WASHINGTON STATE UNIVERSITY

AUDIO/VISUAL DESIGN GUIDE

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1 Preface

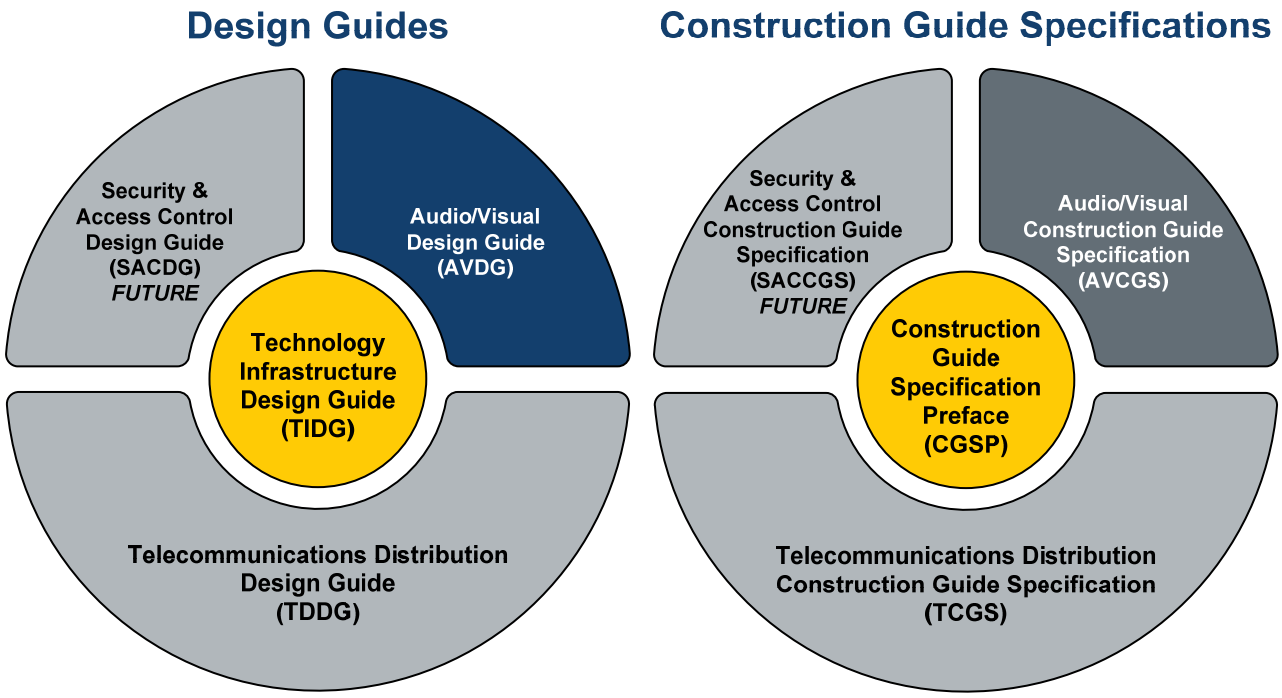
1.1 Introduction

A. The Audio/Visual Design Guide (AVDG) is written to communicate the requirements of the Washington State University Pullman (WSUP) campus for the design and installation of audio/visual systems and infrastructure at WSUP 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 WSUP where audio/visual systems currently exist or will be installed.
- It is also intended for other low voltage telecommunications Contractors installing audio/visual systems at WSUP facilities.
- This document also applies to infrastructure designed and installed by WSUP staff, when a formal design is not developed.

B. The AVDG belongs to a set of documents (depicted below) that comprise the standard design and installation practices for all facets of technology infrastructure and systems at WSU's Pullman Campus.

Technology Infrastructure Standards Document Set



C. The Technology Infrastructure Design Guide (TIDG), contains information common to all of WSUP's Design Guides.

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 WSUP in MS Word format) and then shall make any project-specific edits 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.

E. Audio/visual systems designed for WSUP are expected to support and integrate voice, data, and video communications with common media (fiber optic and unshielded twisted pair (UTP) copper cable).

F. 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.

G. This document was prepared by Summit Engineering & Consulting, P.S. and by the Information Technology Services department at the Pullman campus of Washington State University. As technology and needs evolve, the document will be periodically updated.

- February 6, 2015 – Originally published

1.2 Standards and Guidelines

A. Generally speaking, WSUP follows guidelines and standards endorsed or published by the International Communications Industries Association, Inc. (www.infocomm.org).

B. Audio/visual system designers and installers shall adhere to the following guidelines for audio/visual system design:

- *Basics of Audio and Visual Systems Design,* published by the International Communications Industries Association, Inc. (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).

- *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).

C. While lighting and lighting control is to be managed under the current WSUP 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.

D. Audio/visual infrastructure shall fully comply with the current WSUP AVDG (this document), the WSUP 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 using materials from the current product lines of the manufacturers upon which WSUP has standardized.

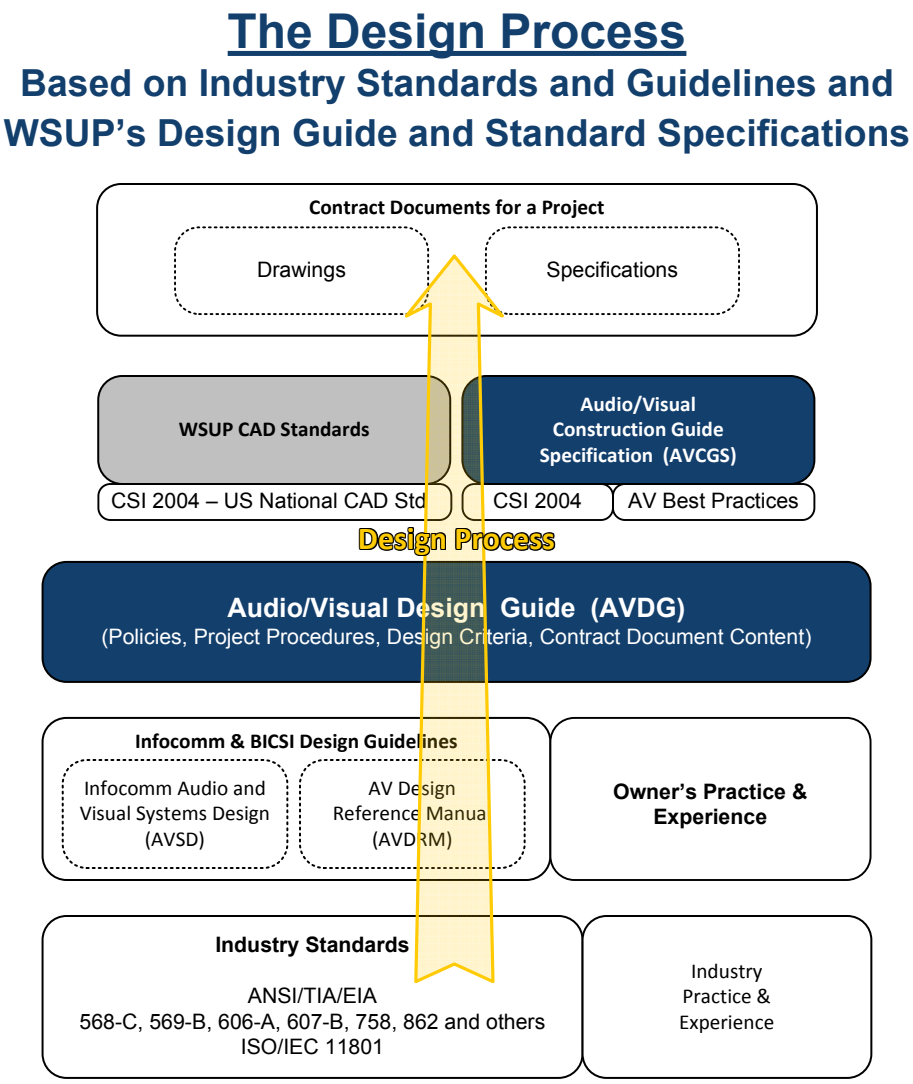
G. The Designer shall seek approval for designs that are not consistent with WSUP AVDG requirements. Standards Variance Requests (SVR) to deviate from industry standards or WSUP design solutions will be considered on a case-by-case basis by the WSUP Audio/Visual Project Manager (AVPM). Designers shall contact the AVPM to discuss proposed alternatives before spending significant time pursuing the option. See the TIDG for more information about the roles of WSUP technology project managers.

H. The Designer is required to incorporate only the manufacturers listed in this document into the design (unless otherwise directed by WSUP) 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.

I. The requirements contained in the AVDG are considered to be in addition to those listed in *Instructions for Architects and Engineers Doing Business with Division of Engineering and Architectural Services* and the *State of Washington Conditions of the Agreement*. Where the requirements differ, the issue shall be brought to the attention of the WSUP Facilities Services Project Manager – otherwise, 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 WSUP documents (AVDG, AVCGS), and the project-specific Construction Documents. Audio/visual infrastructure at WSUP 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 WSUP AVDG.



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 WSUP'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 comprised of drawings and a system specification that properly incorporates 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.

1.4 Document Structure

The AVDG is organized in the following sections:

A. 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.

B. The **WSUP Audio/Visual Policies** section defines and discusses considerations for internal WSUP stakeholders as they plan the instructional functionality of a new or remodeled building.

C. The **Project Procedures** section discusses the activities that should occur during each phase of a project.

D. The **Physical Infrastructure for A/V** section describes the physical infrastructure components that are required to support audio/visual systems for WSUP.

E. 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 WSUP.

F. The **Application Spaces** section describes how the components introduced in the A/V Systems section shall be deployed in specific room types.

G. The **Construction Document Content** section describes the content that a complete set of drawings and specifications is required to contain.

1.5 WSUP Personnel

A. There are three specific WSUP personnel roles referenced in this document. The Designer shall interact with these individuals as direct points of contact:

- **Facilities Services Project Manager (FSPM**) – responsible for project management, project oversight, and project budget.

- **Audio/Visual Project Manager (AVPM)** – responsible for oversight of all audio/visual technology considerations, including interpretation of the requirements of this document.
- **Information Technology Project Manager (ITPM)** – responsible for oversight of all IT and telecommunications technology considerations, including interpretation of the requirements of the TDDG.

B. The WSUP Audio/Visual Policies section of this document applies specifically to WSUP personnel. In addition to the WSUP Audio/Visual Policies section, WSUP 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 WSUP facilities.

C. WSUP personnel, should be familiar with these requirements with respect to their application on both large-scale audio/visual distribution projects and small-scale projects. These requirements also apply to 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 adapt the AVCGS specifications in the course of designing audio/visual systems at WSUP 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. Washington State University is authorized to edit and adapt the document for University purposes.

Summit Engineering & Consulting has authored similar documents for many other organizations. The 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 WSUP Audio/Visual Policies

The following policies apply to anyone that may be involved in the design, installation, maintenance or use of audio/visual systems at a WSUP facility.

2.1 Getting Help from AMS

All requests for A/V assistance should be submitted to Academic Media Services (AMS):

- Call 509.335.7336
- Email ams@wsu.edu

When your request is received, it will be evaluated by AMS and assigned to the appropriate specialists to address your needs.

AMS is most efficient in meeting your needs when you work through our normal channels. We are committed to applying our best efforts to address each request in a timely and professional manner.

2.1.1 DO NOT ALTER CABLING OR EQUIPMENT

Audio/visual equipment and its associated cabling shall not be altered by anyone outside AMS. Doing so will cause interoperability problems with equipment and may void manufacturer warranties.

Please do not:

- Remove installed connectors
- Attempt to access locked panels
- Remove patch cables

Anyone needing help with cabling should contact AMS for assistance.

2.2 Facilities Services

The following information is intended to assist representatives in the Facilities Services department as spaces are planned and during the construction and commissioning of buildings.

2.2.1 AUDIO/VISUAL FEATURES IN BUILDING SPACES

In the life of a building, technology advances occur, systems become obsolete, and the cabling and equipment components of the technology infrastructure will be changed several times. In order to keep the life-cycle costs low, it is essential that spaces and pathways supporting technology infrastructure are properly sized, properly located, and remain accessible.

Please use the following guidelines when considering the audio/visual features of spaces in new projects:

2.2.1.1 GENERAL UNIVERSITY CLASSROOMS

A General University Classroom (GUC) has presentation audio/visual and audio amplification features. It does not include the equipment needed for video conferencing.

This space will have the following:

- Audio/visual equipment rack (housed inside an instructor podium)
- Whiteboards
- Projection surface & projector
- Cameras
- Document camera
- Blu-ray/DVD player
- Wireless lapel microphone or ceiling-hung microphones
- VOIP telephone
- Speakers
- Assistive listening system
- Instructor computer, with
    - Room Control Panel application
    - Lecture Capture application
    - Standard Office & Presentation software
- Acoustic wall treatment as required

2.2.1.2 ACTIVE LECTURE HALLS

Active Lecture Halls (ALH) are sometimes called “Flipped” or “SCALE-UP” classrooms, and typically include student workspace clusters with a video panel or projector for each cluster. In addition to the audio/visual features of a General University Classroom, they also contain:

- Additional video panels and/or projectors to display student computer images.
- Additional microphones and associated equipment as needed.
- Wireless/wired collaborative screen-sharing.

2.2.1.3 AUDITORIUMS

In addition to the audio/visual features of a General University Classroom, an Auditorium will also have the audio/visual features listed below:

- Digital Signal Processor (audio)
- Different audio amplifier(s) with sufficient power to support the larger number of speakers required for the space
- Additional speakers
- Multiple projection surfaces & multiple projectors
- Acoustic wall treatment

2.2.1.3.1 AUDIO/VISUAL EQUIPMENT ROOM

A 10’ x 9’ (minimum) A/V Equipment Room will be required for larger auditoriums to host one or more equipment cabinets.

2.2.1.4 DISTANCE EDUCATION CLASSROOMS

Distance Education Classrooms are designed to support two-way video conferencing with other classrooms at campuses around the State. In addition to the audio/visual features of General University Classrooms, Distance Education Classrooms will also have the audio/visual features listed below:

- Additional video panels
- Additional cameras
- Ceiling-hung microphones
- Acoustic wall treatment

2.2.1.5 BREAKOUT ROOMS

Breakout Rooms are spaces for several people to meet. A Breakout Room has a video panel with integrated speakers for presentation audio/visual features, including:

- Video panel (with integrated speakers)
- External HDMI connection for user devices

Breakout Rooms do not include the equipment needed for video conferencing. However, if a user's mobile device is equipped with a camera and microphone, then the room could be used for video conferencing.

2.2.1.6 PRESENTATION CONFERENCE ROOMS

It is recommended that a Conference Room (either Presentation or Collaborative) be provided for each major floor in a building.

Presentation Conference Rooms have the following audio/visual features:

- Audio/visual equipment rack (housed inside built-in casework)
- Video panel(s) or projector(s) and projection surface(s)
- Document camera
- VOIP telephone
- Wireless/wired collaborative screen-sharing system
- Speakers
- Assistive listening system
- Room control panel
- Acoustic wall treatment

2.2.1.7 COLLABORATIVE CONFERENCE ROOMS

In addition to the audio/visual features in a Presentation Conference Room, Collaborative Conference Rooms have the following audio/visual features:

- Video conferencing equipment
- Video panel
- Cameras
- Microphone(s) (desktop, lapel, and/or ceiling-hung)

2.2.1.8 LARGE CONFERENCE ROOMS

Large Conference Rooms (Presentation or Collaborative) have the same audio/visual features as regular Conference Rooms. However, it is usually necessary to expand the audio/visual features, for example:

- Additional video panels
- Additional audio signal processing
- Additional speakers
- Additional ceiling-hung microphones

2.2.1.9 INSTRUCTIONAL MEDIA STUDIOS

Instructional Media Studios are used to prepare audio/visual media for instructional and or training purposes. Lectures or demonstrations can be recorded (both audio and video) and streaming media files can be produced in this space.

The space is sized similar to an office and will require a movable table.

The following audio/visual features are required:

- Audio/visual equipment rack (floor-standing)
- Computer with two video panels for lecture capture and presentation software
- Ultra-short-throw projector and projectable whiteboard surface
- Cameras
- Document camera
- Blu-ray/DVD player
- VOIP telephone
- Speakers
- Microphone (lapel, desktop or ceiling-hung)
- Acoustic wall treatment
- Specialty lighting as needed

2.2.1.10 DIGITAL SIGNAGE

Video panels are wall-mounted and used to display announcements and other information.

Where applicable, the video panels may also be provided with touch-interaction capability.

WSUP uses a variety of content sources to display information on digital signage. Consult with the AVPM regarding the appropriate solution for each application.

2.2.1.11 OUTDOOR PLAZA / GATHERING SPACES

Outdoor public gathering spaces can be used for group events requiring public address systems to communicate with larger groups. The following features are needed:

- Power outlets
- Speakers mounted on poles
- Wireless network access points

2.2.2 SYSTEM INTEGRATION

Significant technical advances have been made in recent years resulting in numerous systems that now communicate with audio/visual systems and with networks. The following are examples of systems or processes that should be integrated with audio/visual systems:

- Window coverings/sunshades (in conference rooms)
- Folding walls (to divide rooms)
- Lighting control systems

These systems shall use wired-network connectivity. Do not expect wireless networking to provide the capacity, reliability or security required to handle these systems.

It is therefore crucial to the success of these systems that Facilities Services coordinate with AMS and ITS during the planning and design phases to ensure that adequate network and infrastructure are included in the design.

2.2.3 DOCUMENTATION

2.2.3.1 AS-BUILT / RECORD DRAWINGS

When a construction project is completed, the as-built drawings and record drawings need to be made available to AMS and ITS as follows:

- Full-size hardcopy printed drawings – the portion of the drawing set that is applicable to technology. The full set is not required, just the sheets that depict the technology features of the project.

- The A/V Contractor's as-built drawings are extremely important for maintenance of the A/V systems. Please obtain both hardcopy and CAD files of these drawings.

- The A/V Contractor's software configuration files and software settings (used in the A/V equipment) are also required for WSU to maintain the A/V systems. Please obtain the uncompiled, editable configuration files and software settings for each A/V component.

3 Project Procedures

The Project Procedures section contains guidelines for architects, engineers, and audio/visual systems designers regarding the procedures that WSUP 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 the requirements in the *State of Washington Conditions of the Agreement* or the *State of Washington Instructions for Architects and Engineers*, but rather to complement them, providing additional requirements that apply specifically to audio/visual design projects at WSUP facilities.

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

3.1 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. WSUP’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 WSUP.

B. 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
- AMX Certified Expert (ACE) from AMX (See **http://amx.com/training/**)

C. 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 WSUP 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.

3.2 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 or obstruct the projection path.
- Make sure that pendant lighting does not obstruct the projection path.
- 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 designer of the HVAC systems, to provide adequate cooling and ventilation for A/V equipment.

4 Physical Infrastructure for A/V

This section defines and describes the physical infrastructure components that are required to support audio/visual systems for WSUP. The Designer shall design these into the various application spaces (classrooms, conference rooms, etc.) in WSUP facilities as described in Section 6. The Designer shall incorporate this content into the construction drawings and specifications.

4.1 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 WSUP 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, light gray, or light blue.

4.2 Furniture

4.2.1 INSTRUCTOR'S PODIUM

4.2.1.1 CODE/REGULATORY CONSIDERATIONS

Section 802.1 in the 2010 ADA Standards for Accessible Design addresses the requirements for wheelchair-accessible spaces. In order to meet this requirement, adjustable-height podiums 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 podium beneath the work surface, there is not space for a wheelchair to roll underneath.

Exception Advisory 226.1 of the 2010 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.

4.2.1.2 DESIGN GUIDELINES

The Instructor's podium shall be custom-designed by the Architect. On the back side of the podium (facing the classroom) the podium shall have a hinged door to allow access to the A/V equipment mounted inside the cabinet portion of the podium.

The space surrounding the podium shall comply with the 2010 ADA Standards for Accessible Design.

WSUP will accommodate wheelchair-bound instructors by specifying a work surface on the side of each podium, sized 30" wide (minimum) at a height of 34". Preferably this work surface would fold out from a hinged attachment on the podium, but it could also be a table beside the podium. 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.

WSUP may wish to install a cable access cubby in the tops of some podiums. 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, and audio/visual inputs for each application.

- WSUP currently uses products from Kramer and AMX for this purpose.

The Designer shall coordinate with WSUP FS Interior Designers to specify the podium stain color and desktop surface materials for a given project.

See Appendix 8.1 for example drawings of podium furniture, features, and space arrangement.

4.2.2 BUILT-IN CASEWORK

Built-in dual-door casework is used to host A/V equipment in some spaces (such as conference rooms). The casework shall be floorless, with no cabinet face structure behind the door, allowing an A/V equipment rack to roll out of the casework for service.

The internal clear dimensions shall be 34" high, 30" to 36" wide and 30" deep.

The casework must provide adequate ventilation to prevent overheating of the equipment inside. The following two features shall be provided for air circulation:

- A louvered vent on top of the casework door – 12" x 2".
- A 1" gap between the bottom of the casework door and the floor.

An open-faced junction box (18" high x 14" wide x 4" deep) shall be recessed into the wall behind the casework to terminate pathways and/or cabling serving A/V applications.

See Appendix 8.1.2, *Conference Room Casework* for example drawings of casework for A/V applications.

4.2.3 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 a recording session.

4.2.4 CONFERENCE TABLES

Conference tables shall be designed by the Architect to meet the needs of the room. The table shall be designed to support cable routing from a floor box to a cable cubby 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.

WSUP requires that a cable access cubby 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 cubby in the center of the table.
- Tables longer than 15' require two cubbies, one each at the one-third points along the length of the table.
- WSUP currently uses products from Kramer and AMX for this purpose.

When selecting the conference table, consider how cables for wired network, desktop microphones, A/V inputs, and wiring for power 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.

4.3 Equipment Racks and Cabinets

WSUP prefers racks and cabinets from Lowell or Middle-Atlantic.

4.3.1 GROUNDING / BONDING

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

4.3.2 FIXED RACKS IN PODIUMS

One or two small fixed racks (14 rack units) shall be mounted inside instructor podiums. Sliding rails are not used, because the podium shall have a rear access door(s) as described above.

WSUP prefers to use the Lowell LXR-1421, which provides 14-16 units of rack space.

4.3.3 RACKS IN CASEWORK

A mid-height rack (10 rack units minimum) shall be used to host equipment stored inside built-in casework for applications such as conference rooms.

For this application, WSUP prefers to use either:

- Lowell LDTR-1018
- Middle Atlantic CFR-10-18

4.3.4 EQUIPMENT CABINETS

A 6-foot tall cabinet or two-post open rack ("relay rack") 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.

4.4 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.

4.4.1 WIRE BASKET CABLE TRAY

A wire basket cable tray may 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.

4.4.2 BOXES AND CONDUITS

A large junction box shall be provided above the ceiling (near the A/V Equipment Rack). The box shall be sized 12" x 12" x 6" (minimum dimensions), shall have a screw-cover, and shall be accessible in the ceiling space to work with cabling and to add future conduits.

Device boxes/outlet boxes serving A/V applications shall comply with WSUP'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 depth shall be 2 ½" 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
- For wall-mounted devices (such as speakers and assistive listening transmitters), provide a single gang faceplate with a ½" grommeted hole for cable pass-through.

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

- All conduits shall be 1" trade size minimum.

- Conduits intended to pass large connectors shall be sized accordingly – typically 1½" trade size or larger (depending on cable fill and the sizes of factory-terminated connectors).
- Provide a separate conduit for speaker wiring.

4.4.3 A/V JUNCTION PANEL

The A/V Junction Panel is a coverless junction box that shall be recess-mounted into the wall in the back of the built-in casework serving A/V cabinets. The A/V Junction Panel shall be sized 18"W x 14"H x 4"D.

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
- Above ceiling wire basket cable tray (if applicable).

4.4.4 A/V FLOOR BOXES

Large "oversize" floor boxes are required to accommodate the quantity of A/V cables, data cables, and power outlets that comprise A/V systems. Many A/V cables have limited bend radius due to the size and stiffness of the cables.

An example of a large floor box solution uses the following products from Spider Agile Technology (www.spideragiletechnology.com):

- Rough-in "Pour Box": AFB-701
- Floor Box Insert: AFB-704
- Floor Box Insert: AFB-706

5 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 WSUP. The Designer shall design these into the various application spaces (classrooms, conference rooms, etc.) in WSUP facilities as described in Section 6. The Designer shall incorporate this content into the construction drawings and specifications.

WSUP 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 WSUP 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 WSUP AVPM to select a replacement, preferably from the same manufacturer and product family as the listed equipment.
- Design the systems using this equipment or the WSUP-approved equivalent.

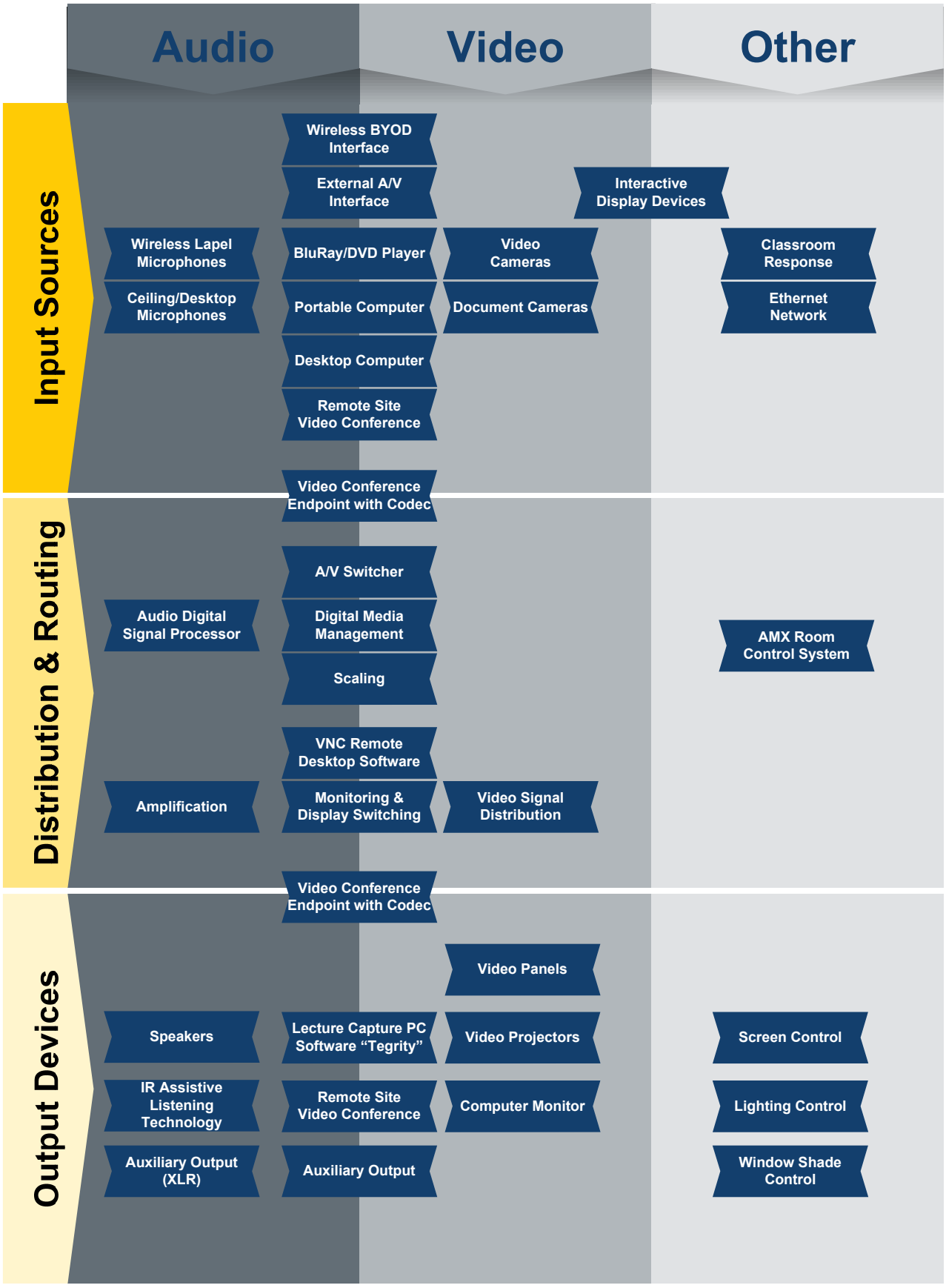
5.1 General

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

- Sourcing and Input
- Distribution and Routing
- Output

Also, audio/visual equipment can serve audio, video, and “other” functions.

The following diagram depicts the various types of devices that generally comprise WSUP’s audio/visual systems:


Audio
Video
Other
Input Sources
Wireless BYOD Interface
External A/V Interface
Interactive Display Devices
Wireless Lapel Microphones
BluRay/DVD Player
Video Cameras
Classroom Response
Ceiling/Desktop Microphones
Portable Computer
Document Cameras
Ethernet Network
Desktop Computer
Remote Site Video Conference
Video Conference Endpoint with Codec
Distribution & Routing
A/V Switcher
Audio Digital Signal Processor
Digital Media Management
AMX Room Control System
Scaling
VNC Remote Desktop Software
Amplification
Monitoring & Display Switching
Video Signal Distribution
Video Conference Endpoint with Codec
Output Devices
Video Panels
Speakers
Lecture Capture PC Software "Tegrity"
Video Projectors
Screen Control
IR Assistive Listening Technology
Remote Site Video Conference
Computer Monitor
Lighting Control
Auxiliary Output (XLR)
Auxiliary Output
Window Shade Control

5.2 Sourcing and Input Devices

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

5.2.1 MICROPHONES

5.2.1.1 CEILING-HUNG

Ceiling-hung microphones shall be digital, three-element devices from Polycom. 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 to 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.

The Polycom microphones WSUP currently uses cover a 15-foot radius area. Field-constructed cables for the Polycom microphones must be fabricated using STP CAT5e cable. Pay close attention to the manufacturer's instructions for cable pinout, which does not follow T568A or T568B rollover standards.

WSUP also uses a ceiling-box mounted Crown PZM-11 pressure zone microphone for some applications.

5.2.1.2 DESK-MOUNTED

The Designer shall inquire whether desktop devices are required, and if so, which of the following two options should be used for a given project:

- Option 1:

  Ceiling-hung microphones may be used. In these cases, the system shall be programmed to activate or mute the corresponding ceiling microphones with a desktop control interface.

- Option 2:

  Desktop microphones shall be Shure 392C. The system shall be programmed to activate or mute the microphone as the button is pressed.

Any desktop microphone use will require the consideration of wireless options and pre-approval of the WSUP AVPM on a case-by-case basis.

5.2.1.3 WIRELESS

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 with coordination of frequencies with nearby users.

The microphone shall be wired into the sound system to allow for voice reinforcement to the room without feedback. Volume adjustment for the microphone shall be immediately available to the instructor.

WSUP currently uses Shure BLX4R with WL185 microphones.

5.2.2 CAMERAS

5.2.2.1 DOCUMENT CAMERAS

The document camera shall rest on the top of the instructor podium. It shall be connected to the video switcher/scaler to enable quick and easy change of sources.

WSUP has currently standardized on the following document camera:

- Epson DC-20

5.2.2.2 CONFERENCE ROOM CAMERAS

WSUP currently uses the Polycom Eagle Eye series camera for conference room applications.

5.2.2.3 CLASSROOM CAMERAS

WSUP currently uses the Vaddio WallView series camera for GUC applications.

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

5.2.3 BLU-RAY/DVD PLAYER

The Designer shall discuss Blu-ray/DVD player equipment with the AVPM.

5.2.4 OWNER-PROVIDED COMPUTER

Computers shall be provided by WSUP in accordance with established standards. WSUP currently provides a video panel. The Owner-provided computer will mount in the A/V Equipment Rack inside the Instructor Podium (either rack-mounted, or provide a 2U shelf). The monitor shall sit on top of the Instructor Podium, on the side of the podium that is away from the classroom door.

- The monitor shall be secured to the podium furniture with a suitable cable and lock assembly to impede theft.

5.2.5 PORTABLE DEVICES

Audio/visual systems shall be capable of receiving audio and video inputs from portable devices, including but not limited to notebook computers, tablet computers, and multimedia devices.

WSUP currently requires HDMI audio/video, HD15 XGA video, 3.5mm audio inputs, a set of RCA audio and video inputs, an XLR input for a microphone, and three USB type-A connections. An Ethernet cable is also required for notebook computers.

The Designer shall discuss with the AVPM whether DisplayPort will be required, in lieu of the HD15 connector.

The Designer shall discuss the wireless collaboration solution with the AVPM.

5.3 Distribution and Routing Equipment

5.3.1 VIDEO SWITCHING EQUIPMENT

Video switching (and scaling) will be required to meet digital distribution needs. All inputs (analog and digital) shall be scaled to a single resolution best matching the native resolution of the display devices in the room.

WSUP currently uses the Kramer or Sierra Video switching and routing product families.

5.3.2 AUDIO/VIDEO SWITCHING EQUIPMENT

Audio and video switching may be done with the Kramer ProScale series or AMX Enova series (which includes a small audio amplifier) if this is appropriate for the application. The Designer shall discuss this selection in advance with the AVPM.

5.3.3 AUDIO SIGNAL PROCESSING EQUIPMENT

Audio signal processing may be done with the Biamp Audia or Nexia series equipment.

5.3.4 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 instructor speech monaural audio signal. 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, 8 and 16 ohms. Amplifiers may have 70V line outputs intrinsic in their design.

- WSUP currently uses amplifier equipment from Crest/Peavey and AMX (Enova).

Separate amplification of content audio (not speech) may be designed into the system.

5.3.5 VIDEO CONFERENCING ENDPOINTS

WSUP currently uses Polycom High Definition Group Series Video Conferencing Endpoint (VCE) equipment with Polycom's RealPresence platform. The VCE contains an integrated codec.

VCEs connect to IT networks via a standard 100 Mbps Ethernet jack.

Two video sources connect directly to the VCE inputs:

- Cameras
- Content video

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

- Microphones
- Content audio

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

5.4 Output Devices

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

5.4.1 SPEAKERS

WSUP uses 70V, 4-ohm and 8-ohm audio speakers.

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.

5.4.1.1 CEILING-MOUNTED

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

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.

WSUP typically uses speakers from QSC and Pure Resonance.

5.4.1.2 WALL-MOUNTED

Wall-mounted speakers are also used at WSUP where a room application has ceiling circumstances that are not practical for ceiling-mounted speakers. The device box serving the speakers shall have a faceplate with center hole for wire exit. The Designer shall discuss this situation in advance with the AVPM.

WSUP typically uses speakers from QSC and Pure Resonance.

5.4.2 ASSISTIVE LISTENING DEVICES

The program audio feed shall be broadcast by the assistive listening device.

WSUP typically uses IR devices from Williams Sound.

Table 219.3 in the 2010 ADA Standards for Accessible Design provides the following information about the number of receivers and the number of hearing-aid compatible receivers required depending on the number of seats in a given room:

Seating Capacity of Assembly Area	Minimum Number of Required Receivers	Minimum Number of Receivers Required to be Hearing-aid Compatible
50 or less	2	2
51 to 200	2, plus 1 per 25 seats over 50 seats*	2
201 to 500	2, plus 1 per 25 seats over 50 seats*	1 per 4 receivers or fraction thereof
501 to 1000	20, plus 1 per 33 seats over 500 seats*	
1001 to 2000	35, plus 1 per 50 seats over 1000 seats*	
2001 and over	55, plus 1 per 100 seats over 2000 seats*	

* or fraction thereof

5.4.3 VIDEO OUTPUT DEVICES

5.4.3.1 PROJECTORS

Video projectors shall have the following performance characteristics:

- Standard-throw and Ultra-short-throw projectors are preferred.
    - Short-throw projectors are not normally desirable, and require pre-approval by the WSUP AVPM, as well as coordination with pendant lighting).
- 1280x800 native resolution with 16:10 aspect ratio.
- Three-LCD projector. LCD is preferred over DLP.
- The Designer shall discuss with the AVPM the minimum ANSI lumens output rating.
- No keystone adjustment shall be required with a properly installed system.

Acceptable manufacturers of projectors include:

- Ultra Short-throw: Panasonic WXGA+ or better
- Standard-throw: Panasonic WXGA+ or better

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 6 cable for Ethernet data, routed to the telecommunications room.
- One Category 6 cable for Serial Control (RS232), routed to the A/V rack.

- 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.
- One Beldin 1279P cable (5-conductor mini, high resolution cable) for video signal, routed to the A/V rack and terminated directly onto the projector.

See Sections 6.1.1.3.3 and 8.2 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 keystoning. Light fixtures shall be installed so as not to obstruct the projection image.

Acceptable manufacturers of ceiling mounts for projectors include:

- Chief Manufacturing RPAU universal mount.
- See Sections 6.1.1.3.3 and 8.2 below for more information about projector wiring.

5.4.3.2 WRITEABLE PROJECTION SURFACES

WSUP is considering the use of IdeaPaint (www.ideapaint.com) and Da-Lite IDEAScreen materials (www.da-lite.com) in lieu of projection screens. These products can be used to cover the wall and serve both as a projectable surface and also as a dry-erase whiteboard. The Designer shall discuss these options with the AVPM on a case-by-case basis.

Wherever these products are used, the treated area shall be surrounded with thin metal framing to prevent overwriting or wiping ink residue onto the surrounding surfaces. The Designer shall discuss the framing options with the AVPM on a case-by-case basis.

5.4.3.3 PROJECTION SCREENS

Projection screen shall be sized appropriately to the room size. Screen shall have a 16:10 aspect ratio, and have a matte white surface.

Electrically operated screens shall employ a low voltage control system. A manual switch for instructor use is not desired. However, a service shut-off switch above the ceiling is required, allowing a technician to cut power to the screen for servicing.

Acceptable manufacturers of projection screens include:

- Da-Lite
- Draper

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.

5.4.3.4 VIDEO PANELS

Video panels shall be a minimum of 55 inches (measured diagonally). Larger rooms will require larger video panels. Plasma, Backlit LED, and newer technologies are acceptable; however, in some applications plasma panels may produce an unacceptable reflection or glare.

Video panels in most Conference Rooms will need to be sized near 80” in order to be viewable from the farthest seat in the room.

Acceptable manufacturers of video panel screens include:

- NEC

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 fixed style.

For all video panels, the wall shall be reinforced for mounting purposes. Plywood backing (fire-treated, 5/8” thick) shall be mounted to the wall studs beneath the gypsum board.

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

Acceptable manufacturers of wall mounts for video panels include:

- Chief Manufacturing MTRU and LTMU series
- NEC

Acceptable manufacturers of ceiling mounts for video panels include:

- Chief Manufacturing

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 6 cable for Ethernet data, routed to the telecommunications room.
- One Category 6 cable for Serial Control (RS232), routed to the A/V rack.
- One Category 6A cable (10GB rated) for video signal (such as HDBaseT/DXLink), field connectorized and passed through a space in the two faceplates (not terminated on jacks), routed to the A/V rack.
- One Beldin 1279P cable (5-conductor mini, high resolution cable) for video signal, routed to the A/V rack and terminated directly onto the video panel.
- See Sections 6.1.1.3.3 and 8.2 below for more information about video panel wiring.

5.5 Room Control Systems

5.5.1 AMX

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

The control system shall automate projector and screen functions, control room audio volume levels, and control source-selection for the projector. 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 AMX brand control system. The system includes a central processor, touch panels, current sensors, and relay or RS-232 controls for electric projection screens, lights, video panels, codecs, and audio levels. All programming for the Control CPU and all touch panels shall be coordinated with the WSUP 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 AMX programming developed within a WSUP project shall become the property of WSUP and shall become part of the project deliverables in the current standard AMX uncompiled format.

Power on/off and input selections on the projector are selected by the AMX system. The AMX system shall also automatically lower and raise the projection screen with the projector on/off control. The AMX system shall provide control for the following devices depicted on the diagram discussed in Section 5.1 – A/V Features, Functions & Services.

Input Sources:

- Wireless Lapel Microphones
- Ceiling/Desktop Microphones
- External A/V Interface
- Blu-ray/DVD Player
- Portable Computer
- Video Codec Endpoint
- Video Cameras
- Interactive Display Devices

Distribution & Routing Devices

- Video Router
- Video Switcher/Scaler
- Audio Switcher with Digital Signal Processor

Output Devices:

- Speaker
- Assistive Listening System
- Class Capture System
- Video Panel Power & Port Selection
- Video Projector Power & Port Selection
- Projection Screen Control
- Window Shade and Lighting Control

5.5.2 TOUCH PANEL

The Designer shall inquire with the WSUP AVPM about which of three options shall be provided for room control:

- Option #1: WSU's custom software interface that runs on the Instructor Computer.
- Option #2: Polycom Touch Panel.
- Option #3: AMX 10" (maximum) diagonally measured color display. The touch panel shall be placed on the Instructor's podium.

5.5.3 AUDIO AND VIDEO SWITCHING

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

5.6 Administration / Labeling

5.6.1 NUMBERING SCHEME

WSUP'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).

5.6.1.1 EQUIPMENT

Each piece of equipment receives a unique identifier:

Equipment Type	Abbreviation	Sequence	Example
Controller	IC	##	IC-##
Touch Panel	TP	##	TP-##
PTZ Camera	PTZ	##	PTZ-##
Camera	CAM	##	CAM-##
Codec Video Conference	VCDX	##	VCDX-##
Video Switcher	VS	##	VS-##
Computer	IBMA	##	IBMA-##
Computer Monitor	IBMB	##	IBMB-##
Doc Cam	DC	##	DC-##
Laptop	IBML	##	IBML-##
Video Wall Processor	VWP	##	VWP-##
Audio Mixer	MX	##	MX-##
Digital Signal Processor	DSP	##	DSP-##
Projector	VP	##	VP-##
Video Panel	LCD	##	LCD-##
Distribution Amplifier	DA	##	DA-##
Assistive Listening	ADA	##	ADA-##
Speaker	SP	##	SP-##

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

5.6.1.2 CONNECTION POINTS

Each connection point (port, connector, cable termination, etc.) on a piece of equipment receives a sequentially numbered identifier:

Input / Output	Sequence	Example
Out	##	Out-##
In	##	In-##

5.6.1.3 CABLES

Each cable receives a unique identifier.

Cable Type	Abbreviation	Sequence	Example
Composite Video	CV	##	CV-##
S-Video	Y/C	##	Y/C-##
RGB-HV 5-wire	RGBHV	##	RGVHV-##
RGB 3-wire	YPbPr	##	YPbPr-##
DVI-A	DVI-A	##	DVI-A-##
DVI-D	DVI-D	##	DVI-D-##
HDMI	HDMI	##	HDMI-##
DisplayPort	DP	##	DP-##
HDBaseT	HDBT	##	HDBT-##
DC Power	DC	##	DC-##
Mic Level Audio	MIC	##	MIC-##
AUX Level Audio	AUX	##	AUX-##
Speaker Audio	SP	##	SP-##
Ethernet	N	##	N-##
Control	RS232	##	RS232-##
Control	RS485	##	RS485-##
Control	IR	##	IR-##
Control	RELAY	##	RELAY-##
Control	AXLINK	##	AXLINK-##
Control	ICSNET	##	ICSNET-##
Control	ICSHUB	##	ICSHUB-##
Control	I/O	##	I/O-##

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

5.6.1.4 CABLE LABELS

Cable labels are comprised of three parts:

- Cable Number
- Equipment Number (where the near end of the cable terminates)
- Connection Number (where the near end of the cable terminates)

Each cable is labeled with its own cable identifier plus the piece of equipment and connection point on which the cable terminates, as follows:

CABLETYPE - ##	EQUIPTYPE - ##	PORTTYPE - ##

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

RS232-01	IC-01	out-01

6 Application Spaces

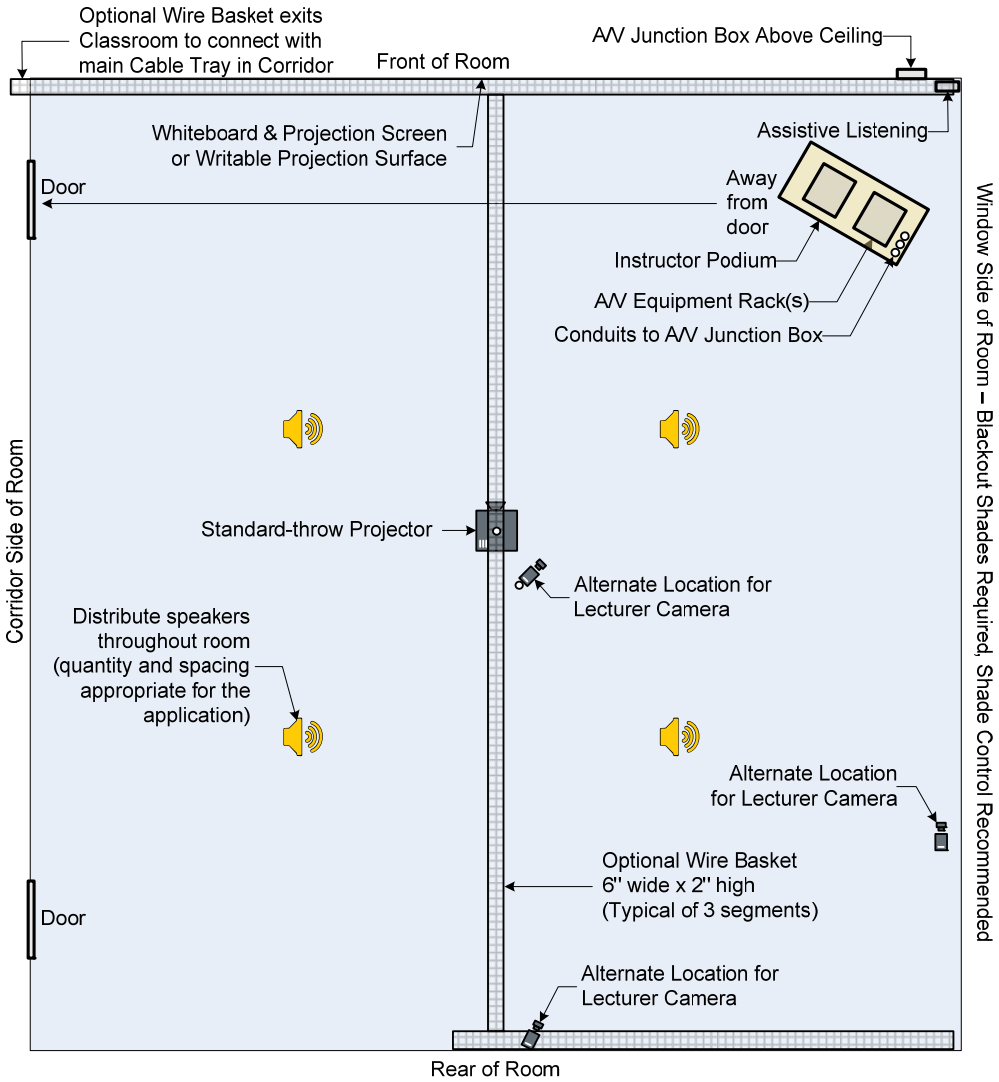
See Sections 4 and 5 for the definitions and specifications of the features and equipment described in each application space below.

6.1 General University Classroom

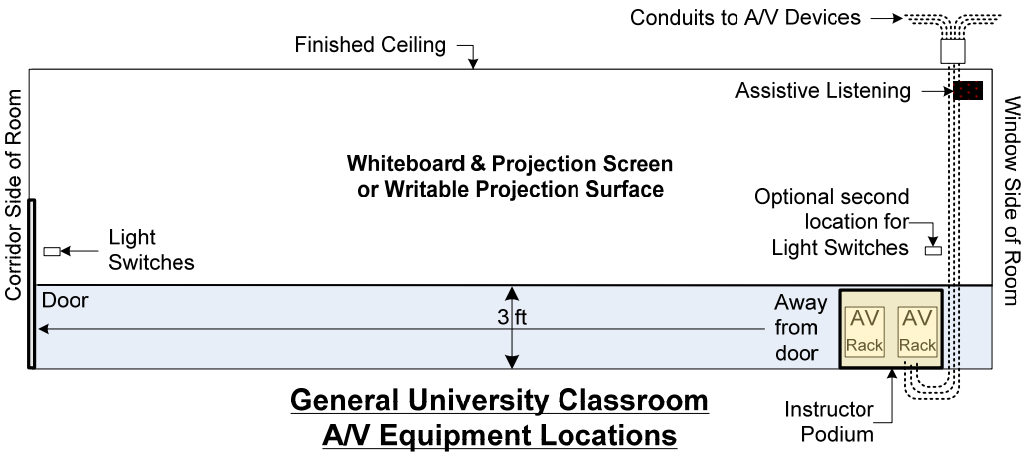
A General University Classroom has presentation audio/visual, audio amplification features, lecture capture features, and web conferencing.

6.1.1.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

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



General University Classroom
A/V Equipment Locations
Plan View



6.1.1.2 ARCHITECTURAL REQUIREMENTS

6.1.1.2.1 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.

6.1.1.2.2 ROOM SHAPE

Classrooms should be longer than they are wide. Window walls should be perpendicular to the presentation wall.

6.1.1.2.3 ACOUSTICS

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.

The Designer and the Architect shall discuss with the Owner whether there is any possibility that a General University 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.

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

B. 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.

6.1.1.2.4 COLORS

The Designer and the Architect shall discuss with the Owner whether there is any possibility that a General University 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.

6.1.1.2.5 WINDOWS

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

6.1.1.2.6 FURNITURE

When selecting student tables, consider whether power outlets or push-to-talk buttons for microphones will be required. If so, it is recommended that tables be manufactured with integrated cable raceways.

The Designer shall work with the WSUP FS Interior Designers to specify the table colors and tabletop surface materials.

6.1.1.3 ELECTRICAL REQUIREMENTS

6.1.1.3.1 POWER REQUIREMENTS

The electrical power circuits supplying the Projector, Video Panels, Instructor's Podium, 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.

- Power for projection screens is not required to be from the same phase.

The Equipment Racks in the Instructor's Podium can share a single dedicated 20A circuit.

Conduits for electrical power shall be ¾" trade size minimum.

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

- Video Projector – ceiling-mounted power outlet typically located flush with the underside of the ceiling to support a standard-throw or ultra-short-throw projector.
- A/V Rack – quad outlet per rack, mounted on the floor of the podium casework (inside).
- Projection Screen – if a projectable surface is not used, a motorized projection screen may be needed, requiring a separate power circuit and a low-voltage control interface.

6.1.1.3.2 LOW-VOLTAGE PATHWAYS AND BOXES

A. A/V conduits shall be sized 1" minimum, and shall be larger as required for each application.

B. Provide an A/V Junction Box above the ceiling as shown in the plan diagram above.

Provide conduits from the A/V Junction Box down to the underside of the Instructor Podium, stubbed up 1" above the floor.

Provide a separate 1" conduit routed from the Instructor Podium to the main distribution cable tray (typically in the corridor) for telecommunications cabling. Do not route this cabling exposed through the optional in-room wire basket, because this may require the data cabling to be plenum-rated.

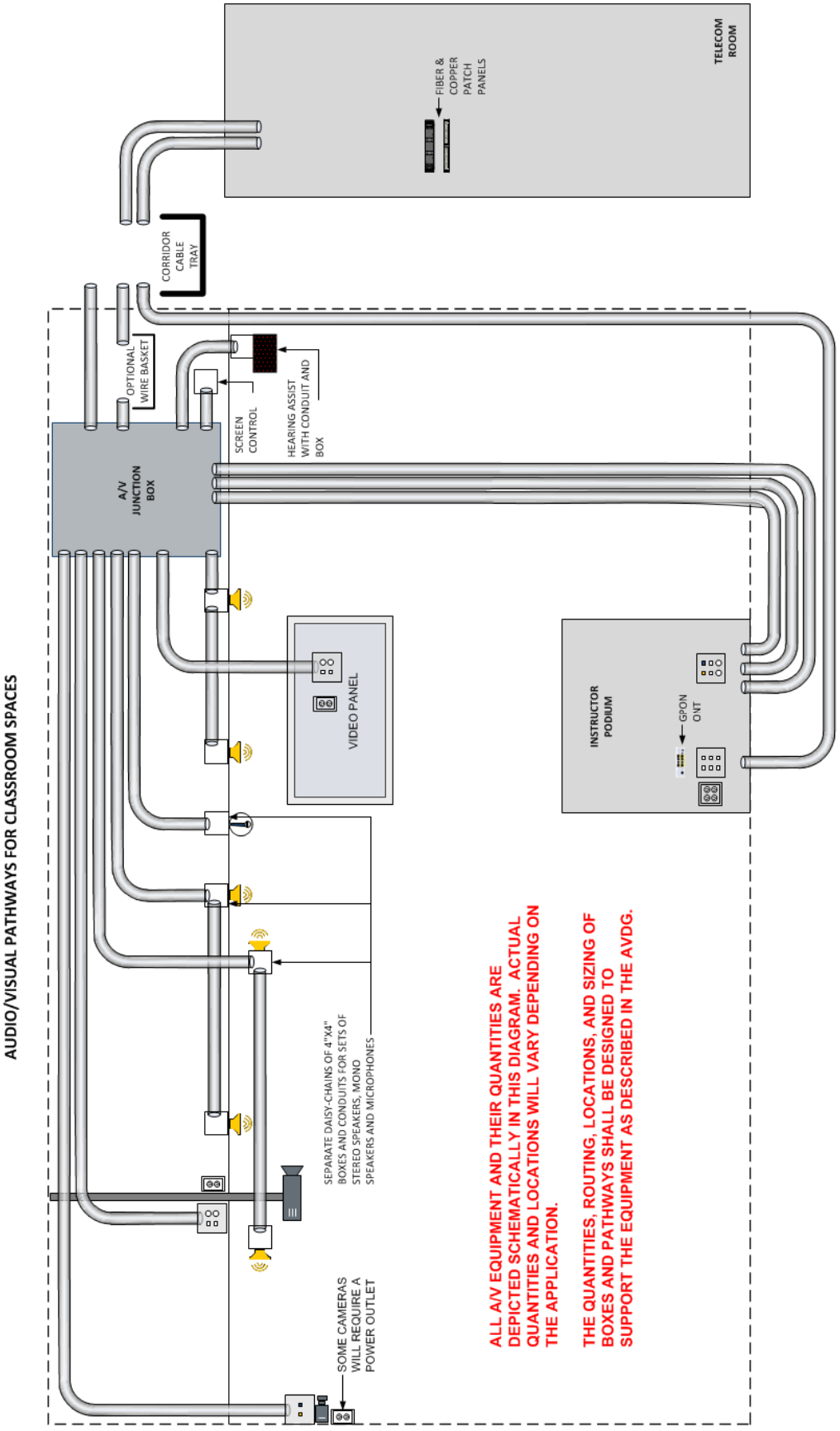
If an A/V Floor Box is used under an Instructor Podium, it shall only function as a cable pass-through point. Cabling shall not terminate in an A/V Floor Box. The Designer shall discuss the need for an A/V Floor Box with the WSUP AVPM prior to inclusion in the design.

C. 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 WSUP 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. Optional: Provide wire basket cable trays in accessible ceiling to accomplish the functions depicted in the plan diagram above. Cable tray practices shall comply with WSUP telecommunications guidelines. If an in-room wire basket is provided (optional), provide conduits from the A/V Junction Box to the wire basket.

E. The diagram below depicts the pathways and boxes required for a Classroom A/V application:


AUDIO/VISUAL PATHWAYS FOR CLASSROOM SPACES
TELECOM ROOM
FIBER & COPPER PATCH PANELS
CORRIDOR CABLE TRAY
OPTIONAL WIRE BASKET
A/V JUNCTION BOX
SCREEN CONTROL
HEARING ASSIST WITH CONDUIT AND BOX
VIDEO PANEL
INSTRUCTOR PODIUM
GPON ONT
SEPARATE DAISY-CHAINS OF 4"X4" BOXES AND CONDUITS FOR SETS OF STEREO SPEAKERS, MONO SPEAKERS AND MICROPHONES
SOME CAMERAS WILL REQUIRE A POWER OUTLET
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, LOCATIONS, AND SIZING OF BOXES AND PATHWAYS SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

6.1.1.3.3 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. For buildings using a traditional telecommunications cabling infrastructure (not GPON-based), provide the following telecommunications cabling:

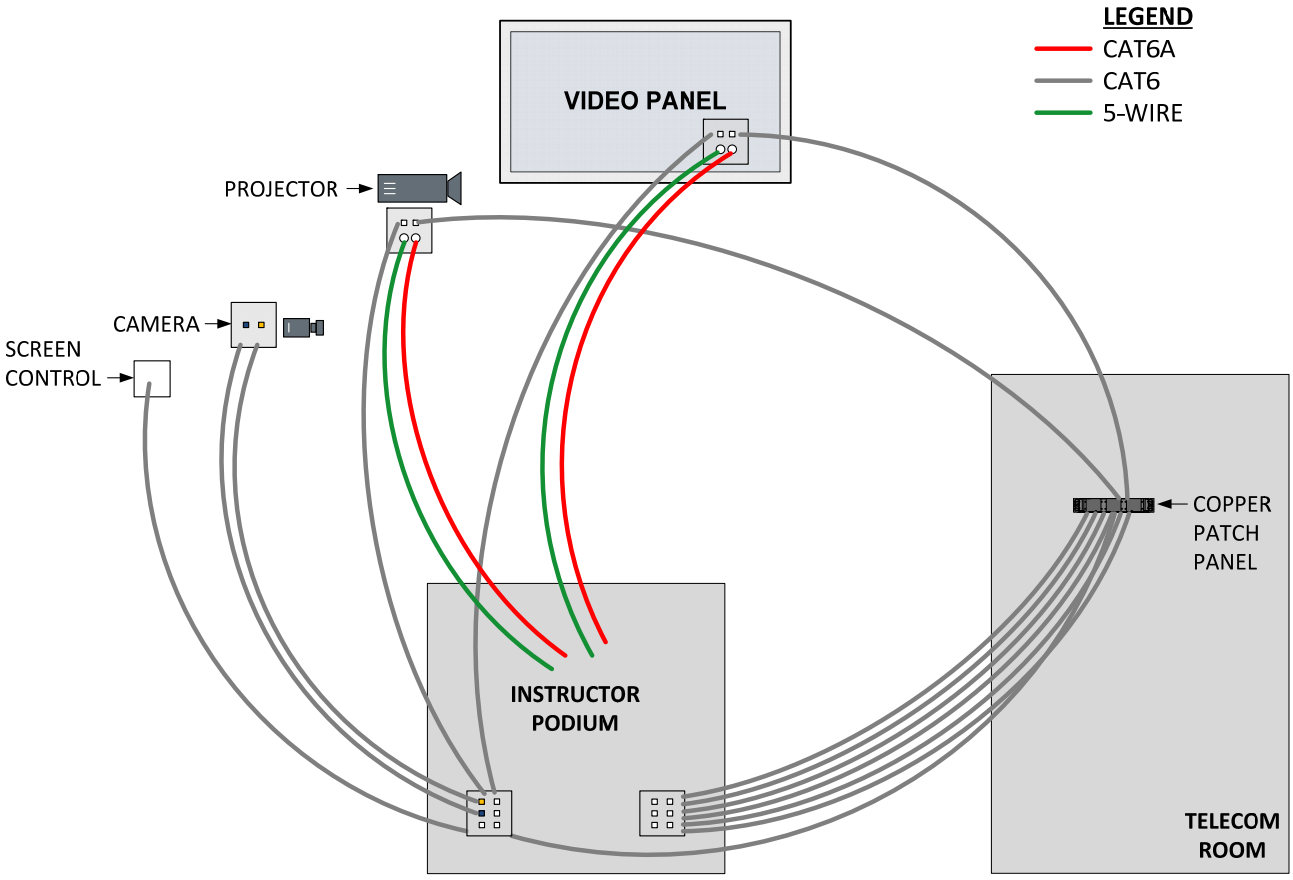
Application	Endpoint/Termination	Cable	Endpoint	Termination
Owner-provided Voice-Over IP (VOIP) telephone	Telecom Room	Category 6	Outlet inside Podium	RJ45 Jack
AMX control system	Telecom Room	Category 6	Outlet inside Podium	RJ45 Jack
Owner-provided computer located in the A/V Rack	Telecom Room	Category 6	Outlet inside Podium	RJ45 Jack
Video Switcher located in the A/V Rack	Telecom Room	Category 6	Outlet inside Podium	RJ45 Jack
Audio DSP located in the A/V Rack	Telecom Room	Category 6	Outlet inside Podium	RJ45 Jack
Data network connection for laptop	Telecom Room	Category 6	Outlet inside Podium	RJ45 Jack
Spare	Telecom Room	Category 6	Outlet inside Podium	RJ45 Jack
Each Projector (LAN)	Telecom Room	Category 6	Outlet above projector	RJ45 Jack
Each Video Panel (LAN)	Telecom Room	Category 6	Outlet behind video panel	RJ45 Jack
Each Projector – Serial Control (RS-232)	Outlet above projector	Category 6	Outlet inside Podium	RJ45 Jacks (both ends)
Each Video Panel – Serial Control (RS-232)	Outlet behind video panel	Category 6	Outlet inside Podium	RJ45 Jacks (both ends)
Each Screen – Control (RS-232)	Terminated at projector screen	Category 6	Outlet inside Podium	RJ45 Jack & screw terminals
Each Vaddio Camera – Video & Power	Outlet behind camera	Category 6	Outlet inside Podium	RJ45 Jacks (both ends) **(Yellow)**
Each Vaddio Camera – RS232 Control Signal	Outlet behind camera	Category 6	Outlet inside Podium	RJ45 Jacks (both ends) **(Blue)**
HDBaseT to each video projector and video panel	Pass through outlet above projector or behind video panel	Category 6A	Bypass Outlet inside Podium	Field Connectorize (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 Instructor Podium to terminate all cables.

The following diagram depicts the telecommunications cabling required for a Classroom audio/visual application, for buildings using a traditional telecommunications cabling infrastructure (not GPON-based):

TELECOMMUNICATIONS CABLING FOR CLASSROOM 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 NON-TELECOMMUNICATIONS A/V WIRING AND CABLING IS ALSO REQUIRED (FOR SPEAKERS, MICROPHONES, ETC.), BUT NOT DEPICTED HERE.

C. For buildings using a GPON-based telecommunications cabling infrastructure, provide the following telecommunications cabling:

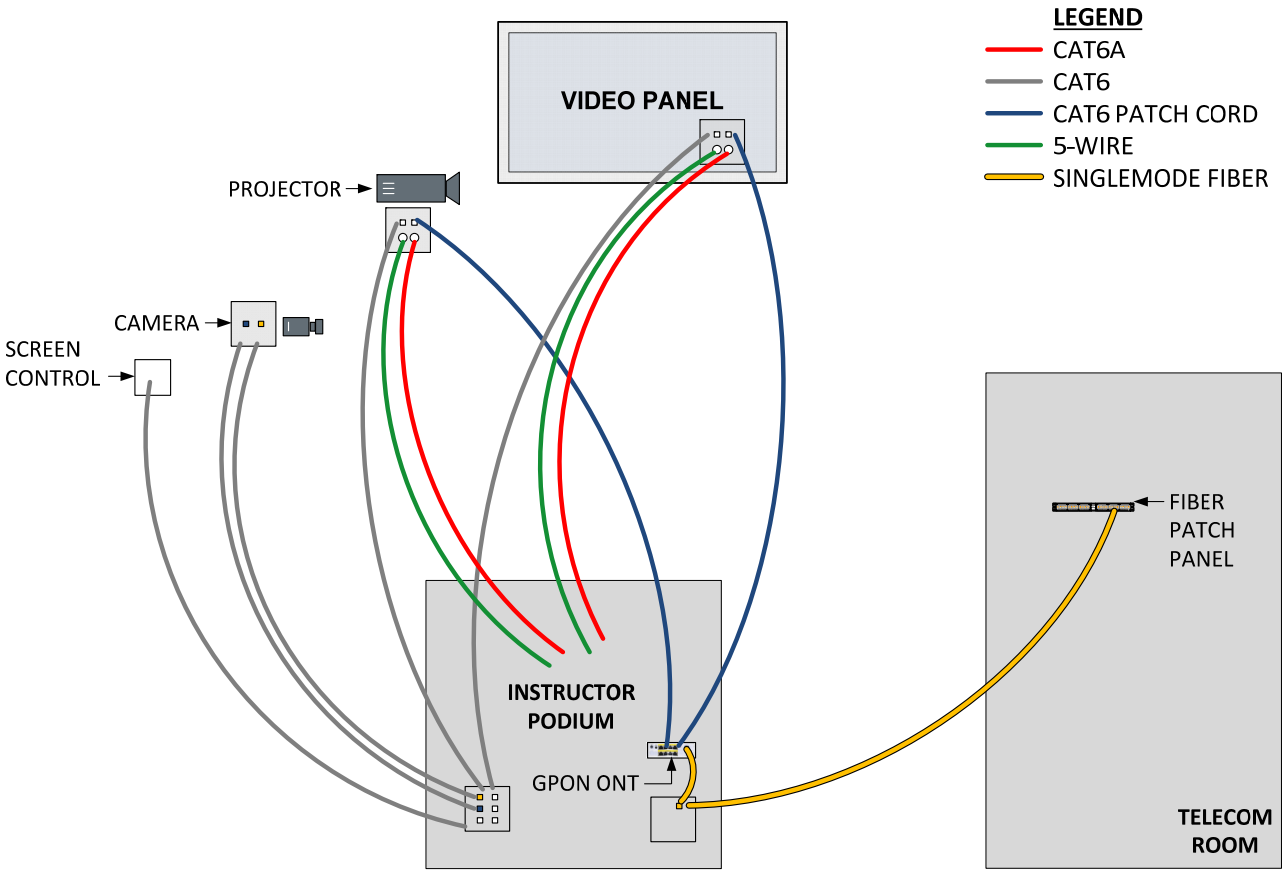
Application	Endpoint/Termination	Cable	Endpoint	Termination
GPON ONT Device	Telecom Room	Singlemode Fiber	Outlet inside Podium	As required for GPON ONT
Owner-provided Voice-Over IP (VOIP) telephone	GPON ONT in Podium	Category 6 Patch Cord		
AMX control system	GPON ONT in Podium	Category 6 Patch Cord		
Owner-provided computer located in the A/V Rack	GPON ONT in Podium	Category 6 Patch Cord		
Video Switcher located in the A/V Rack	GPON ONT in Podium	Category 6 Patch Cord		
Audio DSP located in the A/V Rack	GPON ONT in Podium	Category 6 Patch Cord		
Data network connection for laptop	GPON ONT in Podium	Category 6 Patch Cord		
Spare	GPON ONT in Podium	Category 6 Patch Cord		
Each Projector (LAN)	GPON ONT in Podium	Category 6 Patch Cord	Outlet above projector	Pass-through
Each Video Panel (LAN)	GPON ONT in Podium	Category 6 Patch Cord	Outlet behind video panel	Pass-through
Each Projector – Serial Control (RS-232)	Outlet above projector	Category 6	Outlet inside Podium	RJ45 Jacks (both ends)
Each Video Panel – Serial Control (RS-232)	Outlet behind video panel	Category 6	Outlet inside Podium	RJ45 Jacks (both ends)
Each Screen – Control (RS-232)	Terminated at projector screen	Category 6	Outlet inside Podium	RJ45 Jack & screw terminals
Each Vaddio Camera – Video & Power	Outlet behind camera	Category 6	Outlet inside Podium	RJ45 Jacks (both ends) **(Yellow)**
Each Vaddio Camera – RS232 Control Signal	Outlet behind camera	Category 6	Outlet inside Podium	RJ45 Jacks (both ends) **(Blue)**
HDBaseT to each video projector and video panel	Pass through outlet above projector or behind video panel	Category 6A	Bypass Outlet inside Podium	Field Connectorize (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 Instructor Podium to terminate all cables.

The following diagram depicts the telecommunications cabling required for a Classroom audio-visual application, for buildings using a GPON-based telecommunications cabling infrastructure:

GPON-BASED TELECOMMUNICATIONS CABLING FOR CLASSROOM 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 NON-TELECOMMUNICATIONS A/V WIRING AND CABLING IS ALSO REQUIRED (FOR SPEAKERS, MICROPHONES, ETC.), BUT NOT DEPICTED HERE.

D. In addition to telecommunications cabling, the following A/V cabling also passes through outlet boxes serving A/V devices:

Application	Endpoint	Termination	Cable	Endpoint	Termination
Projector Video	Outlet above projector	Pass through empty space in faceplate	Belden 1279 (5-wire) cable	Bypass Outlet inside Podium	On equipment in Podium

6.1.1.3.4 LIGHTING REQUIREMENTS

If Ultra Short-throw projectors are *not* used, 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 6 and 12 inches below the finished ceiling to cener of lens, and set back from the front of the room a distance of twice the screen width 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.

6.1.1.4 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.

6.1.1.5 A/V EQUIPMENT AND FURNISHINGS

6.1.1.5.1 INSTRUCTOR PODIUM

Instructor Podium 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 Podium 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. Podiums shall be anchored to the floor, preferably in an angled orientation.

6.1.1.5.2 A/V EQUIPMENT RACK

An A/V Equipment Rack assembly shall be located inside the instructor podium. The cabling shall enter the rack at the bottom rear, and be securely anchored to the rack. The A/V Equipment Rack shall contain the following equipment:

- AMX controller system, which shall be connected to the University data network.
- Blu-ray/DVD player, if required.
- Owner-provided computer. The Designer shall inquire with the WSUP AVPM whether the computer will be rack-mountable or whether the Designer shall include a 2U shelf to support the computer.
- Wireless microphone receiver
- Video Switcher/Scaler
- Audio Switcher/DSP
- Amplifier

- Ventilation Fans
- In Instructor Podiums, uninterruptible power supply (UPS) devices shall be provided to support the equipment in the A/V Racks.

An example A/V Equipment Rack elevation detail is shown in Appendix 8.1.1.

6.1.1.5.3 FLOOR BOX

Typically, a floor box beneath the Instructor Podium is undesirable. Instead, WSUP prefers that low-voltage conduits serving the technology applications in the Podium simply stub up approximately 1" above the floor, and enter the Podium through cutouts in the floor of the Podium. However, if a floor box is required, no cabling shall terminate in it, but rather the floor box shall serve as a pass-through point.

6.1.1.5.4 VIDEO PROJECTOR

Discuss with the WSUP AVPM which type of project 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 ultra-short or long-throw projector.

AC power will be required for the projector.

6.1.1.5.5 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 shall clear the chalk tray of any black or white board-mounted behind it when extended. The bottom of the fully-extended screen shall be a minimum of 36 inches above the finished floor.

A manual screen control switch is not desired. However, a power cutoff switch above the ceiling is desired so that technicians can disconnect the screen from power for servicing activities.

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

6.1.1.5.6 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.

6.1.1.5.7 ROOM CONTROL

The AMX 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.

6.1.1.5.7.1 Room Control Programming

All programming for the AMX Processor and all touch panels shall be coordinated with the WSUP 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.

6.1.1.5.7.2 Projector Control

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

6.1.1.5.7.3 Lighting

If remotely controllable lighting is used in the classroom, the AMX 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.

6.1.1.5.7.4 Codec

The following feature shall be programmed into the codec:

- Set to Auto Answer incoming calls

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

6.1.1.5.7.5 Audio and Video Routing and Switching

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

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

6.1.1.5.7.6 Content Switcher

When WSUP uses the AMX Enova All-In-One Digital Media switcher, the switcher is used for all video source selections including computer, laptop, Blu-ray/DVD and document camera. The Polycom codec is used for camera source selection.

6.1.1.5.7.7 Touch Panel

The Designer shall inquire with the WSUP AVPM which of three options shall be provided for room control:

- Option #1: WSU's custom software interface that runs on the Instructor Computer.
- Option #2: Polycom Touch Panel.
- Option #3: AMX 10" (maximum) diagonally measured color display. The touch panel shall be placed on the Instructor's podium.

6.2 Active Lecture Halls

Active Lecture Halls (ALH) are sometimes called “Flipped” or “SCALE-UP” classrooms. In addition to the audio/visual features of General University Classrooms, they contain additional video panels and/or projectors to display student computer images.

In Active Lecture Halls, 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. ALHs are not well-suited to video conferencing applications.

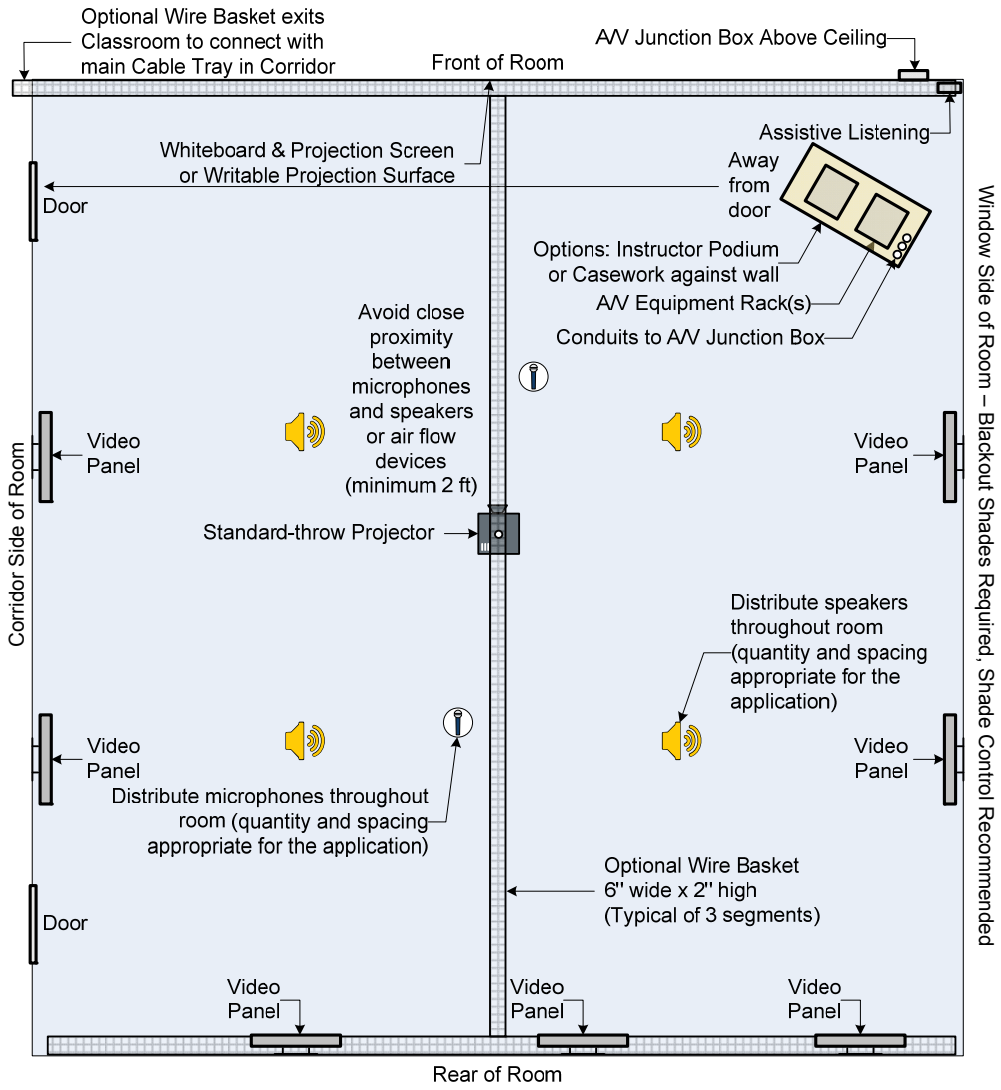
In ALHs, students sit in groups of up to 9 around each table. The tables are equipped with technology to support computers that are used by students during the class period. The wall near each table may have a video panel or a projection surface where the students can view it and can interact collectively.

ALHs also have a “front-of-room” projection wall where the instructor might present a limited amount of material; however, ALHs 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.

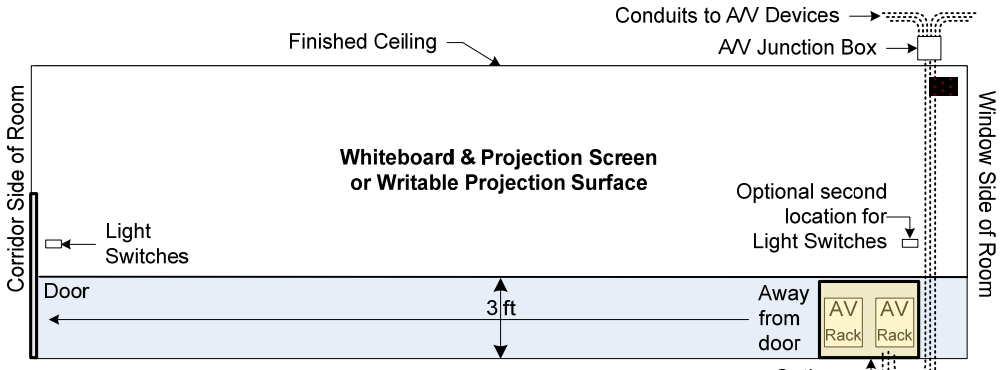
Depending on the intended use of an ALH space, it may not have an Instructor Podium. In such cases, the A/V Equipment Rack will need to be mounted inside casework.

6.2.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

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



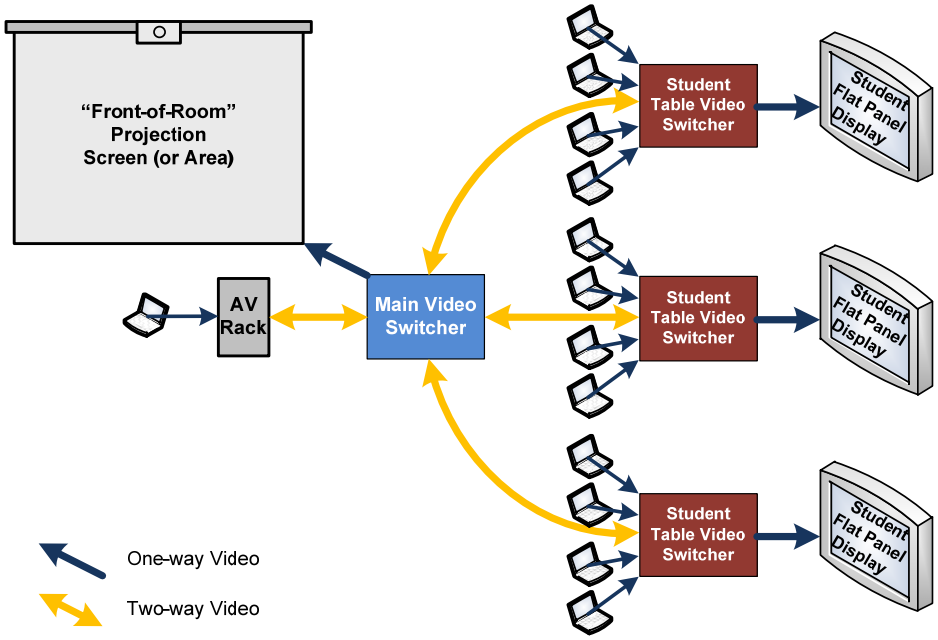
Active Lecture Hall
A/V Equipment Locations
Plan View



Active Lecture Hall
A/V Equipment Locations
Front Wall Elevation

6.2.2 A/V EQUIPMENT AND FURNISHINGS

In addition to all of the features of a General University Classroom, Active Lecture Halls will also require video switching (equipment or software) and video panels as shown in the diagram 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.

6.2.2.1 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 Active Lecture Halls 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 WSUP user group/building committee. The Designer shall also discuss this option with the WSUP AVPM.

6.2.2.2 VIDEO SWITCHING

Video switching equipment and/or software will be required on two levels:

- 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.

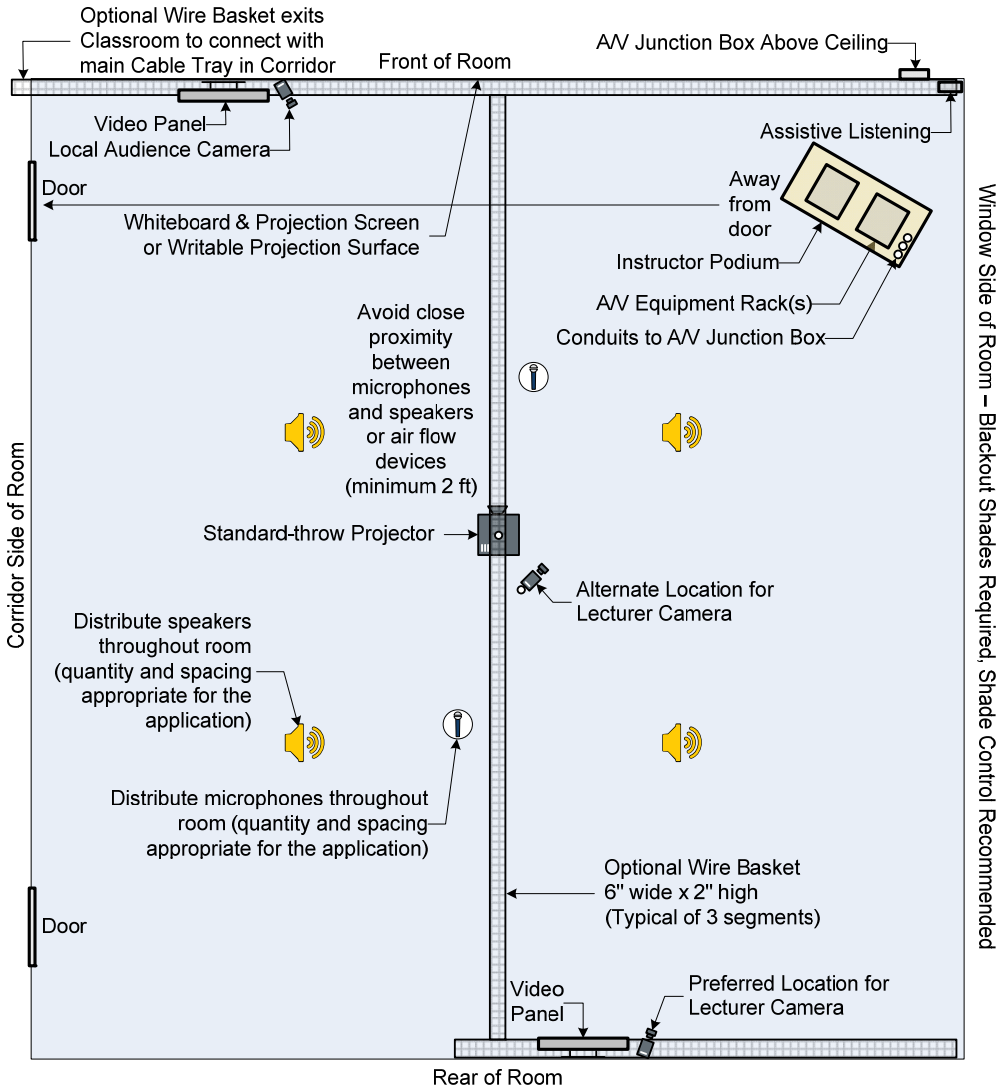
- At the front of the room, the instructor will need to be able to choose to project audio/visual content, the screen image from the instructor's computer, or the screen image from a student computer anywhere in the room.

Video switching can be done with physical equipment and cabling or using software to control video streamed over the network. Currently, WSUP is investigating software and hardware products to perform video switching for Active Lecture Halls.

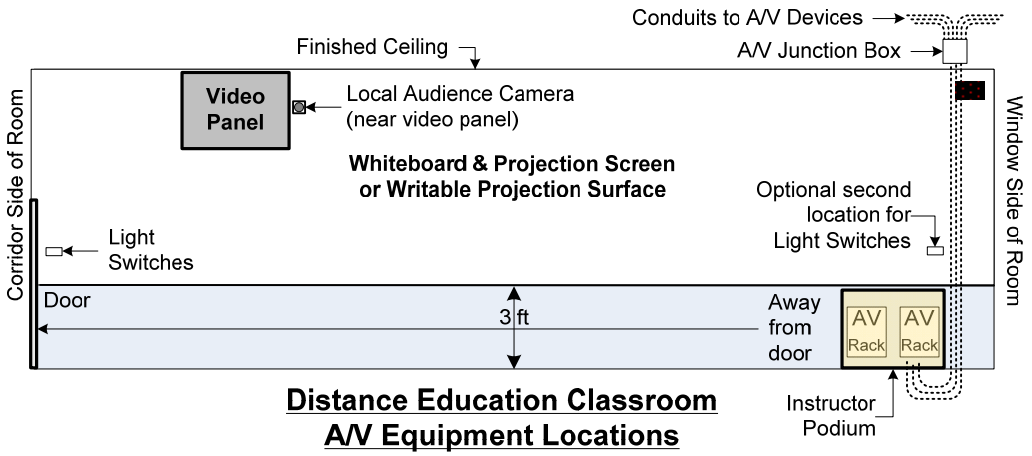
6.3 Distance Education Classrooms

6.3.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

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



Distance Education Classroom
A/V Equipment Locations
Plan View



6.3.2 A/V EQUIPMENT AND FURNISHINGS

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

- Multiple video cameras
- Multiple video panels
- Microphones (desktop, wireless or ceiling-hung)
- Video conference endpoint

6.4 Auditoriums

6.4.1 A/V EQUIPMENT AND FURNISHINGS

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

- 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 multiple projection surfaces and multiple projectors.
- Provide acoustic wall treatment as required.

6.4.2 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.

6.4.2.1 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.

6.4.2.2 ARCHITECTURAL PROVISIONING

A. 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.

B. 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 WSUP 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 WSUP. 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 t 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.

6.4.2.3 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 WSUP 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, WSUP 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.
- WSUP 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.

6.4.2.4 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.
- Near or adjacent to 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.

- In a shared space with electrical equipment other than panels serving the A/V equipment.

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

6.4.3 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 podium rack and the video projectors.

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

6.5 Breakout Rooms

Breakout 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 Breakout Rooms.

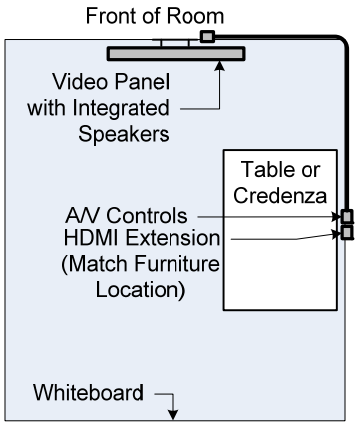
Provide a conduit and box to support an A/V control pad, and a second box and faceplate to host an HDMI extension port. The Designer shall select a location that coordinates with furniture locations in this space. These features will enable users to connect their own mobile devices without requiring 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.

WSUP currently uses the AMX Novara Control Pad for this purpose. The control pad shall provide the following functions:

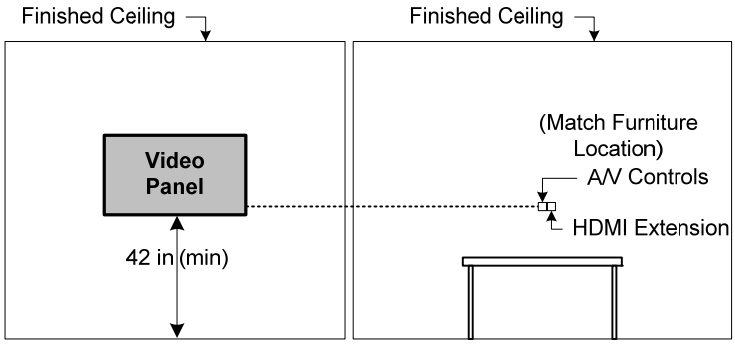
- Video Panel On/Off
- Volume Up/Down
- HDMI Input Select

6.5.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

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



Breakout Room
AV Equipment Locations
Plan View



Breakout Room
A/V Equipment Locations
Wall Elevations

6.6 Presentation Conference Rooms

Presentation Conference Rooms have presentation features (no video conferencing features). A/V cabinets are located inside built-in casework.

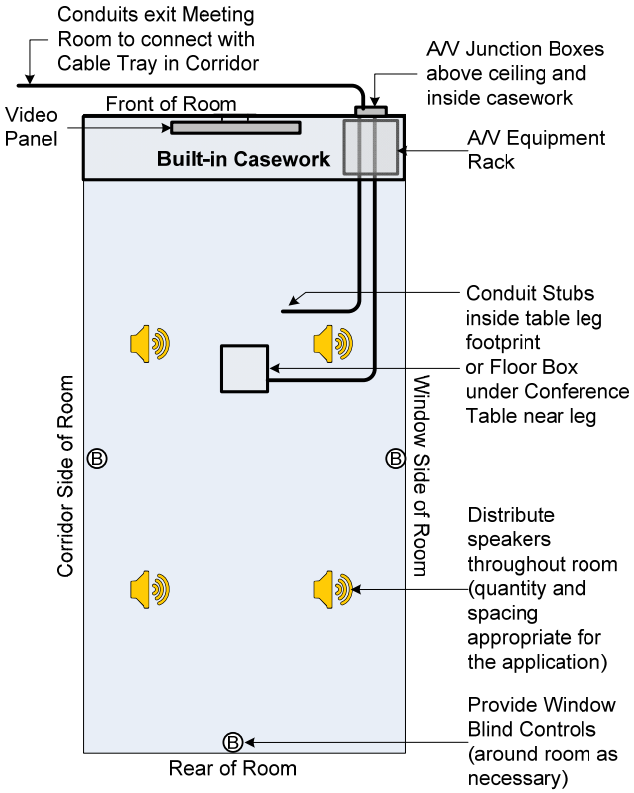
Presentation Conference Rooms shall use the same audio/visual systems as a General University Classroom except that there will not be an Instructor's podium. This is the WSUP standard conference facility, especially for non-instructional use. It can also serve as a small classroom for some very specialized purposes, such as graduate seminars.

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

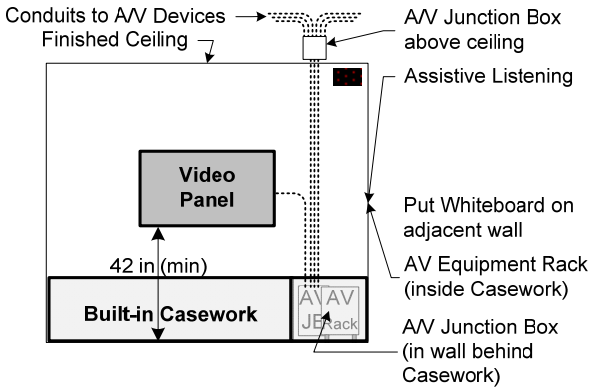
All Presentation Conference Rooms shall be designed to include conduits and boxes sufficient to support a future upgrade into a Collaborative Conference Room.

6.6.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

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



Presentation Conference Room
A/V Equipment Locations
Plan View



Presentation Conference Room
A/V Equipment Locations
End Wall Elevation

6.6.1.1 ARCHITECTURAL REQUIREMENTS

6.6.1.1.1 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.

6.6.1.1.2 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.

6.6.1.1.3 WALLS

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

6.6.1.1.4 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.

6.6.1.1.5 FURNITURE

Each Presentation Conference Room requires built-in casework (located along the presentation wall, biased to one side) to host the A/V Equipment Rack. The casework is defined in Section 4.2.2 above.

A conference table with cable cubbies shall be provided to fit the room.

In each cable cubby, provide the following:

- Two electrical power receptacles
- Two data jacks

In one cable cubby at the presentation end of the room, provide the following:

- One HDMI/DisplayPort jack
- VGA Video input for a document camera or notebook computer
- 3.5mm stereo audio jack

Chairs should be selected for comfort and utility in a conference setting.

6.6.1.2 ELECTRICAL REQUIREMENTS

6.6.1.2.1 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 ¾" trade size minimum.

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

- Conference Table (table-top cubbies) – 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.

6.6.1.2.2 LIGHTING REQUIREMENTS

If short-throw projectors are *not* used, 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.

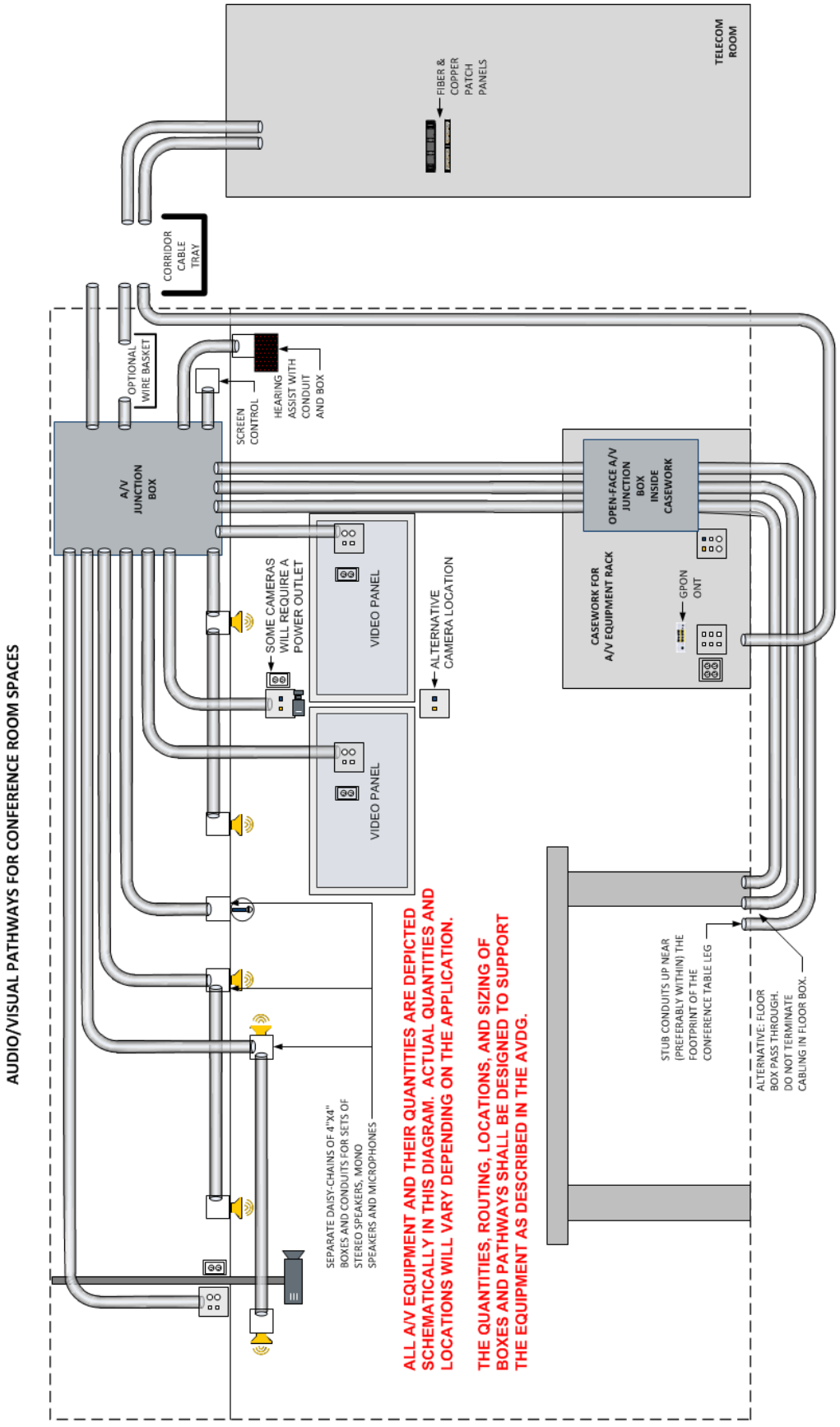
6.6.1.3 HVAC

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

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

6.6.1.4 LOW-VOLTAGE PATHWAYS AND BOXES

The wall elevation and plan diagrams above depict the arrangement of audio/visual features in academic 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.


AUDIO/VISUAL PATHWAYS FOR CONFERENCE ROOM SPACES
TELECOM ROOM
FIBER & COPPER PATCH PANELS
CORRIDOR CABLE TRAY
OPTIONAL WIRE BASKET
A/V JUNCTION BOX
SCREEN CONTROL
HEARING ASSIST WITH CONDUIT AND BOX
SOME CAMERAS WILL REQUIRE A POWER OUTLET
VIDEO PANEL
VIDEO PANEL
ALTERNATIVE CAMERA LOCATION
OPEN-FACE A/V JUNCTION BOX INSIDE CASEWORK
CASEWORK FOR A/V EQUIPMENT RACK
GPON ONT
SEPARATE DAISY-CHAINS OF 4"X4" BOXES AND CONDUITS FOR SETS OF STEREO SPEAKERS; MONO SPEAKERS AND MICROPHONES
STUB CONDUITS UP NEAR (PREFERABLY WITHIN) THE FOOTPRINT OF THE CONFERENCE TABLE LEG
ALTERNATIVE: FLOOR BOX PASS THROUGH. DO NOT TERMINATE CABLING IN FLOOR BOX.
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, LOCATIONS, AND SIZING OF BOXES AND PATHWAYS SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

6.6.1.4.1 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 WSUP telecommunications guidelines (see TDDG).

6.6.1.4.2 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 WSUP 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.

6.6.1.4.3 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 ½" conduits to the equipment rack casework.

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 because this may require the data cabling to be plenum-rated.

6.6.1.4.4 A/V FLOOR BOX

Some applications may require an A/V Floor Box beneath conference tables or other furniture. WSUP requires that all floor boxes be used for cable pass-through only. Do not terminate cabling in a floor box.

6.6.1.5 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. For buildings using a traditional telecommunications cabling infrastructure (not GPON-based), provide the following telecommunications cabling:

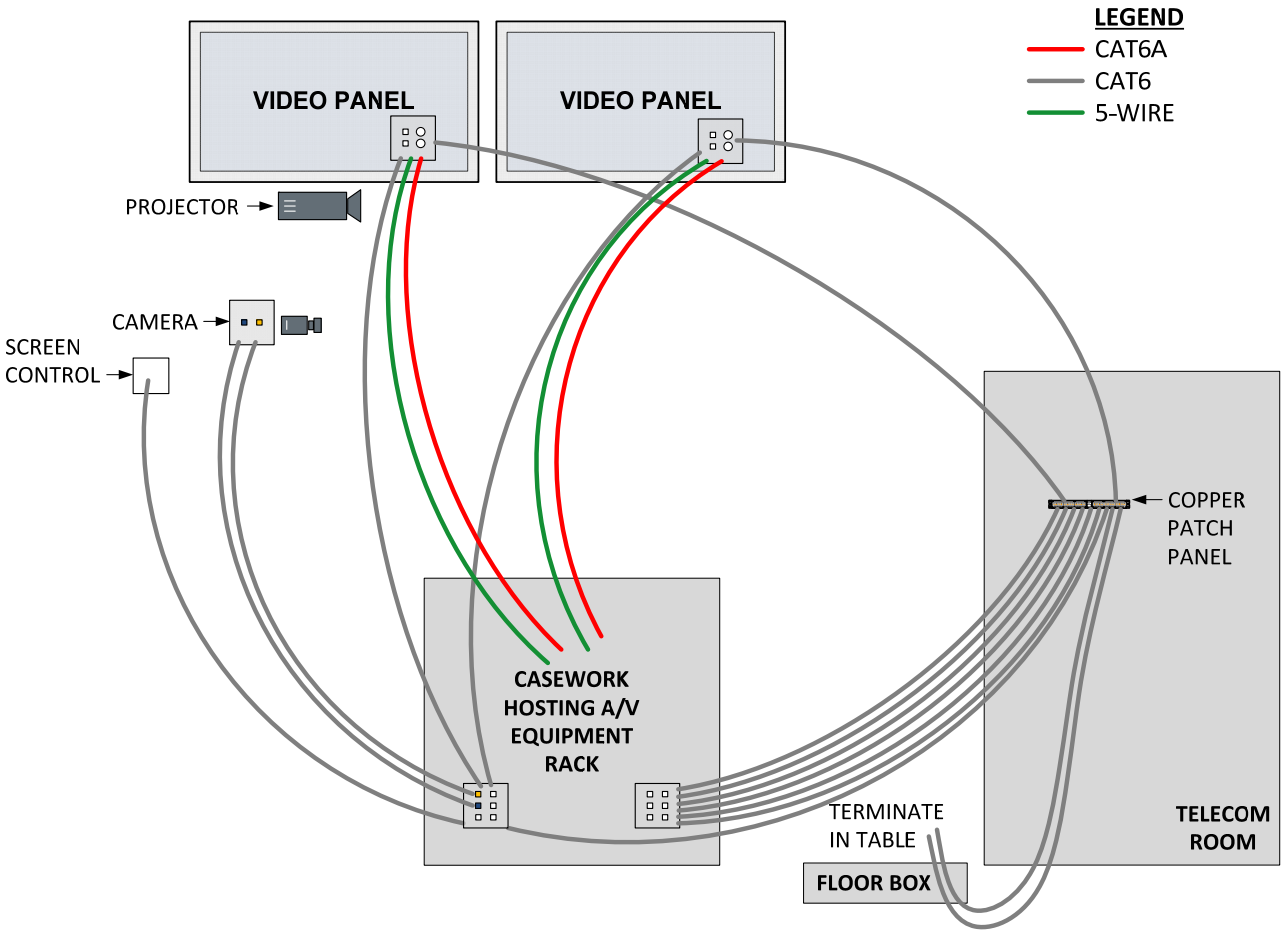
Application	Endpoint/Termination	Cable	Endpoint	Termination
Owner-provided Voice-Over IP (VOIP) telephone	Telecom Room	Category 6	Outlet inside Casework	RJ45 Jack
AMX control system	Telecom Room	Category 6	Outlet inside Casework	RJ45 Jack
Owner-provided computer located in the A/V Rack	Telecom Room	Category 6	Outlet inside Casework	RJ45 Jack
Video Switcher located in the A/V Rack	Telecom Room	Category 6	Outlet inside Casework	RJ45 Jack
Audio DSP located in the A/V Rack	Telecom Room	Category 6	Outlet inside Casework	RJ45 Jack
Data network connection for laptop	Telecom Room	Category 6	Outlet inside Casework	RJ45 Jack
Spare	Telecom Room	Category 6	Outlet inside Casework	RJ45 Jack
Each Projector (LAN)	Telecom Room	Category 6	Outlet above projector	RJ45 Jack
Each Video Panel (LAN)	Telecom Room	Category 6	Outlet behind video panel	RJ45 Jack
Each Projector – Serial Control (RS-232)	Outlet above projector	Category 6	Outlet inside Casework	RJ45 Jacks (both ends)
Each Video Panel – Serial Control (RS-232)	Outlet behind video panel	Category 6	Outlet inside Casework	RJ45 Jacks (both ends)
Each Screen – Control (RS-232)	Terminated at projector screen	Category 6	Outlet inside Podium	RJ45 Jack & screw terminals
Each Vaddio Camera – Video & Power	Outlet behind camera	Category 6	Outlet inside Casework	RJ45 Jacks (both ends) **(Yellow)**
Each Vaddio Camera – RS232 Control Signal	Outlet behind camera	Category 6	Outlet inside Casework	RJ45 Jacks (both ends) **(Blue)**
HDBaseT to each video projector and video panel	Pass through outlet above projector or behind video panel	Category 6A	Bypass Outlet inside Casework	Field Connectorize (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 Casework to terminate all cables.

The following diagram depicts the telecommunications cabling required for a Conference Room audio/visual application, for buildings using a traditional telecommunications cabling infrastructure (not GPON-based):

TELECOMMUNICATIONS 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 NON-TELECOMMUNICATIONS A/V WIRING AND CABLING IS ALSO REQUIRED (FOR SPEAKERS, MICROPHONES, ETC.), BUT NOT DEPICTED HERE.

C. For buildings using a GPON-based telecommunications cabling infrastructure, provide the following telecommunications cabling:

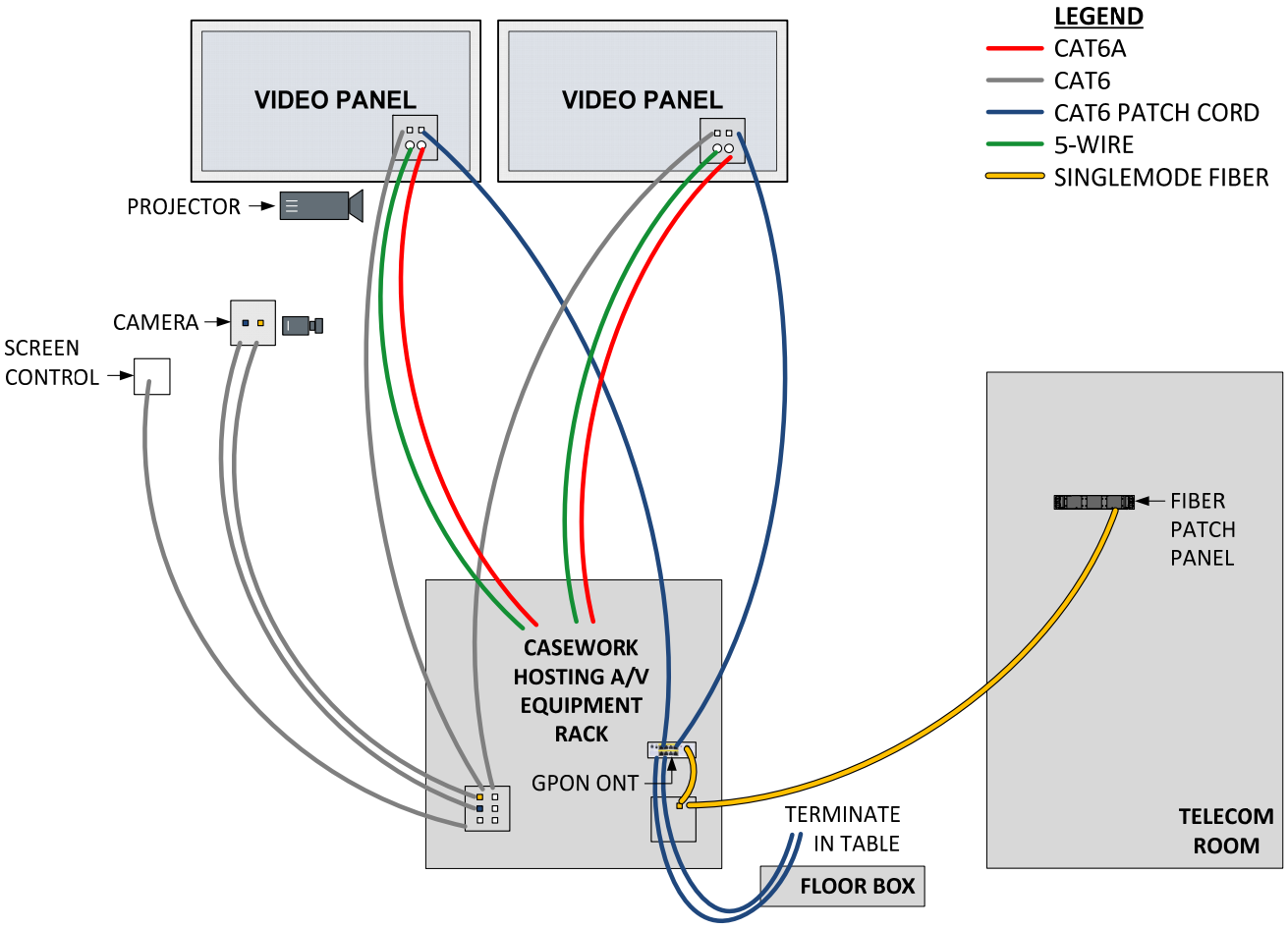
Application	Endpoint/Termination	Cable	Endpoint	Termination
GPON ONT Device	Telecom Room	Singlemode Fiber	Outlet inside Casework	As required for GPON ONT
Owner-provided Voice-Over IP (VOIP) telephone	GPON ONT in Casework	Category 6 Patch Cord		
AMX control system	GPON ONT in Casework	Category 6 Patch Cord		
Owner-provided computer located in the A/V Rack	GPON ONT in Casework	Category 6 Patch Cord		
Video Switcher located in the A/V Rack	GPON ONT in Casework	Category 6 Patch Cord		
Audio DSP located in the A/V Rack	GPON ONT in Casework	Category 6 Patch Cord		
Data network connection for laptop	GPON ONT in Casework	Category 6 Patch Cord		
Spare	GPON ONT in Casework	Category 6 Patch Cord		
Each Projector (LAN)	GPON ONT in Casework	Category 6 Patch Cord	Outlet above projector	Pass-through
Each Video Panel (LAN)	GPON ONT in Casework	Category 6 Patch Cord	Outlet behind video panel	Pass-through
Each Projector – Serial Control (RS-232)	Outlet above projector	Category 6	Outlet inside Casework	RJ45 Jacks (both ends)
Each Video Panel – Serial Control (RS-232)	Outlet behind video panel	Category 6	Outlet inside Casework	RJ45 Jacks (both ends)
Each Screen – Control (RS-232)	Terminated at projector screen	Category 6	Outlet inside Podium	RJ45 Jack & screw terminals
Each Vaddio Camera – Video & Power	Outlet behind camera	Category 6	Outlet inside Casework	RJ45 Jacks (both ends) **(Yellow)**
Each Vaddio Camera – RS232 Control Signal	Outlet behind camera	Category 6	Outlet inside Casework	RJ45 Jacks (both ends) **(Blue)**
HDBaseT to each video projector and video panel	Pass through outlet above projector or behind video panel	Category 6A	Bypass Outlet inside Casework	Field Connectorize (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 Instructor Podium to terminate all cables.

The following diagram depicts the telecommunications cabling required for a Conference Room audio/visual application, for buildings using a GPON-based telecommunications cabling infrastructure:

GPON-BASED TELECOMMUNICATIONS 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 NON-TELECOMMUNICATIONS A/V WIRING AND CABLING IS ALSO REQUIRED (FOR SPEAKERS, MICROPHONES, ETC.), BUT NOT DEPICTED HERE.

D. In addition to telecommunications cabling, the following A/V cabling also passes through outlet boxes serving A/V devices:

Application	Endpoint	Termination	Cable	Endpoint	Termination
Video Panel Video	Outlet behind video panel	Pass through empty space in faceplate	Belden 1279 (5-wire) cable	Bypass Outlet inside casework	On equipment in Casework

Projector Video	Outlet above projector	Pass through empty space in faceplate	Belden 1279 (5-wire) cable	Bypass Outlet inside casework	On equipment in Casework

6.6.1.6 A/V EQUIPMENT AND FURNISHINGS

6.6.1.6.1 EQUIPMENT RACKS

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

6.6.1.6.2 MICROPHONES

Ceiling-mounted HDX digital microphones shall be hung centered above the conference table. Provide the appropriate quantity of microphones for the room size. Microphones shall be appropriately spaced in the room.

Provide separate 1" conduits for microphone cabling. Microphone cabling shall not be run exposed.

6.6.1.6.3 PROJECTION SCREEN AND PROJECTOR

Presentation 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.

6.6.1.6.4 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 appropriate for the room.

Video panels shall be mounted with the bottom edge not less than 42 inches above finished floor and no higher than is required to see the bottom of the image from any seat in the room.

6.6.1.6.5 CAMERAS

A shelf-mounted Polycom 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 at approximately 60 inches above finished floor. If a projection screen is used, the camera shall be mounted adjacent to the projection screen at an approximate height of 60 inches above the finished floor.

A document camera shall be stored inside the casework for use on the conference table.

6.6.1.6.6 SPEAKERS

Ceiling-mounted speakers of the same style as the classroom speakers are to be used for permanent installations where possible. Wall-mounted box speakers may be substituted in small rooms.

6.6.1.6.7 VIDEO CONFERENCING ENDPOINT

A Polycom video conferencing endpoint (High Definition Group Series) shall be provided.

Control of cameras and audio is done by the participants of the conference.

6.7 Collaborative Conference Rooms

A Collaborative Conference Room has the same features as a Presentation Conference Room, plus it is used for video conferencing, which will require the following additional equipment:

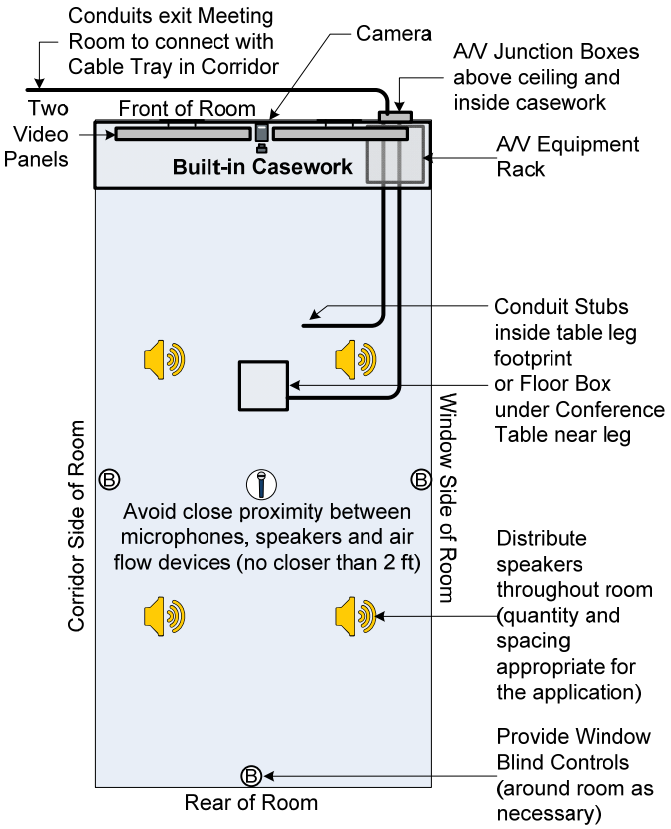
- One or more cameras.
- One or more video panels, possibly to be used for viewing the inbound video stream or a second outbound video stream showing document content. Larger-sized Collaborative Conference Rooms shall have video panels for local content and video panels for video from afar.
- Video Conference Endpoint.
- Ceiling-hung microphones.

Some other differences may include:

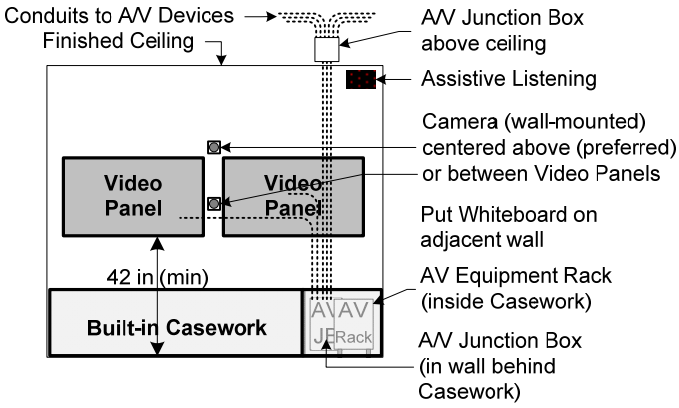
- Additional speakers.
- A larger conference table that would require multiple cable cubby devices hosting additional power, data, and A/V connections.

6.7.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

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



Collaborative Conference Room
A/V Equipment Locations
Plan View



Collaborative Conference Room
A/V Equipment Locations
End Wall Elevation

6.8 Instructional Media Studios

Instructional Media Studios are used to prepare audio/visual media for instructional purposes. 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 lighting shall be dimmable, warm-colored light (not solely fluorescent).

The following audio/visual features are required:

- Audio/visual equipment rack (housed inside built-in casework)
- Computer with two video panels
- Cameras
- Document camera
- Blu-ray/DVD 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.

The space shall be arranged similar to an office.

6.9 Digital Signage

Video panels shall be sized for the application. At a minimum, the panel shall be at least 55 inches (diagonally measured).

Video panels used for digital signage shall be wall-mounted using a secure, articulating wall 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 3 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 6 cables are required for each Digital Signage video panel, terminated in the nearest telecommunications room or patch corded from a nearby GPON ONT.
- If GPON is used, the Designer shall coordinate with the telecommunications designer to determine a desirable location for the GPON ONT, potentially behind the video panel.
    - If the GPON ONT is to be located behind the video panel, provide additional pathway for Category 6 patch cords to be routed up to the corridor cable tray for use with other applications (such as WAPs, cameras, etc.).
- See TDDG for more information.

WSUP is currently exploring digital signage content solutions from Four Winds and Visix. The Designer shall inquire with the WSUP AVPM on a case-by-case basis about the requirements for a project.

6.10 Outdoor Plaza / Gathering Spaces

Outdoor public gathering spaces at WSUP are used for group events, and sometimes require public address systems to communicate with larger groups.

Power outlets are required for A/V equipment and computer equipment.

Mounting structures are required to support loudspeakers, and cable raceways are required to route speaker wiring to the loudspeakers.

7 Construction Document Content

This section of the AVDG describes the content requirements that the Designer shall include when creating the Construction Documents[1]. This content is in addition to the content found in some generally accepted document sets.

The documents produced by the Designer and the services provided by the Designer shall comply with the requirements in the *Conditions of the Agreement* and the *Instructions for Architects and Engineers doing Business with Division of Engineering and Architectural Services* (published by the Washington State Department of General Administration). 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:

7.1 Plans and Drawings

7.1.1 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

[1] As of this writing, the *Conditions of the Agreement* and the *Instructions for Architects and Engineers Doing Business with Division of Engineering and Architectural Services* (both published by the Washington State Department of General Administration) make reference to the term “Construction Drawings.” However, the *Manual of Practice* from the Construction Specifications Institute (CSI) defines “Construction Documents” as a subset of the “Contract Documents” and indicates that drawings, specifications and other written documentation are contained within the Construction Document subset. The AVDG will use the term “Construction Documents” according to CSI’s definition.

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.

7.1.2 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 with site work for other disciplines could possibly arise, in particular indicating the separation distances between low voltage and power or steam. The sequencing of site work shall also be shown, if applicable.

7.1.3 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 WSUP.
- 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 WSUP 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.

7.1.4 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. WSUP 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.

7.1.5 A/V EQUIPMENT ROOM PLAN DETAILS

A. Construction documents for WSUP 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

7.1.6 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

7.1.7 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 8.2.

7.2 Project Manual

A. The *Instructions for Architects and Engineers Doing Business with Division of Engineering and Architectural Services* (published by the Washington State Department of General Administration) lists requirements for the Project Manual. The *State of Washington Conditions of the Agreement* (also published by the Washington State Department of General Administration) lists additional requirements for the Designer.

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.

7.2.1 SPECIFICATIONS

7.2.1.1 WSUP AUDIO/VISUAL CONSTRUCTION GUIDE SPECIFICATION

A. The WSUP 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 WSUP 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 WSUP 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.

7.2.1.2 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 WSUP standard and addresses Instructor Podiums. 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

7.2.2 CUTOVER PLAN

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

Not all projects will require a cutover plan.

7.2.3 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 WSUP's Telecommunications Distribution Design Guide. Upon request, WSUP will provide an electronic spreadsheet file to be used as a template.

7.3 Record Drawings and Documentation

The *Instructions for Architects and Engineers Doing Business with Division of Engineering and Architectural Services* (published by the Washington State Department of General Administration) lists requirements for Record Drawings and submittals. The following requirements related to Record Drawings and submittals are **in addition** to the requirements listed in *Instructions for Architects and Engineers Doing Business with Division of Engineering and Architectural Services*:

7.3.1 RECORD DRAWING CONTENT

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

7.3.2 RECORD DRAWING DELIVERABLES

The following shall be delivered to the WSUP FSPM, the second copy of which shall be given to the AVPM:

- Two copies of 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.
- Two copies of the A/V subcontractor's redline drawings and updated CAD drawings (reflecting construction adjustments), in both printed and electronic form (on CDROM).
- Two copies of a CDROM containing the digital photographs taken by the Designer during the project shall be delivered to WSUP Facilities Planning and Construction.

8 Appendices

8.1 Furniture Details

8.1.1 INSTRUCTOR PODIUM

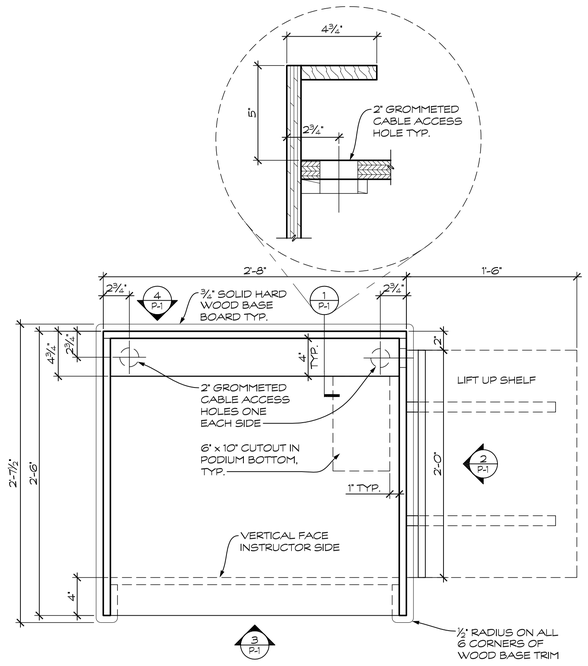
The following pages show four different styles of Instructor Podiums that are used at WSUP. The Designer shall inquire with the WSUP AVPM regarding which style(s) shall be used in each space for each given project:

8.1.1.1 ONE-HALF SIZE PODIUM

8.1.1.2 THREE-QUARTER SIZE PODIUM

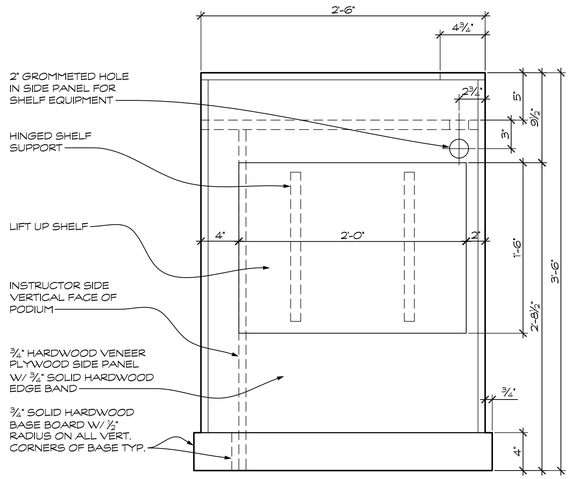
8.1.1.3 FULL-SIZE PODIUM

8.1.1.4 OVERSIZED PODIUM



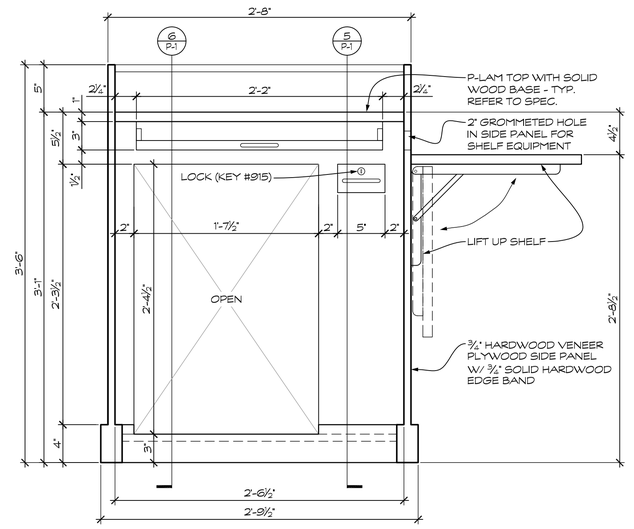
1 P-1 1/2 SIZE PODIUM - PLAN VIEW

SCALE: 1 1/2" = 1'-0"



2 P-1 1/2 SIZE PODIUM - SIDE VIEW

SCALE: 1 1/2" = 1'-0"



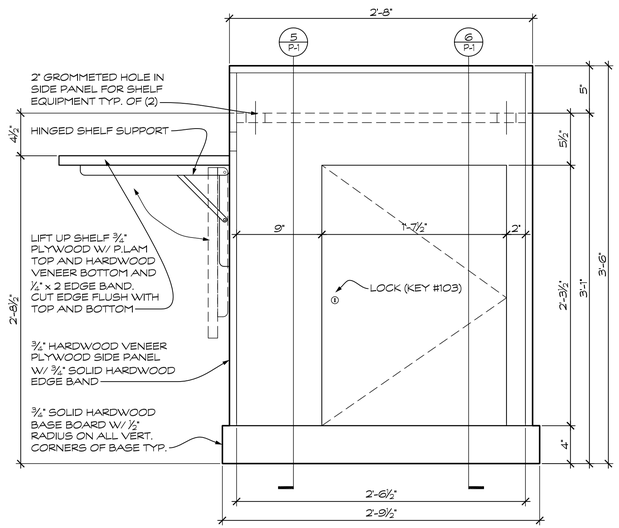
3 P-1 1/2 SIZE PODIUM - BACK ELEVATION (INSTRUCTOR SIDE)

SCALE: 1 1/2" = 1'-0"

1/2 SIZE PODIUM SCHEDULE

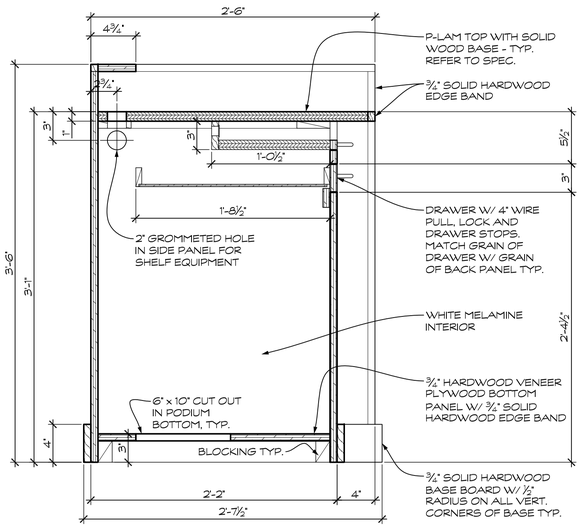
TYPE	TAG	DESCRIPTION
1	TYP.	RIGHT HAND DRAWER, RIGHT HAND PULL-OUT SHELF, KEYBOARD PULL-OUT SHELF TYPICAL DIMENSIONS OF DOORS AND OPENINGS
1A	- -	TYPE 1 PODIUM MIRRORED

FOR CONSTRUCTION



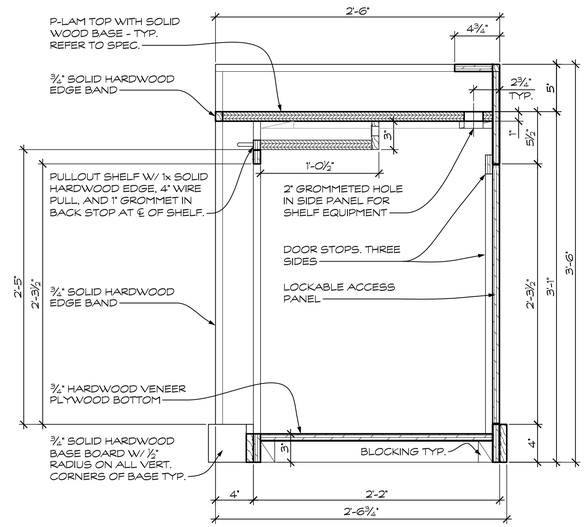
4 P-1 1/2 SIZE PODIUM - FRONT ELEVATION (CLASSROOM SIDE)

SCALE: 1 1/2" = 1'-0"



5 P-1 1/2 SIZE PODIUM - SECTION

SCALE: 1 1/2" = 1'-0"



6 P-1 1/2 SIZE PODIUM - SECTION

SCALE: 1 1/2" = 1'-0"

REV.	APPD.	DATE	REVISION DESCRIPTION

WASHINGTON STATE UNIVERSITY
Facilities Services
225 SE Idaho Street
Pullman, Wa. 99164-3011
PH 509-335-5571
FAX 509-335-6875

PODIUM DETAILS

BUILDING - VARIES

PODIUM TYPES FOR WSU CLASSROOMS

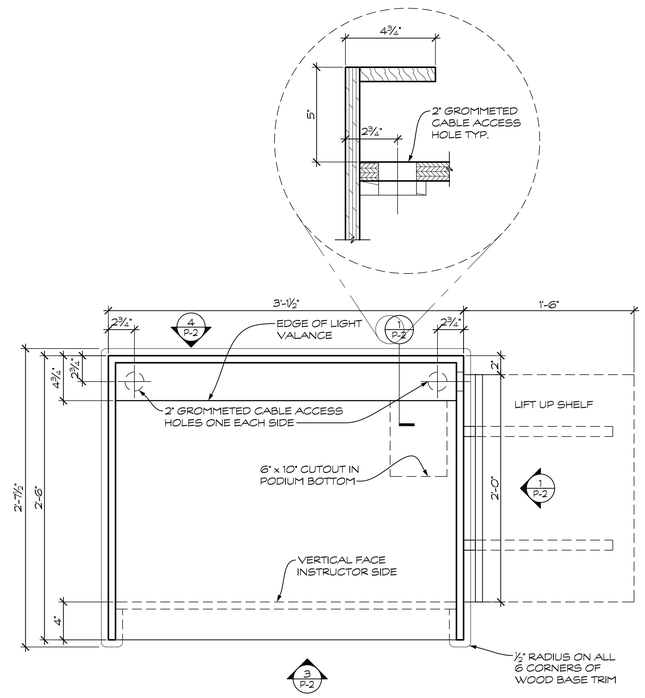
1/2 SIZE PODIUM

DESIGN	KJP
DRAWN	KJP
APP'D	
DATE	1/31/14
F.F. NO.	----
FILE NO.	----

P-1

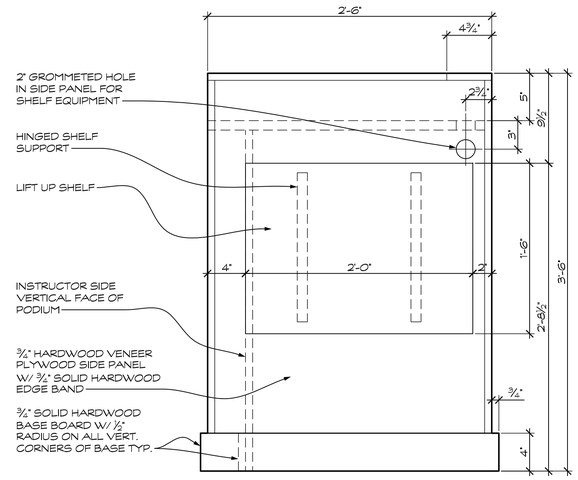
SHEET 1 OF 4

FILE: Y:\Lopes, Doug\AV PODIUM DETAIL DWGS\P-1 ONE HALF SIZE PODIUM.dwg DATE: Feb/18/2014 1:40



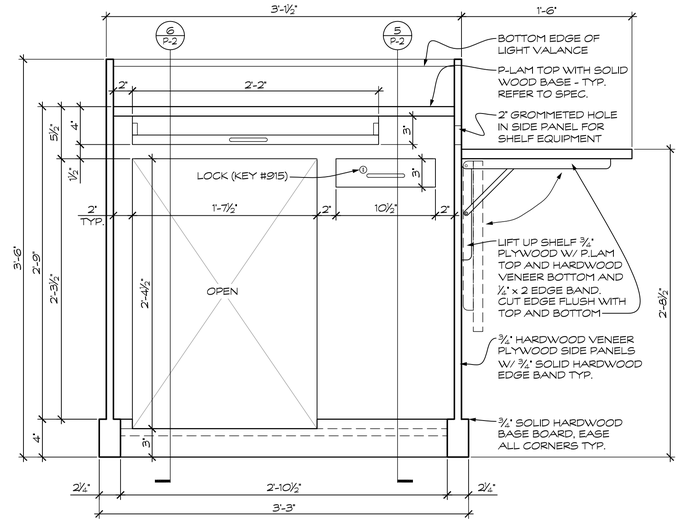
1 P-2 **3/4 SIZE PODIUM - PLAN VIEW**

SCALE: 1 1/2" = 1'-0"



2 P-2 **3/4 SIZE PODIUM - SIDE VIEW**

SCALE: 1 1/2" = 1'-0"



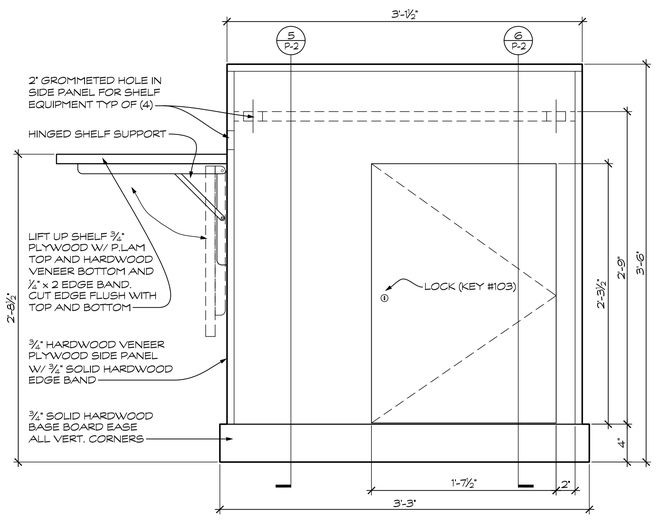
3 P-2 **3/4 SIZE PODIUM - BACK ELEVATION (INSTRUCTOR SIDE)**

SCALE: 1 1/2" = 1'-0"

3/4 SIZE PODIUM SCHEDULE

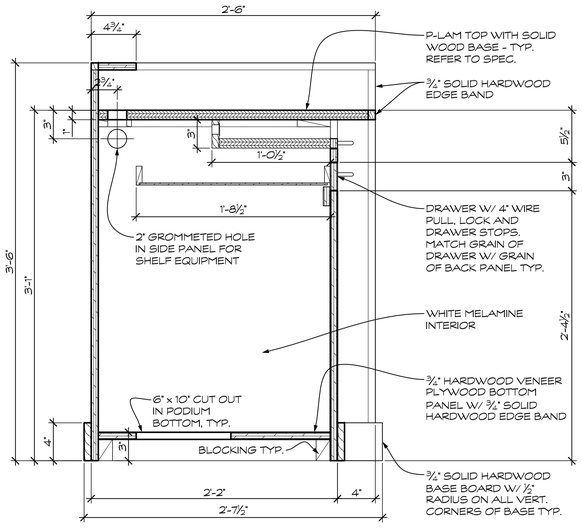
TYPE	TAG	DESCRIPTION
2	TYP.	RIGHT HAND DRAWER, RIGHT HAND PULL-OUT SHELF, KEYBOARD PULL-OUT SHELF TYPICAL DIMENSIONS OF DOORS AND OPENINGS
2A	- -	TYPE 1 PODIUM MIRRORED

FOR CONSTRUCTION



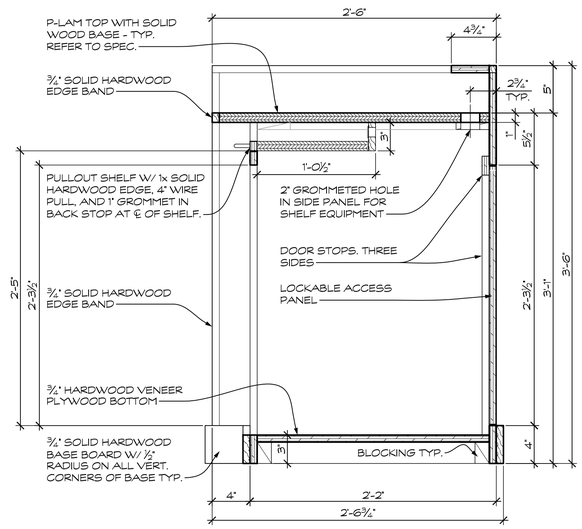
4 P-2 **3/4 SIZE PODIUM - FRONT ELEVATION (CLASSROOM SIDE)**

SCALE: 1 1/2" = 1'-0"



5 P-2 **3/4 SIZE PODIUM - SECTION**

SCALE: 1 1/2" = 1'-0"



6 P-2 **3/4 SIZE PODIUM - SECTION**

SCALE: 1 1/2" = 1'-0"

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Pullman, Wa. 99164-3011
PH 509-335-5571
FAX 509-335-6875

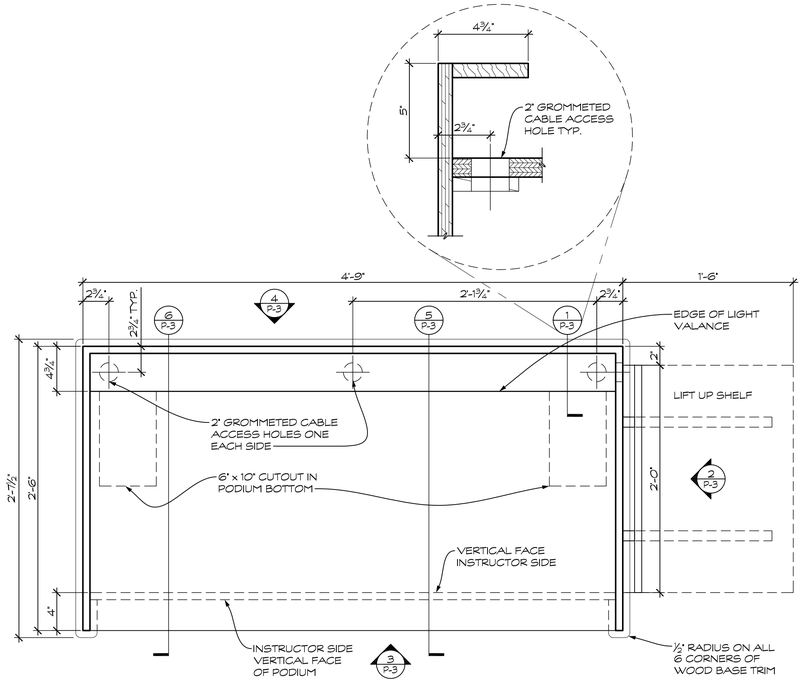
PODIUM DETAILS
BUILDING - VARIES
PODIUM TYPES FOR WSU CLASSROOMS
3/4 SIZE PODIUM

DESIGN	KJP
DRAWN	KJP
APP'D	
DATE	1/31/14
F.F. NO.	----
FILE NO.	----

P-2

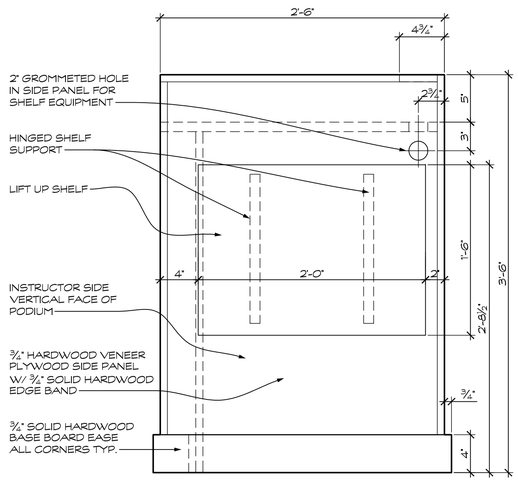
SHEET 2 OF 4

FILE: Y:\Lopes, Doug\AV PODIUM DETAIL DWGS\P-2 THREE QUARTER SIZE PODIUM.dwg DATE: Feb/18/2014 1:43



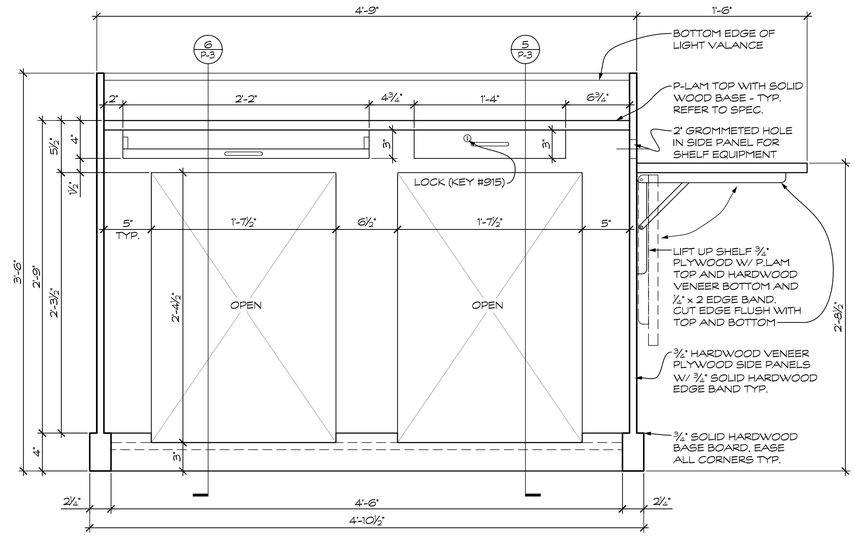
1 P-3 **FULL SIZE PODIUM - PLAN VIEW**

SCALE: 1 1/2" = 1'-0"



2 P-3 **FULL SIZE PODIUM - SIDE VIEW**

SCALE: 1 1/2" = 1'-0"



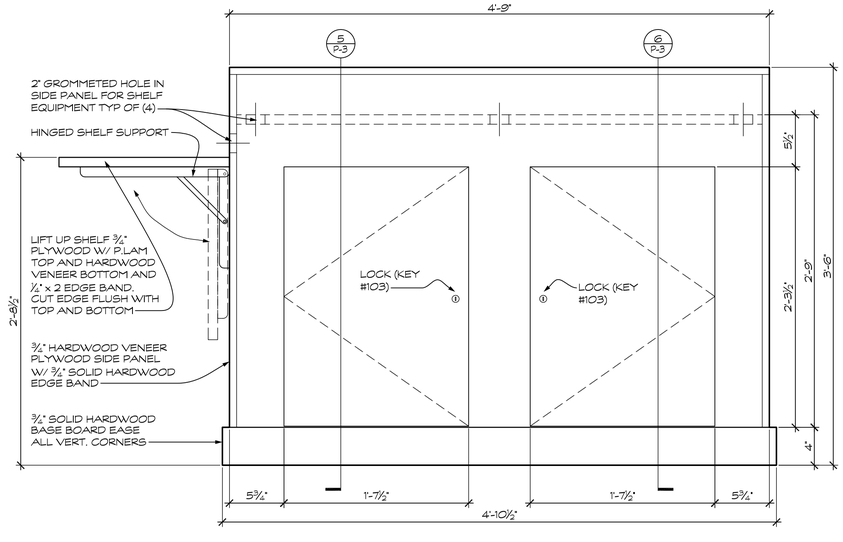
3 P-3 **FULL SIZE PODIUM - BACK ELEVATION (INSTRUCTOR SIDE)**

SCALE: 1 1/2" = 1'-0"

HULL SIZE PODIUM SCHEDULE

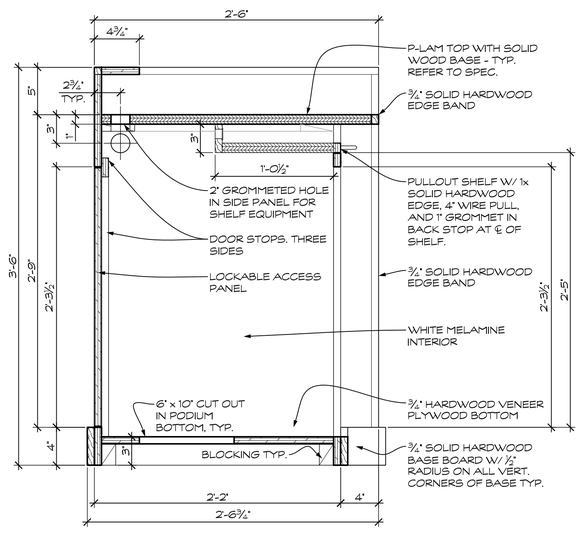
TYPE	TAG	DESCRIPTION
3	TYP.	RIGHT HAND DRAWER, RIGHT HAND PULL-OUT SHELF, KEYBOARD PULL-OUT SHELF TYPICAL DIMENSIONS OF DOORS AND OPENINGS
3A	- -	TYPE 1 PODIUM MIRRORED

FOR CONSTRUCTION



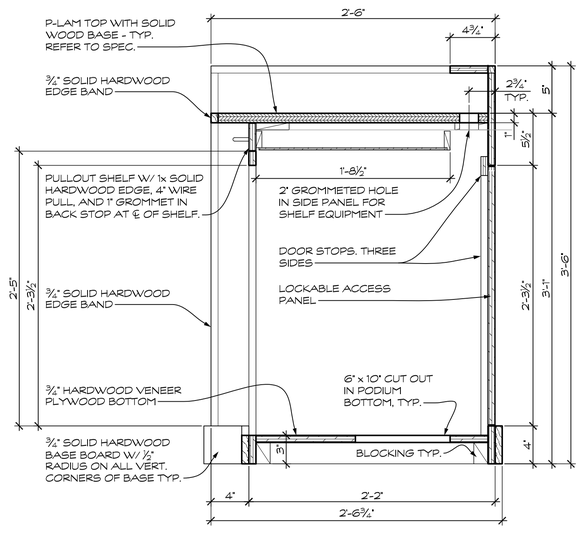
4 P-3 **FULL SIZE PODIUM - FRONT ELEVATION (CLASSROOM SIDE)**

SCALE: 1 1/2" = 1'-0"



5 P-3 **FULL SIZE PODIUM - SECTION**

SCALE: 1 1/2" = 1'-0"



6 P-3 **FULL SIZE PODIUM - SECTION**

SCALE: 1 1/2" = 1'-0"

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WASHINGTON STATE UNIVERSITY
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Facilities Services
225 SE Idaho Street
Pullman, Wa. 99164-3011

PODIUM DETAILS
BUILDING - VARIES
PODIUM TYPES FOR WSU CLASSROOMS
FULL SIZE PODIUM

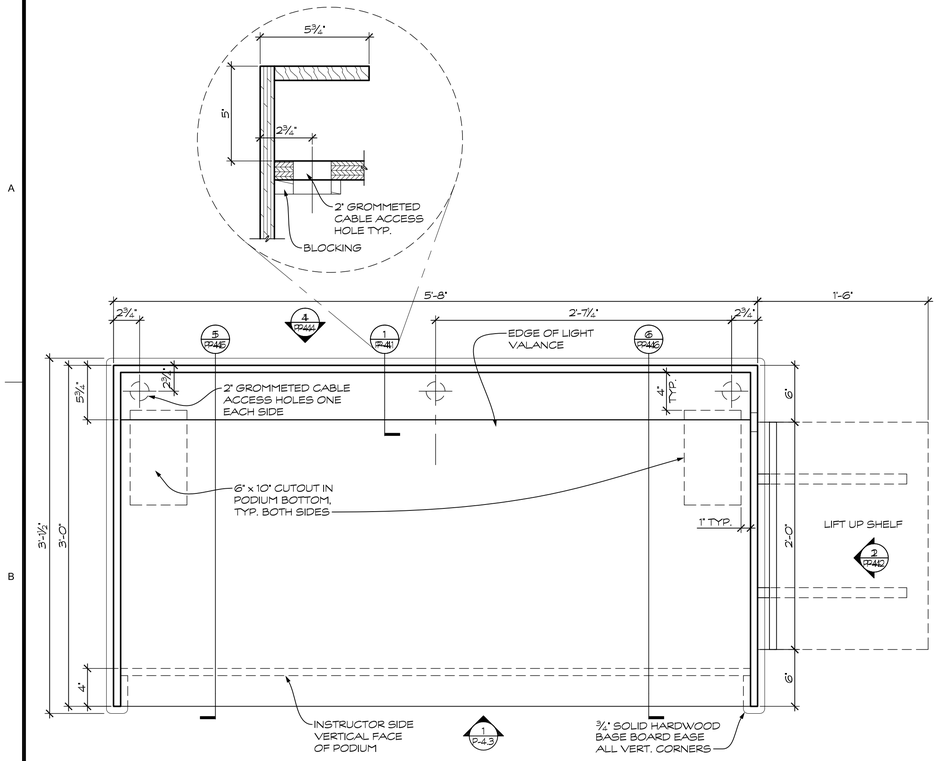
DESIGN	KJP
DRAWN	KJP
APP'D	
DATE	1/31/14
F.F. NO.	----
FILE NO.	----

P-3
SHEET 3 OF 4

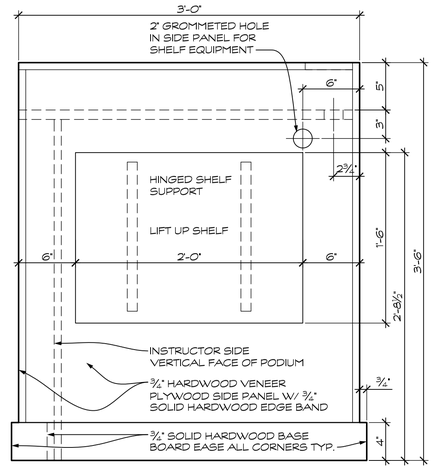
FILE: Y:\Lopes, Doug\AV PODIUM DETAIL DWGS\P-3 - FULL SIZE PODIUM.dwg DATE: Feb/18/2014 1:46

OVERSIZED PODIUM SCHEDULE

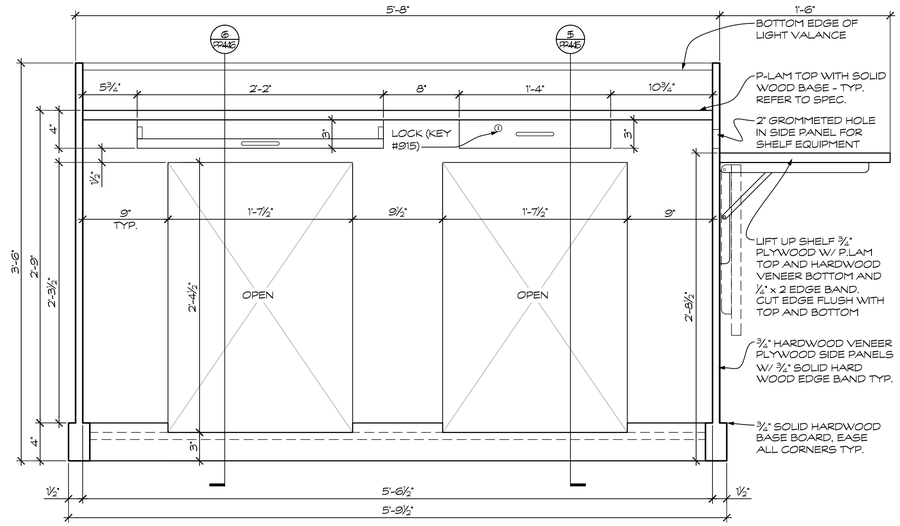
TYPE	TAG	DESCRIPTION
4	TYP.	RIGHT HAND DRAWER, RIGHT HAND PULL-OUT SHELF, KEYBOARD PULL-OUT SHELF TYPICAL DIMENSIONS OF DOORS AND OPENINGS
4A	- -	TYPE 1 PODIUM MIRRORED



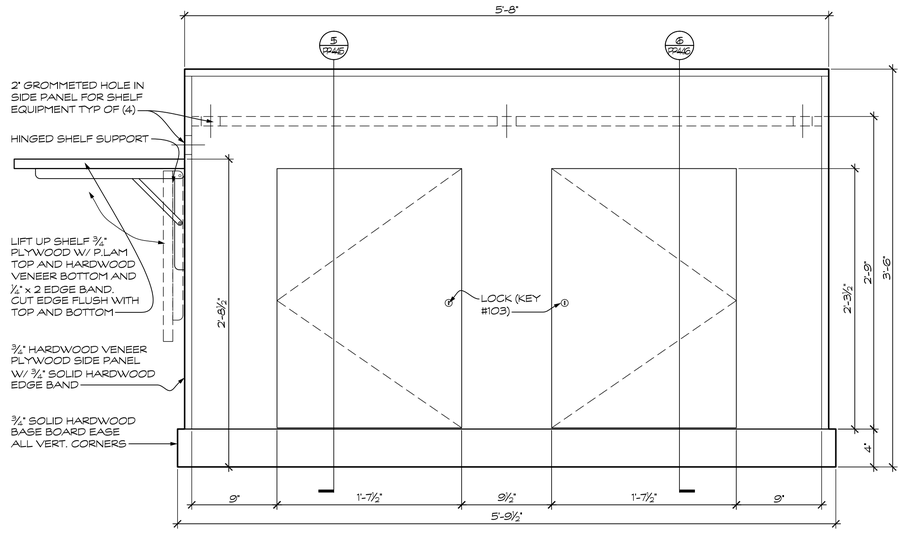
1 OVERSIZED PODIUM - PLAN VIEW
P-4 — SCALE: 1 1/2" = 1'-0"



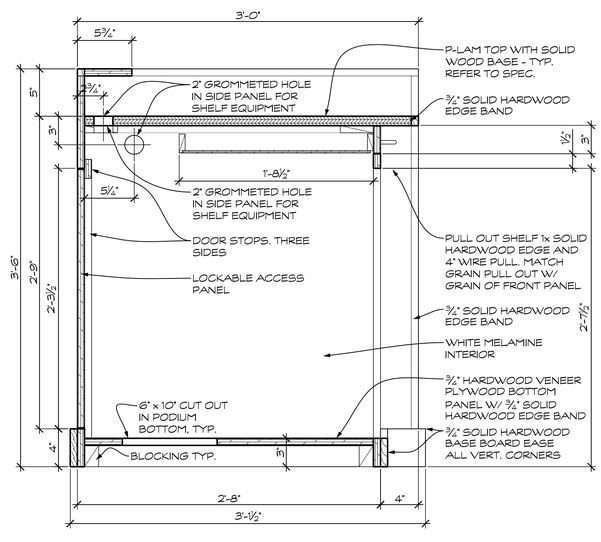
2 OVERSIZED PODIUM - SIDE VIEW
P-4 — SCALE: 1 1/2" = 1'-0"



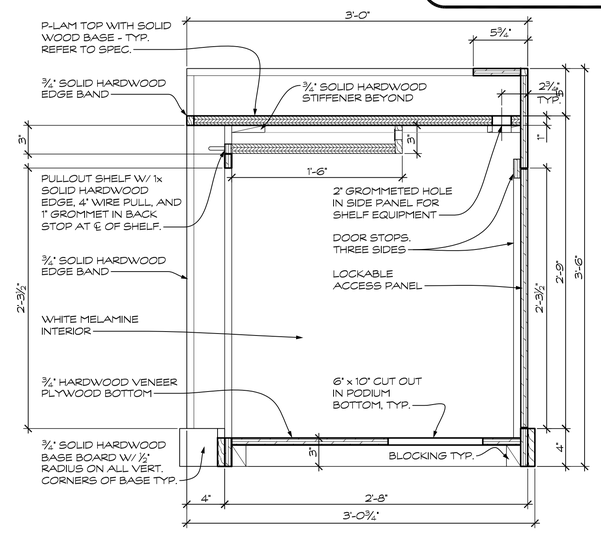
3 OVERSIZED PODIUM - BACK ELEVATION (INSTRUCTOR SIDE)
P-4 — SCALE: 1 1/2" = 1'-0"



4 OVERSIZED PODIUM - FRONT ELEVATION (CLASSROOM SIDE)
P-4 — SCALE: 1 1/2" = 1'-0"



5 OVERSIZED PODIUM - SECTION
P-4 — SCALE: 1 1/2" = 1'-0"



6 OVERSIZED PODIUM - SECTION
P-4 — SCALE: 1 1/2" = 1'-0"

FOR CONSTRUCTION

REV.	APPD.	DATE	REVISION DESCRIPTION

WASHINGTON STATE UNIVERSITY
Facilities Services
225 SE Idaho Street
Pullman, Wa. 99164-3011
PH 509-335-5571
FAX 509-335-6875

PODIUM DETAILS
BUILDING - VARIES
PODIUM TYPES FOR WSU CLASSROOMS
OVER SIZED PODIUM

DESIGN	KJP
DRAWN	KJP
APP'D	
DATE	1/31/14
F.F. NO.	----
FILE NO.	----

P-4
SHEET 4 OF 4

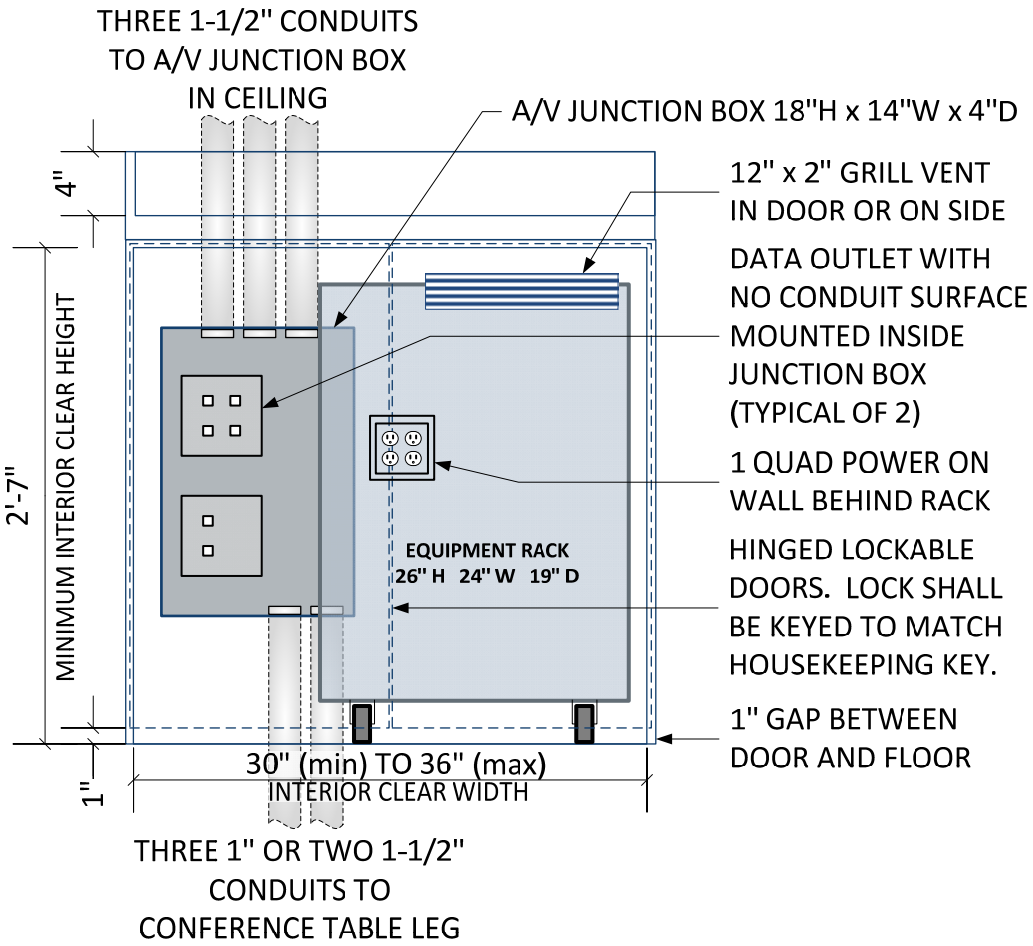
FILE: Y:\Lopes, Doug\AV PODIUM DETAIL DWGS\P-4 - OVER SIZED PODIUM.dwg DATE: Feb/18/2014 1:48

8.1.2 CONFERENCE ROOM CASEWORK

The diagram below depicts the solution WSUP prefers for providing an A/V Equipment Rack for a Conference Room. Please note that this same solution can be adapted for use with a ALH where there is no Instructor Podium.

Conference Room Casework

FRONT VIEW



8.2 Conduit, Boxes and Cabling Schematic

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

6100UE (quantity 2)

8-UTP CAT 6E:

Route qty-1 UTP CAT 6E to Projector.
Route qty-7 UTP Cat 6E to Podium

1½" conduit
COMM
CLOSET

Pwr
Control
Blank

CAMERA Location

CAT 6E (qty-2)
Camera to Podium

COUNDUIT 1
1279P (qty-1)

CONDUIT 2
CAT 6 (qty-3)
Data & Serial Control

JUNCTION BOX
Above Ceiling

WIRE INFO
Belden 1279p: RGB H/V
Belden 6300FE: Audio
Belden 6301FE Screen Control
Belden 6100UE: Speaker ONLY

UPT Cat6e

6301FE (qty-1) UTP Cat6E (qty-1)

6300FE (qty-2)
Manufacturer supplied power cord (qty-1)

ASSISTED LISTENING

SPEAKER JUNCTION BOX

SPEAKER

SPEAKER

Data
Video
Control
Blank

Projector Location

Conduit 1UTP

Conduit 2 A/V

Conduit 3 A/v

115Vac 20a

Conduit 1

7UTP from COMM Closet
Phone, Wan, PC, AMX, Kramer1, Nexia, Spare--Data
4 UTP from external A/V equipment
Projector Control, Camera Control, Camera Power/Video,
Screen Serial

Conduit 2

Belden 1279P (qty-2)
Power Cable Assistive Hearing

Conduit 3

Belden 6100UE (qty2)
Belden 6300FE (qty2)
Belden 6301FE (qty1)

Qty 3-1½" conduits

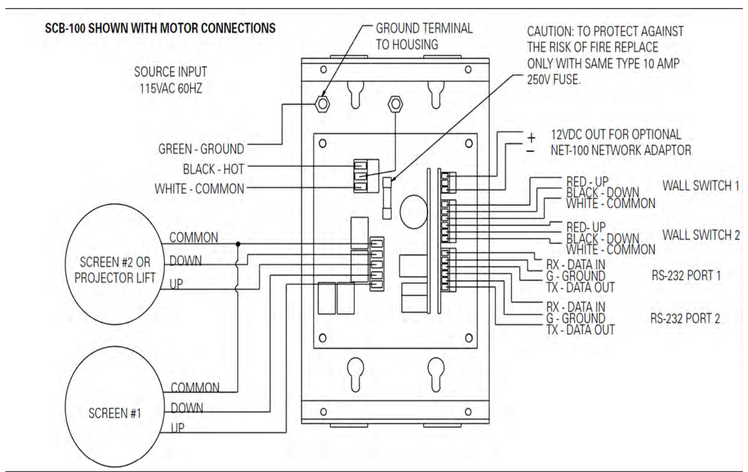
PODIUM

Phone
Wan
PC
AMX
Kramer 1
Nexia

Video
Spare Data
Projector Serial
Screen Serial
Camera Control
Camera Power/Video

SCREEN

SCB-100 SHOWN WITH MOTOR CONNECTIONS



Screen Control Wiring Wall Switch 1
Belden 6301FE
Red-Up
Black-Down
White-Common
Shield-Cut Do Not Terminate

Screen Control Wiring RS-232 Port 1
UTP Cat 6E
Solid orange----Tx-Data Out
Solid Brown-----RX-Data In
Solid Green----G-Ground

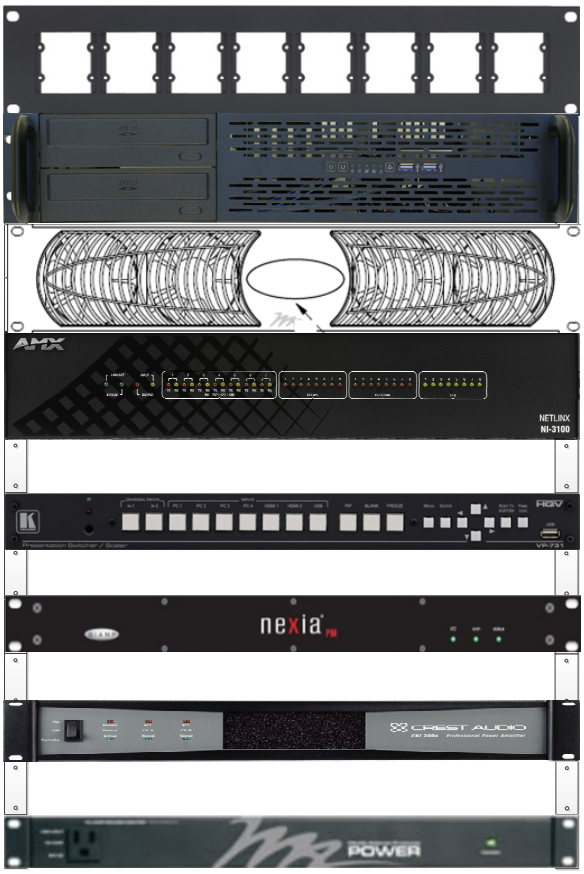
8.3 Rack Elevation Diagrams

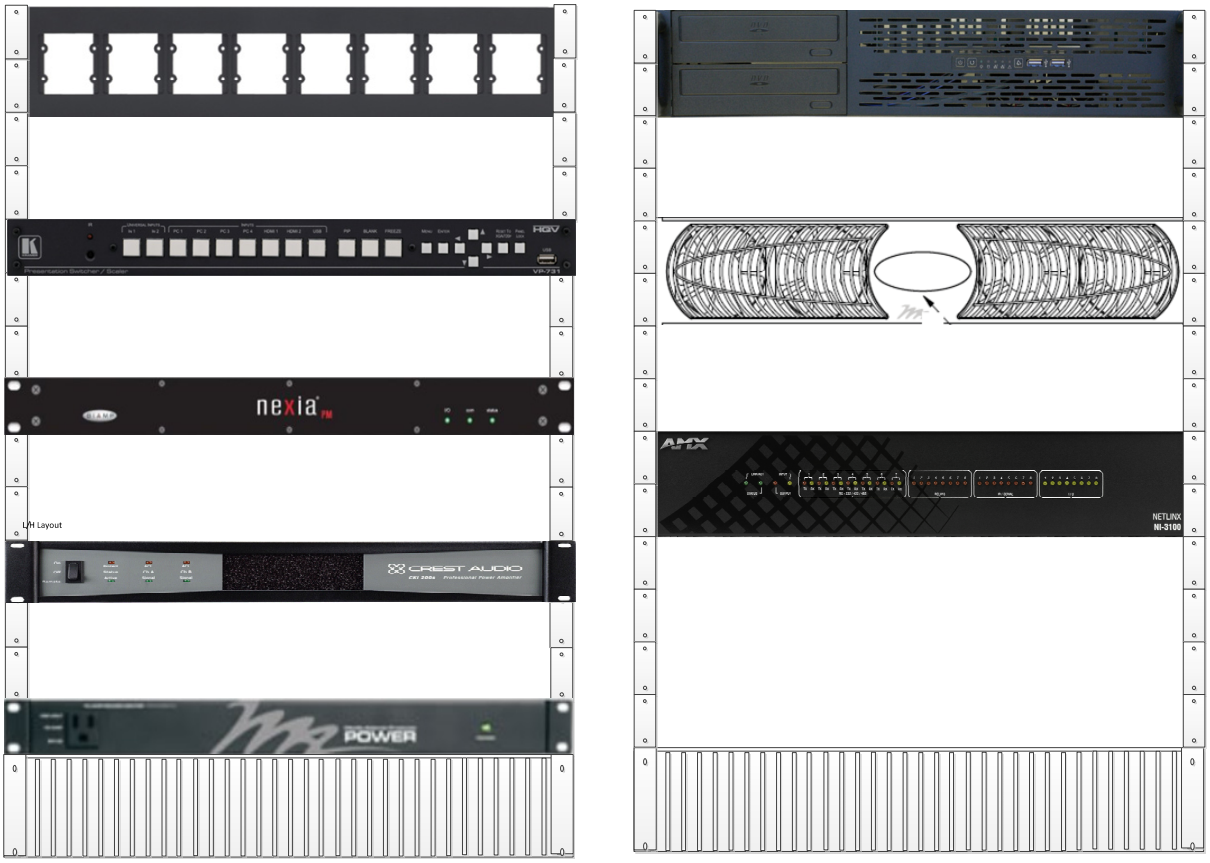
The rack elevation diagrams on the following two pages depict the equipment arrangement that WSUP requires for Instructor Podiums.

Used with ½ size or ¾ sized podiums

W/O Fan

With Fan





Left Hand Podium Layout

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