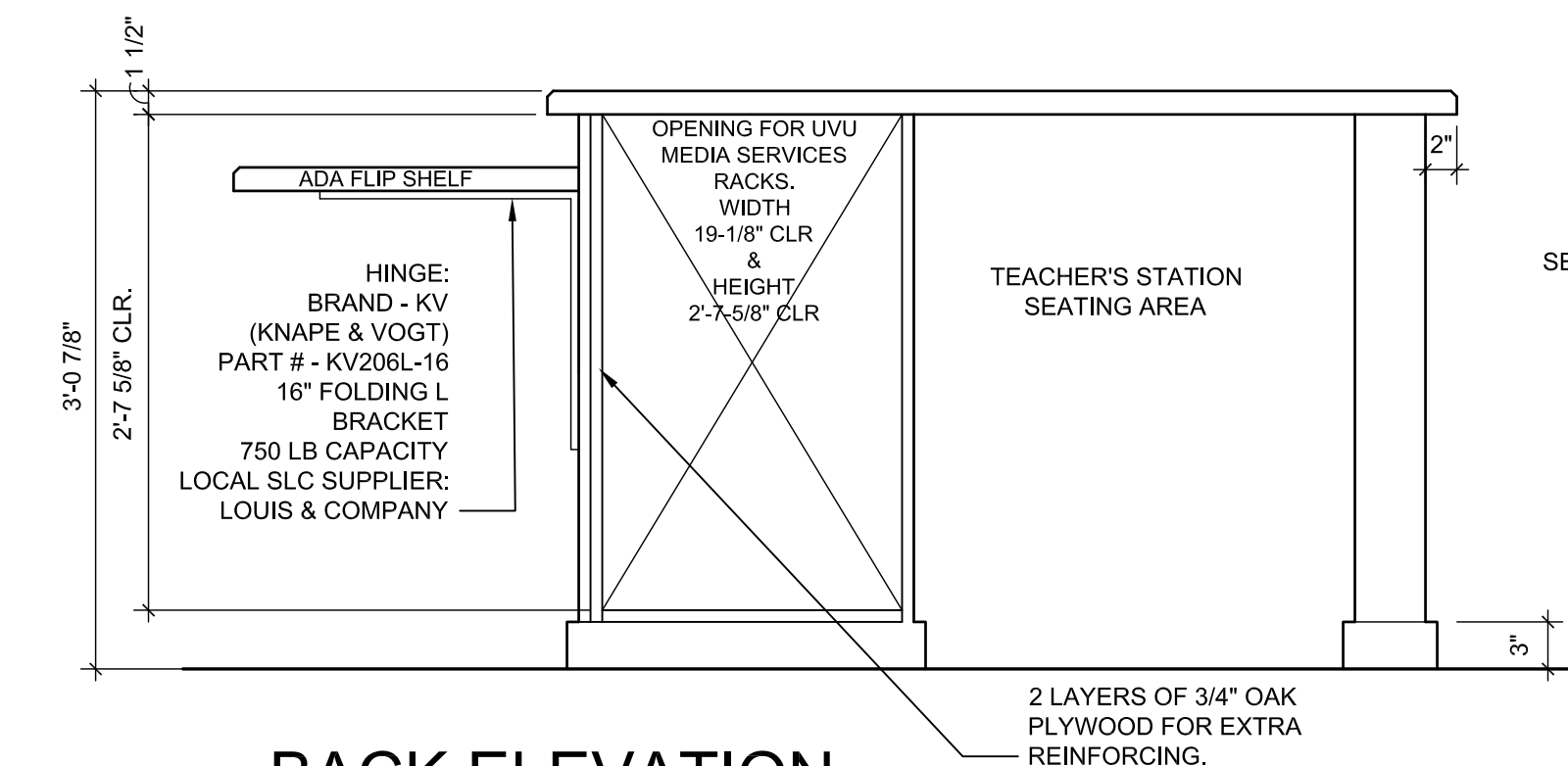
7

1"=1'-0"

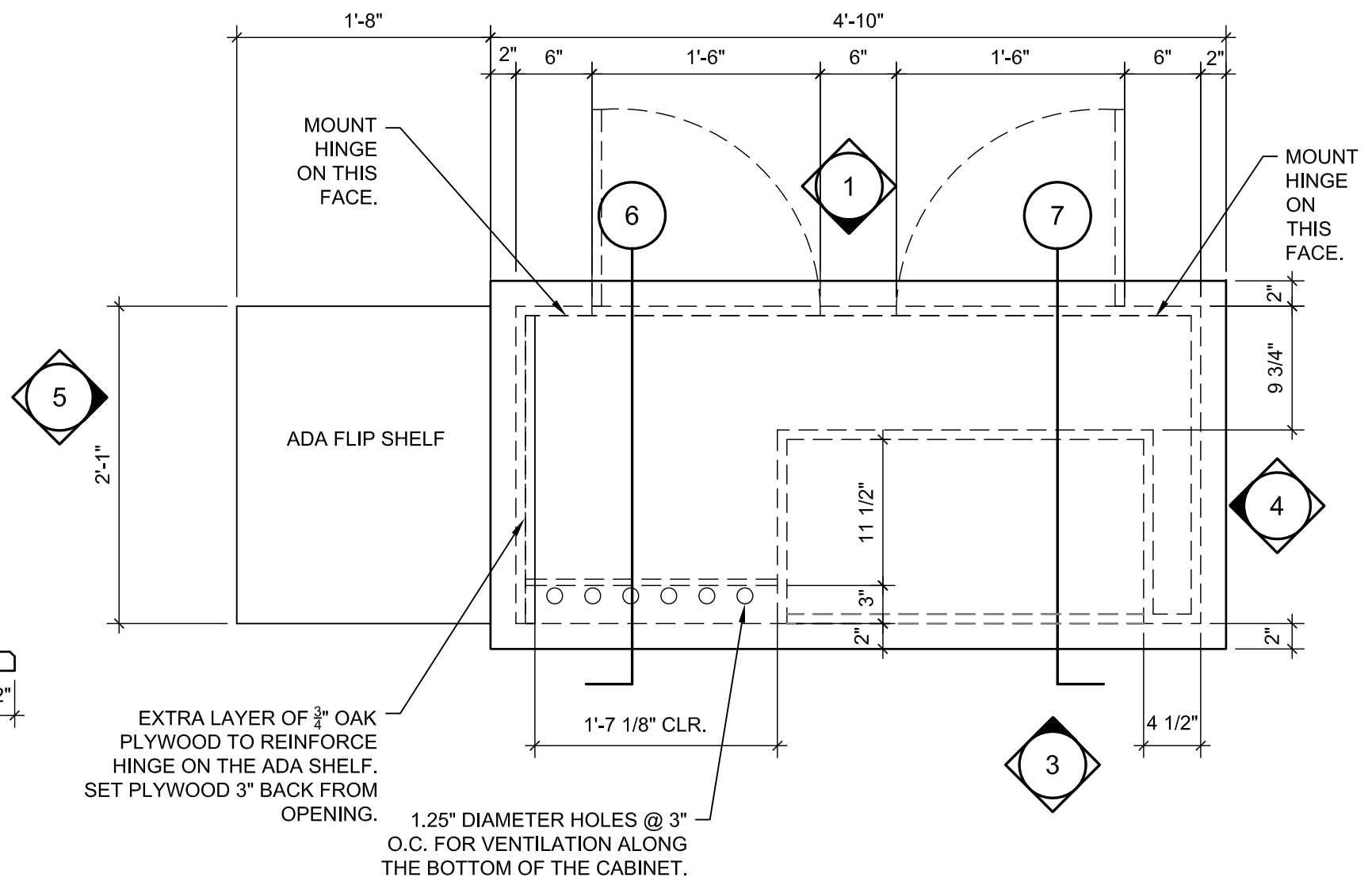
### **8.1.2 DESK STYLE FORM-FACTOR (RACK ON LEFT, KNEE SPACE ON RIGHT)**



FRONT ELEVATION



BACK ELEVATION



FLOOR PLAN

FINISHES

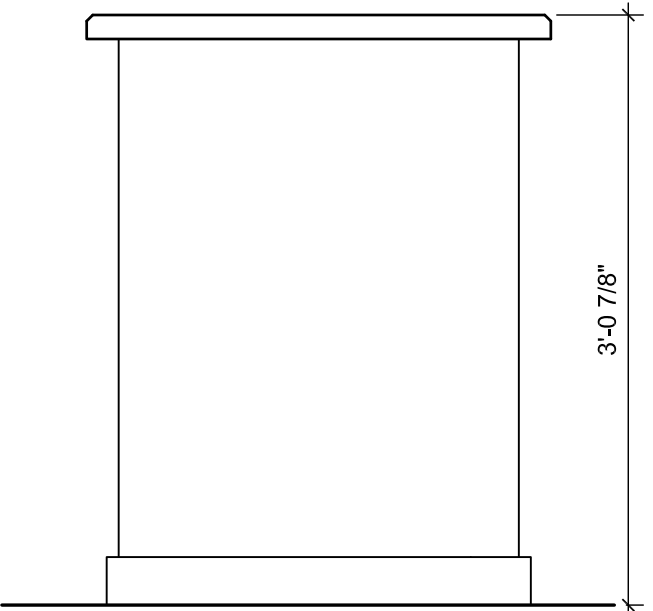
COUNTER:  $\frac{3}{4}$ " WHITE OAK PLYWOOD WITH HDWD OAK BEVELED EDGES,  
NATURAL FINISH.

TEACHER STATION VERTICAL PANELS:  $\frac{3}{4}$ " WHITE OAK PLYWOOD, NATURAL FINISH.

3" BASE:  $\frac{3}{4}$ " HDWD WHITE OAK, NATURAL FINISH.

NOTES

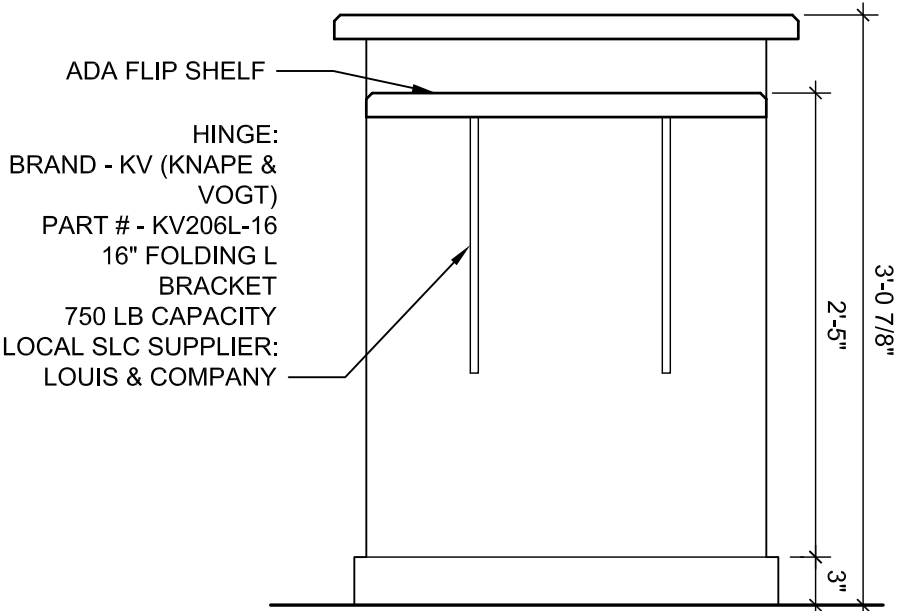
THE DIRECTION OF THE GRAIN TO BE THE SAME ON FRONT, BACK, SIDES & BASE.  
PROVIDE CUTOUTS IN THE TOP SURFACE AND THE LOCATION & SIZES WILL BE  
COORDINATED WITH UVU MEDIA SERVICES.



**SIDE ELEVATION**

4

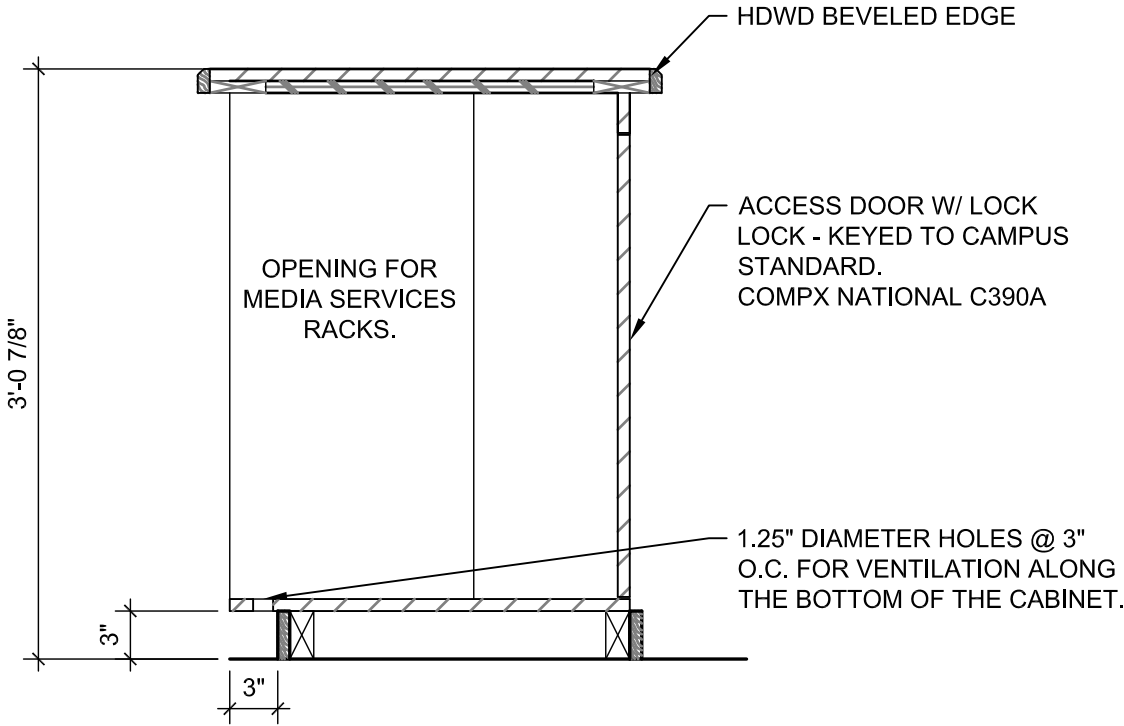
1"=1'-0"



**SIDE ELEVATION**

5

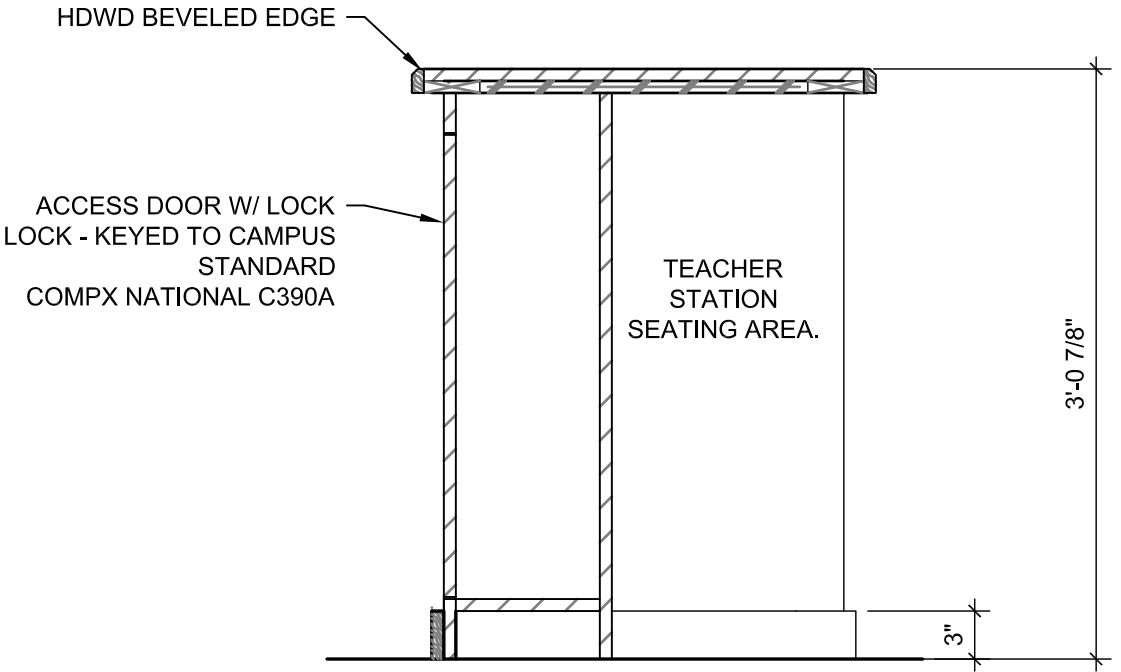
1"=1'-0"



**SECTION**

6

1"=1'-0"

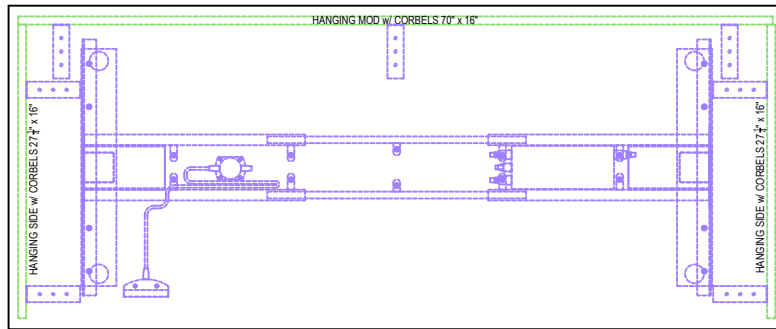


**SECTION**

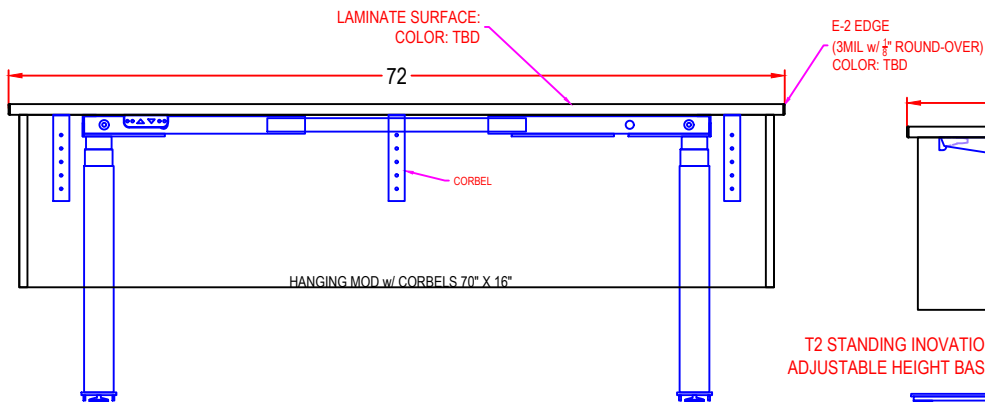
7

1"=1'-0"

### 8.1.3 SIT-STAND STYLE

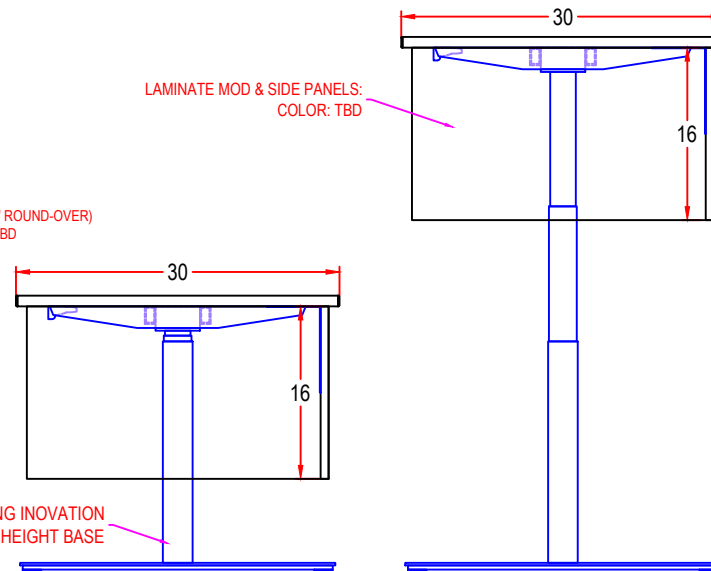


TOP VIEW

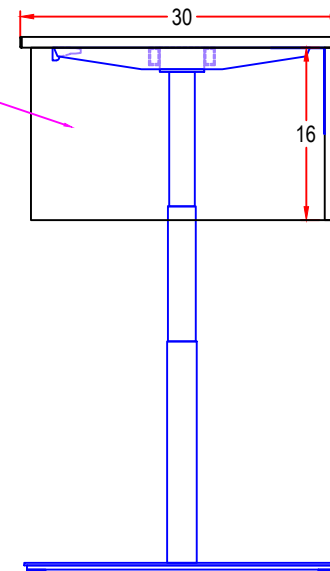


BACK VIEW



**SIT-STAND DESK  
w/ ADJ HEIGHT BASE  
30" x 72" x ADJ.  
w/ HANGING MODESTY  
AND SIDE PANELS**



SIDE VIEW DOWN



SIDE VIEW DOWN

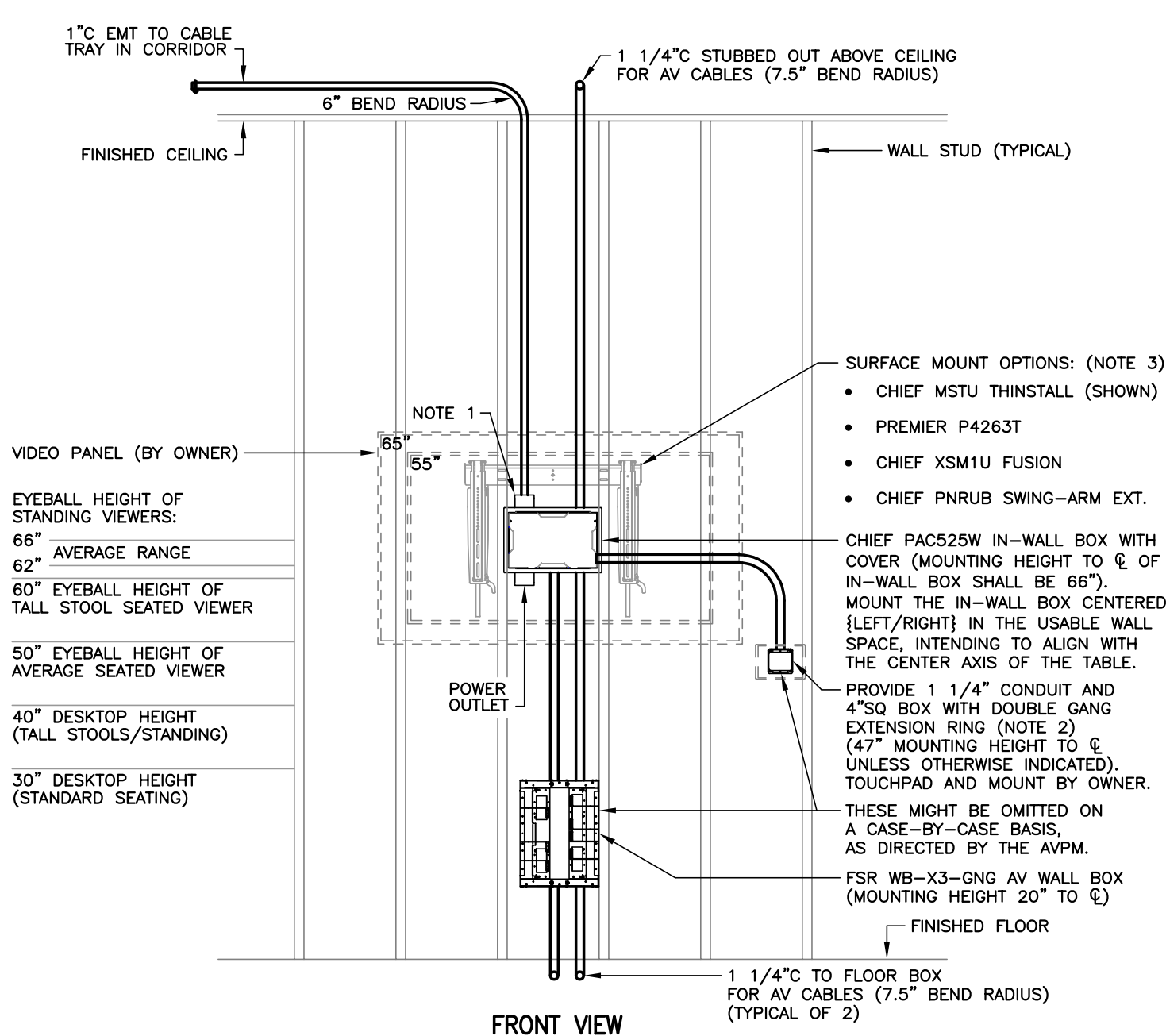
<b>Title:</b> SIT-STAND DESK w/ ADJ HEIGHT BASE 30" x 72" x ADJ. w/ HANGING MODESTY AND SIDE PANELS	<b>Cost:</b> \$	<b>Date:</b> 2/26/2021	<b>Approved:</b> X	<b>Customer:</b> UVU - FOLTON LIBRARY TRAVIS TASKER	<b>Revision Date:</b>	<b>UTAH DEPARTMENT OF CORRECTIONS</b>   UTAH CORRECTIONAL INDUSTRIES 14072 S. W. 1000 E. Suite 100 Midvale, UT 84047 (801) 576-7700 Fax: (801) 522-9733	<b>NOTICE:</b> This drawing is the property of UCI and contains information that is top secret, confidential, or otherwise restricted. Reproduction or copying of this drawing in whole or in part is prohibited without the written consent of the Owner and for Approval.
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## **8.2 Video Panel Mounting Drawings**

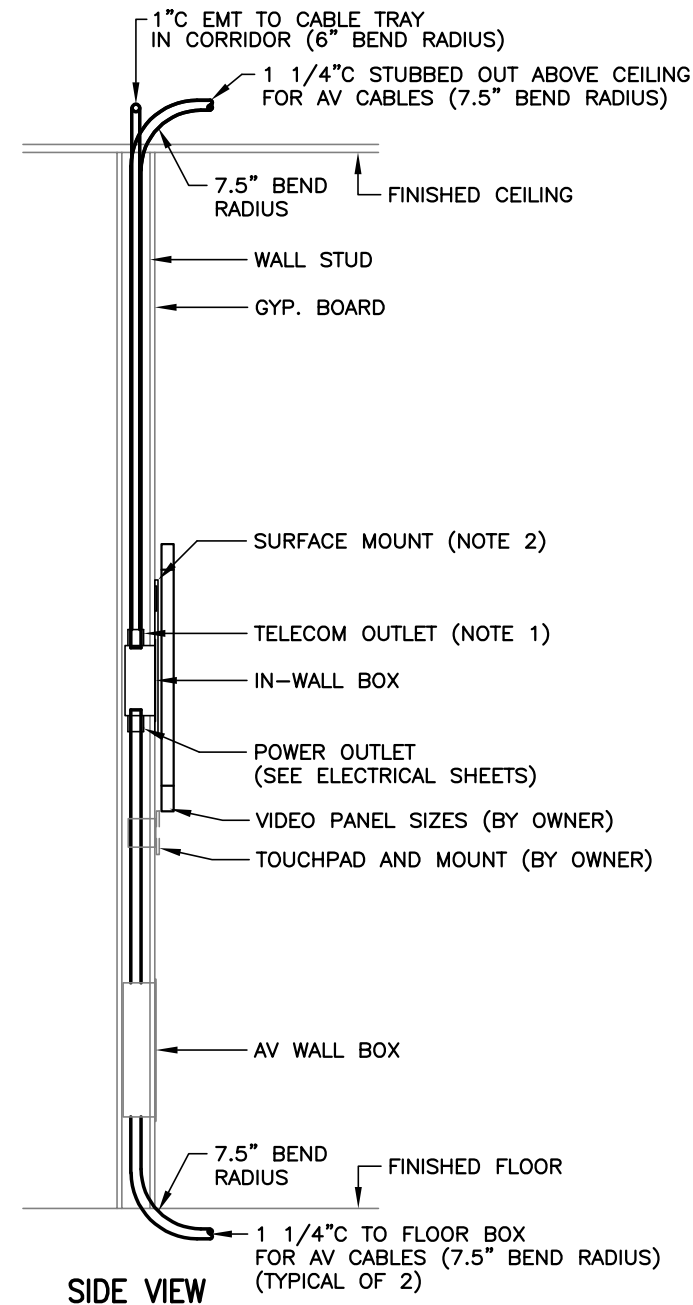
The following pages show two different solutions for video panel mounting used at UVU. These are in addition to the two other solutions shown in section 5.6.2.1.4.1 Presentation Wall Box and Conduit Details, above. The Designer shall inquire with the UVU AVPM regarding which solution or combination of features shall be used in video panel mounting application for each given project:

### **8.2.1 SURFACE MOUNTING**





**DETAIL 1/ET503**  
**VIDEO PANEL SURFACE MOUNTING**  
**FRONT VIEW**  
 SCALE: 1/2"=1'-0"



**DETAIL 2/ET503**  
**VIDEO PANEL SURFACE MOUNTING**  
**SIDE VIEW**  
 SCALE: 1/2"=1'-0"

**GENERAL NOTES:**

- A. UNLESS OTHERWISE INDICATED, THE STANDARD TELECOMMUNICATION OUTLET SHALL CONSIST OF TWO PLENUM-RATED CAT6A CABLES (WHITE) INSTALLED IN A 4 11/16" BOX WITH A 1" EMT CONDUIT (WITH INSULATED THROAT BUSHINGS AND BONDING LUGS) ROUTED BETWEEN THE OUTLET AND THE CABLE TRAY.
- B. THE CONDUIT SWEEP BEND RADIUS FOR ALL TELECOMMUNICATIONS AND AUDIO VISUAL APPLICATIONS SHALL BE 6X THE CONDUIT TRADE SIZE FOR CONDUITS 1 1/2" AND SMALLER AND 10X FOR 2" AND LARGER. PROVIDE FACTORY SWEEPS FOR 2" AND LARGER (DO NOT FIELD-BEND 2" AND LARGER CONDUITS).
- C. PROVIDE PULL STRINGS IN ALL CONDUITS BEFORE CABLES ARE PULLED INTO THEM.

**SHEET NOTES:**

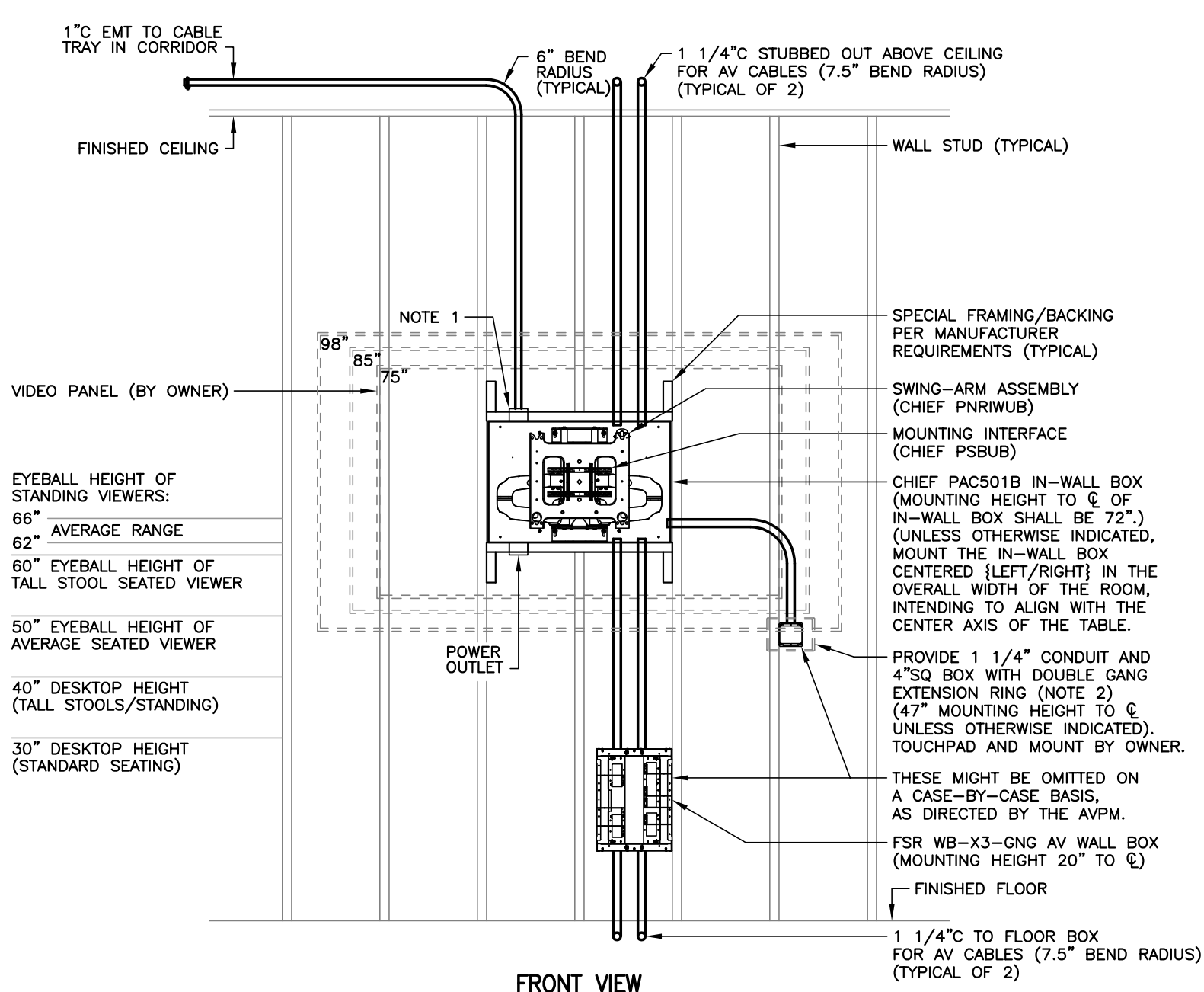
1. PROVIDE SINGLE GANG DEEP HANDY BOX AND SINGLE GANG FACEPLATE (SIEMON MX-FP-S-06-02) FOR TELECOM OUTLET INTEGRATED INTO SIDEWALL OF IN-WALL BOX AND PROVIDE 2 CAT6A CABLES. SEE DETAIL 1/ET201 FOR OTHER REQUIREMENTS.
2. CONTACT OWNER'S AUDIO-VISUAL REPRESENTATIVE FOR INSTRUCTIONS REGARDING THE TOUCH PANEL MOUNTING LOCATION.
3. CONTACT OWNER'S AUDIO-VISUAL REPRESENTATIVE FOR INSTRUCTIONS REGARDING THE SPECIFIC MOUNT REQUIRED FOR THIS APPLICATION.

**FOR SPECIAL CASE REMODEL PROJECTS, ONLY UNDER APPROVAL BY THE AVPM:**

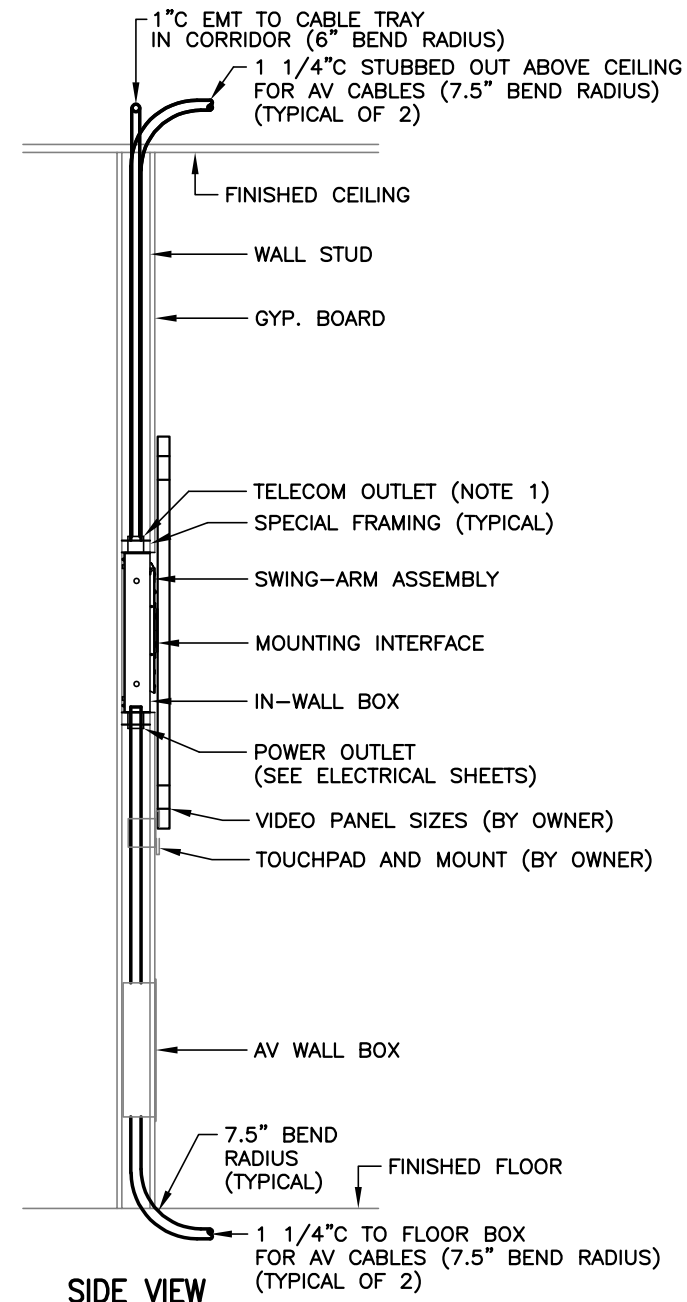
- A. PROVIDE A SINGLE GANG POWER OUTLET.
- B. PROVIDE A SINGLE GANG LOW VOLTAGE CUT-IN BRACKET (NO BOX) WITH 2 CAT6A CABLES, TERMINATED IN A FACEPLATE. SEE SHEET ET201 FOR MORE INFORMATION.
- C. PROVIDE A DOUBLE GANG LOW VOLTAGE CUT-IN BRACKET (NO BOX) AND BLANK FACEPLATE.
- D. LOW VOLTAGE CABLES WILL BE FISHED THROUGH THE INTERSTITIAL WALL SPACE.
- E. MOUNT THESE DEVICES CENTERED {LEFT/RIGHT} IN THE USABLE WALL SPACE, INTENDING TO ALIGN WITH THE CENTER AXIS OF THE TABLE. MOUNTING HEIGHT SHALL BE 75" TO CENTERLINE OF FACEPLATES.

#	DATE	DESCRIPTION
##	XX/XX/20XX	DESCRIPTION-01
##	XX/XX/20XX	DESCRIPTION-02

## 8.2.2 RECESSED MOUNTING



**DETAIL 1/ET504**  
**VIDEO PANEL RECESSED MOUNTING**  
**FRONT VIEW**  
 SCALE: 1/2"=1'-0"



**DETAIL 2/ET504**  
**VIDEO PANEL RECESSED MOUNTING**  
**SIDE VIEW**  
 SCALE: 1/2"=1'-0"

**GENERAL NOTES:**

- UNLESS OTHERWISE INDICATED, THE STANDARD TELECOMMUNICATION OUTLET SHALL CONSIST OF TWO PLENUM-RATED CAT6A CABLES (WHITE) INSTALLED IN A 4 11/16" BOX WITH A 1" EMT CONDUIT (WITH INSULATED THROAT BUSHINGS AND BONDING LUGS) ROUTED BETWEEN THE OUTLET AND THE CABLE TRAY.
- THE CONDUIT SWEEP BEND RADIUS FOR ALL TELECOMMUNICATIONS AND AUDIO VISUAL APPLICATIONS SHALL BE 6X THE CONDUIT TRADE SIZE FOR CONDUITS 1 1/2" AND SMALLER AND 10X FOR 2" AND LARGER. PROVIDE FACTORY SWEEPS FOR 2" AND LARGER (DO NOT FIELD-BEND 2" AND LARGER CONDUITS).
- PROVIDE PULL STRINGS IN ALL CONDUITS BEFORE CABLES ARE PULLED INTO THEM.

**SHEET NOTES:**

- PROVIDE SINGLE GANG DEEP HANDY BOX AND SINGLE GANG FACEPLATE (SIEMON MX-FP-S-06-02) FOR TELECOM OUTLET INTEGRATED INTO SIDEWALL OF IN-WALL BOX AND PROVIDE 2 CAT6A CABLES. SEE DETAIL 1/ET201 FOR OTHER REQUIREMENTS.
- CONTACT OWNER'S AUDIO-VISUAL REPRESENTATIVE FOR INSTRUCTIONS REGARDING THE TOUCH PANEL MOUNTING LOCATION

FOR SPECIAL CASE REMODEL PROJECTS, ONLY UNDER APPROVAL BY THE AVPM:

- PROVIDE A SINGLE GANG POWER OUTLET.
- PROVIDE A SINGLE GANG LOW VOLTAGE CUT-IN BRACKET (NO BOX) WITH 2 CAT6A CABLES, TERMINATED IN A FACEPLATE. SEE SHEET ET201 FOR MORE INFORMATION.
- PROVIDE A DOUBLE GANG LOW VOLTAGE CUT-IN BRACKET (NO BOX) AND BLANK FACEPLATE.
- LOW VOLTAGE CABLES WILL BE FISHED THROUGH THE INTERSTITIAL WALL SPACE.
- MOUNT THESE DEVICES CENTERED {LEFT/RIGHT} IN THE USABLE WALL SPACE, INTENDING TO ALIGN WITH THE CENTER AXIS OF THE TABLE. MOUNTING HEIGHT SHALL BE 75" TO CENTERLINE OF FACEPLATES.

#	DATE	DESCRIPTION
##	XX/XX/20XX	DESCRIPTION-01
##	XX/XX/20XX	DESCRIPTION-02